VERBAL AND OTHER FACTORS RELATED TO BEHAVIOURAL SELF-RESTRAINT IN CHILDREN

by

MONA MANWAH TSOI

Department of Psychology, Bedford College

Thesis presented for examination for the Ph.D. degree in the University of London, January, 1980.

ABSTRACT

This study examined (1) how verbal self-instruction (VSI) affects behavioural self-restraint and (2) individual differences in impulsiveness and verbal regulation of behaviour (VRB) in children.

The review of Luria's interpretation of VRB and other related works suggested that VRB can be examined at different levels of generality. The elementary level concerns the execution and inhibition of simple motor responses; the intermediate level involves control of more complicated behaviour by detailed self-instructions, while the highest level of abstraction relates to the role of speech in the socio-cultural development in Man.

The first three experiments focussed on the elementary motor responses and demonstrated that self-instruction was detrimental to motor performance. There was no evidence to support the assumption that verbal responses were superior to motor responses. However, verbal and motor responses tended to co-ordinate with each other temporally and this feature was utilized in differential-reinforcement-of-low-rate (DRL) experiments, which showed that self-instruction aided behavioural restraint. However, the content of self-instruction was not important, but how it was said.

Behavioural measures of self-restraint and responsiveness to verbal instructions were related to individual differences in cognitive style (measured by the Matching Familiar Figures Test) and personality (measured by self-rated questionnaires and a teacher's

rating scale designed for the purpose). Whereas the use of self-instructions tended to override any individual differences related to behavioural self-restraint, the results supported the hypothesis that cognitive impulsivity was related to measures of anxiety, and behavioural impulsiveness to anxiety and psychoticism. There was no evidence that impulsiveness was related to extraversion. In view of the theoretical discussion on cognitive impulsivity by Kagan and Block, and on impulsiveness in personality by Eysenck and Gray, it seems that behavioural, cognitive and personality impulsiveness cannot be conceptualized as a unitary concept.

CONTENTS

CONTENTS (con't)

CONTENTS (con't)

CONTENTS (con't)

List of Figures

List of Tables

List of Tables (con't)

List of Tables (con't)

List of Tables (con't)

List of Tables (con't)

List of Tables (con't)

List of Tables (con't)

List of Tables (con't)

List of tables (con't)

List of Tables (con't)

LIST OF APPENDICES

List of Appendices (con't)

List of Appendices (con't)

Acknowledgements

I am deeply grateful to Dr. J.N. Nicholson and Professor B.M. Foss for their supervision of my work. I have benefitted from the discussion with them the theoretical as well as technical problems in connection with this research project, and without their patient guidance, the thesis would not have been completed. I owe much to them for their suggestions regarding all aspects of work, though the responsibility is mine if I have ventured to depart from their views, or for any weaknesses in the thesis.

The research proper and most of the writing were completed in England, but the final draft was written and typed in Hong Kong. There are many people, though they may be over eight thousand miles apart, I would like to thank for their assistance in making this thesis possible. Mrs. R. Westley and her technical team at Bedford College,in particular Mr. G. Gonella and Mr. D. Buckwell, designed and constructed the apparatus for the experiments, and they equipped and serviced the mobile laboratory for my use. Mr. D. Finn provided me with photographic assistance. I am grateful to Mr. J. Valentine for statistical advice, Mr. R. Matthews and Mr. D. Wardell for the use of computer service, Dr. C.K. Chan for assistance in graphical presentation, and Mr. S.M. Lo and Miss J. Lee for typing the thesis.

I also wish to thank the Heads of the schools in the London Borough of Brent and the London Borough of Sutton that I visited for making available facilities of their schools to be designated for use of my experiments, and the teachers and pupils for their time and co-operation in participating in the project, and making me feel welcome in their schools.

Finally, I am thankful to my parents, for being so understanding.

INTRODUCTION

The Problem

The present enquiry is concerned with an aspect of self-control in children -- the relationship between a child's ability to inhibit or restrain his or her motor behaviour and a variety of factors, including language and personality.

As far as self-control is concerned, Man's interest in the problem seems to have dated back into antiquity: for example, the Bhagavad-Gita has been known as a manual on self-control for over 2,000 years. Underlying this interest is the value placed on human freedom and dignity. London (1969) sees the history of human development as an engagement in an endless struggle for control. He may be overstating the case, but it is fair to observe that everyone practises some degree of control -- of himself as well as others -- in order to achieve his own ends or what he presumes to be in the best interest of the person being controlled. Methods of control vary, and so does their effectiveness. However, one problem which has cropped up with many methods stems from the agent of change. Most techniques of control involve an external agent, and many people do not like the idea of being controlled. Ethically, self-control is more acceptable, because it puts the responsibility (and awareness) on the person himself.

But the term "self-control" has meant many different things to different people. Philosophers talk about "willpower" and "volition" of human action (Brand, 1970), and many writers attribute self-control to some vaguely defined inner force, or even super-natural entities. "Self-control" also has different meanings to different psychologists. Freud, for example, drew on personality explanation such as the Ego, which acts as a balance between innate biological desires (Id) and externally imposed constraints (Superego) (Freud, 1914), whereas Skinner (1953) considers the "self" to be a device representing a functionally unified system of response. He does not dismiss private events but includes self-control with the other operants. According to Skinner, self-control is a function of a person's history of learning interacting with current environmental influences. Social learning theorists (e.g., Bandura, 1969; Cautela, 1967; Goldfried & Merbaum, 1973; Kanfer & Phillips, 1970; Mahoney & Thoresen, 1974; Mischel, 1973; Thoresen & Mahoney, 1974) consider that the volitional approaches have impeded the understanding of self-control. They split self-control into various components such as cognitive or mediating factors, functional analysis, self-evaluation, self-reinforcement, and so on. Looking at these aspects separately is helpful in understanding the mechanisms underlying self-control so that more effective treatment programmes can be designed. But none of these parts alone is sufficient to bring about self-control. Goldfried & Merbaum (1973) adopt a rather catholic stand and define "self-control" as "a process through which an individual becomes the principal agent in guiding, directing, and regulating those features of his own behaviour that might eventually lead to desired positive consequences" (Goldfried & Merbaum, 1973, p.11).

The merit of this definition is that it allows a wider scope for manoeuvre and choice for emphasis, and it is adopted in the present study as a working definition of "self-control".

Notwithstanding the differences in definition, it is commonly assumed that the ability to control one's behaviour is an important one, for both children and adult. Learning or developing self-control is part of the process of becoming socialized. There are frequent occasions when self-control has to be exercised, often to inhibit a response which has an immediately rewarding but, in the long run, an aversive consequence. Laboratory studies by Mischel and his co-workers (Mischel, 1966, 1974; Mischel, Ebbesen, & Zeiss, 1972) have highlighted the importance of resistance to temptation or the ability to delay gratification. And referring to instances in daily life, excessive eating and suffering from obesity is a problem that may affect all ages. With learning in children, some degree of self-control is also essential, for a child has to be able to sit and attend quietly for a period of time if he is to learn anything. Although traditionally most of the control in the classroom has been in the hands of teachers, it is obvious that if self-control can be fostered among the children, a great step forward will occur in both classroom management and learning.

However, the mechanisms underlying the development of self-control remain obscure, despite the fact that some description of the development of the ability to inhibit or to control one's behaviour is included in most textbooks on Developmental Psychology. Generally, the age between five and seven has been considered to be a time when the child undergoes rapid changes. Qualitatively, the child changes from someone who lacks foresight, thinks in concrete terms, and acts impulsively, into someone who increasingly develops his ability to form a system of planning behaviour, thinks in abstract terms, and is able to restrain himself (Flavell, 1963; Kohlberg, Yaeger, & Hjerthorn, 1968; White, 1965, 1970). There are also changes in terms of an increase in the awareness and access to verbal and voluntary processes. White (1970) suggests that "the interpretation of the five to seven transition will lean heavily upon a mechanism of inhibition which is presumed to have its first sizable influence on behaviour during this age range." White has collected examples from perceptual, cognitive and social development in children and put them under the penumbra of the concept "temporal stacking". However, he has not developed his theoretical framework further, and the correlates of the ability to control one's behaviour remain open to speculation. The present thesis is concerned with only a small number of the variables which may be involved.

The first factor to be related to self-control is the use of speech, or in a broader sense, language. A review of the psychological research into language is beyond the scope of the present study. Suffice it to say that the problem has been tackled in great detail from structural, developmental and functional angles (Brown, 1973; Greenfield & Smith, 1976; Lenneberg & Lenneberg, 1975; Rodgon, 1976; Staats, 1968; and others). From the social-communicative point of view, language has been analysed as speech acts (Bruner, 1974/75; 1975), and there are studies dealing with the interaction between mother and child's speech (Brown & Bellugi, 1964; Ryan, 1973). As for the psychological functioning within an individual, the relationships between language and thinking, memory, perception and skills have also been examined (Bourne, 1971; Clark & Clark, 1977; Cromer, 1974; Furth, 1966).

Whereas most of the researchers have dealt with specific aspects of language, Dance (1967) suggests that a more global approach is required and he puts forward a "total theory of speech communication" which includes five hypothetical "laws" (p.304, 1967):

1. We cannot help communicating
2. Speech communication is uniquely human
3. Speech communication is essential to the emergence of the human individual
4. Speech communication interacts with healthy mental development throughout the life span
5. Speech communication plays an essential role in societal emergence as well as in individual emergence.

Dance himself has not put forward a theoretical formulation to meet these specifications, but it is worth noting that Luria's concern for speech development and its functions comes close to satisfying the criteria. Luria's interest in the study of speech and language has extended from the genesis of speech, both phylogenetically and ontogenetically, to the role that speech plays in integrating an individual into society. And of particular interest in the present context is the nature and development of the regulatory role of speech in Luria's theory.

Luria's view on the self-regulation of behaviour by speech has stimulated a considerable number of studies on the clinical application of verbal self-instruction in the West. The findings of various studies have also led to controversy about the "Luria's hypothesis", which seems to warrant a closer examination. The background and review of Luria's theory and the studies related to it will be presented in the first chapter.

The second set of variables related to behavioural self-control is comprised of measures of individual differences, conceptualized in terms of differences between individuals in personality, traits, temperaments, mental abilities and cognitive style. There is evidence supporting the claim that differences in personality and temperaments are in part genetically based (Buss & Plomin, 1975; Thomas & Chess, 1977) and it has been suggested that individual differences can be explained by the differences in the activities of the neuro-endocrine system (Eysenck, 1972a; Eysenck & Eysenck, 1969; Gray, 1972a, 1977).

Assuming that individual differences exist, the immediate problem is how to measure them and how to explain them. Very often investigators adopt a plethora of terms and adjectives to describe individual differences. A large number of tests have been devised to measure the behaviour described by these terms, and there have been endless studies addressed to establishing the validity and reliability of these tests. The question is comparatively straightforward when a concept like "behavioural restraint" is being considered, because it can be defined and operationalized as the ability to restrain, to inhibit or to delay doing something that one wants to do. But the related notion of "impulsivity" is more problematic. "Impulsiveness" and "impulsivity" are trait terms that have been adopted by several psychologists (Buss & Plomin, 1975; Eysenck & Eysenck, 1969; Eysenck, S.B.G. & Eysenck, 1966, 1978; Gray, 1972b; Kagan, Rosman, Day, Albert, & Philips, 1964; Kogan, 1976) to represent different phenomena. One of the objectives of the present study, therefore, is to look for the correlations between various behavioural tests of impulsivity, and to assess the suggestion that impulsivity is a unitary concept.

Experimental Strategies and Rationale

Readers up to this point may have got the impression that the enquiry has spanned across several dominant areas. The magnitude of the study creates a problem of manageability, and limits must be set. Referring to Eysenck's (1972a) description of the stages of research in personality studies which includes five stages of personality description and interpretation (namely, I. inherited differences in anatomical and physiological structures, II. psychophysiological differences, III. observed differences in experimental studies, IV. personality and V. social phenomena), the present investigation will be concentrating only on Stages III and IV, with tools which are easily accessible. Nevertheless, some assumptions on the other levels will be made on the basis of evidence from other published sources.

Another external constraint is time. A longitudinal study is the ideal way of following the actual trend of development of a certain aspect of behaviour among a sample of children. But the ability to use speech to control one's behaviour has been reported to be developed or acquired at ages different from those postulated by Luria (e.g., Birch, 1966). It is therefore difficult to specify in advance the exact time-span required for a longitudinal study of the development of verbal self-control. In view of this problem, the answer sought in this study is whether or not verbal self-instruction is effectively used by children at a particular age to bring about certain behaviour, rather than when a child begins to effectively employ verbal self-instruction.

The above decision has to some extent affected the choice of subjects in the experiments. A young age group (3½ to 5 years old) has been chosen to participate in the experiments to be reported in Part I, which deals mainly with the regulation of motor behaviour by means of verbal self-instruction. When different forms of personality measures are introduced (Part III), children of an older age (between 7 and 10 years) become more suitable subjects. Personality measurement in children has been recognised to be difficult, both in terms of the deficiency of the measuring instruments available and the dubious validity and reliability of the existing tools (Nicholson & Shapland, unpublished). The problem is more acute the younger the age range. In view of this junior school children have been chosen as subjects, as there is a wider choice of psychometric instruments with which the concept of "impulsivity" can be explored.

When the ages of the subjects extend over a large range, the problem that immediately confronts the experimenter is the selection of appropriate tasks to avoid ceiling and floor effects. It has been found in pilot testing that the tasks described in Part I are too simple for the older subjects, and hence the desirable objective of using the same tasks throughout has to be abandoned. Learning situations which fit into manipulation in terms of "control by systematic variation" (Gollin, 1965; Gollin & Sarovo, 1970) seem extremely difficult to come by. Consequently, behavioural tasks that are considered more appropriate in illustrating the problem of behavioural self-restraint in the older age group have been designed. Later reports on the experiments will indicate that they are also extremely useful for the purpose.

Structure of the thesis

The experiments will be presented in their chronological order, and the discussion of the literature, theoretical and methodological issues will be brought up whenever they are related to a particular group of studies.

The report is divided into three parts. In Part I, the background of verbal self-regulation of behaviour in children is described. Particular emphasis is placed on Luria's hypothesis and how it compares with other explanations of the phenomena Luria reports to have observed. Three experiments are reported. They are simple tasks, including a delayed response task, a reaction time task and a discrimination task, designed to reassess the phenomenon and the possible mechanism underlying "verbal self-regulation of behaviour" in young children. Furthermore, the behavioural measures in the experiments are correlated with a teacher's rating of the subjects' behaviour in an attempt to discover the connection between verbal self-regulation and individual differences in personality.

Part II is a section on psychometrics. The background to this is the felt need that some measure of the children's persoanlity from an outside observer is useful to supplement the data obtained by self-report questionnaires and behavioural tests. This section describes the design and development of the teacher's rating scale on a standardization sample of over 400 children, and this teacher's rating scale has been adopted throughout in the various experiments as one of the measures of personality differences.

Part III investigates in greater detail the concept of "impulsiveness". Chapter Seven is a review of the use of the concept in personality and temperament studies, and in studies of cognitive styles. Three more experiments are presented. The first examines the relationship between behavioural restraint, as measured by the performance on two games called "Simon Says" and "Do and Don't" and impulsivity as measured by Kagan's Matching Familiar Figures Test. The second experiment includes verbal self-instruction as an experimental variable and tests its effects on the performance of impulsive and reflective children on a differential-reinforcement-of-low-rates behaviour (DRL) task, which provides a measure of behavioural restraint. The last experiment further delineates the effects of different forms of verbal self-instructions on DRL performance in reflective and impulsive children. All the subjects are given personality questionnaires and are rated by their teachers. The correlations among the behavioural, personality and developmental variables are reported in the results.

Chapter Eleven reports the attempt to delineate whether "impulsiveness" is a unitary concept, and this leads to the final remarks and conclusions.

PART I

"Although we think we govern our words, . . . certain it is that words, as a Tartar's bow, do shoot back upon the understanding of the wisest, and mightily entangle and pervert the judgment."

Francis Bacon, The Advancement Of Learning

"That was when I learned that words are no good; that words don't ever fit even what they are trying to say at . . . "

William Faulkner, As I lay Dying

CHAPTER ONE

VERBAL SELF INSTRUCTION AND THE REGULATION OF BEHAVIOUR

Emile Coué, a French psychiatrist, treated his patients by employing a method called autosuggestion. He enjoined his clients to repeat to themselves, "Tout les jours, a tous point de vue, je vais de mieux en mieux" to improve their moods and what they thought about themselves (Coué, 1922). (In English, "Day by day, in every way, I'm getting better and better.") Coué's approach to foster positive thinking in the individual and hence improve his overall well-being has found wide-spread appeal in the literature. It has been suggested that it is a "general formula (that) leaves every mind free to unfold and develop in the manner most natural to itself" (Brooks, 1960). However popular, the use of this type of self-instructions is prone to failure. The instructions are too broad and vague, instead of being tailored specifically towards the client's problems and situations. Moreover, there is some empirical evidence that rote repetition of such a "psychological litany" ends up in an emotionless pattern which is ineffective as a coping tool (Meichenbaum & Cameron, unpublished).

Turning to the more systematic analysis and application of verbal self-instruction, the literature in the West burgeoned in the sixties, a proportion of the studies (e.g., Meichenbaum & Goodman, 1969a, 1969b; Schubert, 1969) being inspired by Luria's works published not long before in English (Luria, 1957, 1958a, 1958b, 1959a, 1959b, 1959c, 1961a, 1961b; Luria & Yudovich, 1959).

Although verbal control of behaviour has been demonstrated to be prevalent and powerful, it is not unfailing. What has caused concern in particular, is that attempts to apply Luria's model or to replicate his experiments have led to mixed results (e.g., Miller, Shelton, & Flavell, 1970; Wilder, 1969). This may be due either to differences in the interpretation of Luria's theory or to differences in experimental manipulation.

At the basis of Luria's formulation of the role of speech in the regulation of behaviour is the influence of political ideology and a corpus of Russian works on neuropsychology and child development. His theoretical assumptions and conceptualizations do not necessarily agree with those of some writers in the West. Then, on the empirical level, current applications of verbal self-control over behaviour have covered wider problem areas and experimental strategies than those with which Luria was concerned. In studies attempting to replicate Luria's work, which will be reviewed later, the methods employed also become debatable issues. It seems that Luria's model could be one of many explanations of verbal self-regulation of behaviour, but is nevertheless a relatively comprehensive one and comes closest in meeting the criteria of a "total theory of speech communication" mentioned in the Introduction.

Luria's hypothesis on the verbal regulation of behaviour

Luria's theory about the verbal control of behaviour is concerned with both the ontogenesis and nature of the human speech system, and its relationship with other human cognitive functions

(Luria, 1960). Luria (1957) believes that the absence of a verbal system in animals is what separates animal learning from human learning. Whereas in animal learning, the process is slow and gradual and requires many repetitions to inhibit inappropriate responses, for example in discrimination learning, in man, the verbal system facilitates the connections of many other systems and achieves stable learning. He also comments on the easy retrieval of previously learned connections from the verbal system in order to solve new problems, and the flexible and mobile nature of the operation. Furthermore, the verbal system in man makes possible learning based on abstract cues, but in animals prolonged training is necessary under these circumstances. And this view has been shared by Russian researchers such as Pavlov (1957), Platanov (1959), Zaporozhets (1961) and Leontiev (1968/1969). "The most important conclusion is that human psychological processes, however integral and indivisible they seem to be, are in fact products of historical development and processes of a complex psychological nature. . . . The sources of human development always include objective action and language. The latter, the basis of the second signal system, is not only a means of communication but also a powerful tool for the formation of human conscious processes, . . . distinguishing human mental activities from animal behaviour and making 'the supreme system of self-regulation' " (Luria, 1966, pp. 24-25).

On the one hand, Luria is concerned with the development of language, and how the human speech system continues to play a part in higher mental processes such as behaviour control and thinking. To him, the major characteristic of the human speech system is its close relationship with "voluntary" behaviour. On the other hand, he is interested in the physiological processes the speech system involves. Beiswenger (1968) examines Luria's conception of verbal control of behaviour in the light of some common meanings attached to the term, namely, the use of conceptual labels to facilitate memory or to make the discrimination between situation and stimuli, and the use of self-instruction to direct a person's attention to features of a situation, to regulate the tempo of movements or to elicit specific coping behaviour in demanding situations, only to conclude that "there are undoubtedly areas of overlap between Luria's conception of verbal control and the conceptions listed above, but there is also a distinctive emphasis and thread running through Luria's conception which is different from any one of these approaches." Beiswenger (1968) is probably referring to the all-embracing role of language that Luria has conceptualised. Luria (1966) views the human speech system as a signalling system possessing several functions: a nominative role (direct reference), a semantic role (concept formation), a communicative or social role (syntax, phonology, semantic -- spoken as well as written), an organizing role (in higher mental functions, such as discrimination, imagination, thinking and attention) and a regulating role (in planning, directing or controlling behaviour). Indeed, the verbal control of behaviour is but one of the many special functions language performs.

The stages of the development of verbal regulation of behaviour have been described in details by Luria (1959a, 1959c, 1961a) and documented in review articles (Beiswenger, 1968; Bronckart, 1970, 1973; Wozniak, 1972). The present summary will therefore be brief.

Stage I[(1)] extends approximately from chronological age 1 year to 2 years. The child responds to an adult's command such as "clap hands" or "come here". However, the effect of this external speech on the child is extremely limited, and proper action can be called forth from the child "only if it does not come into conflict with another dominating action of the child" (Luria, 1959c). Luria reports observations by Schelovanov and co-workers (Luria, 1959c, 1961a), and by Poljakova and Ljamina (Luria, 1959a) on a child of 1½ years of age who was removing rings from a bar. The adult told him to "put one on", but the child could not reverse his ongoing activities. So the adult's command could initiate an action of the child, but could not inhibit it, or switch it to another action.

Note (1): Luria mentions four stages of development (Luria, 1961a, p.61) and gives the ages at which the children took part in the experiments. It is interesting to note that most reviews summarize Luria's framework in three stages, with subdivisions within each. Wozniak (1972) and Bronckart (1973) consider that Stage 1 begins at about 1½ years, while Beiswenger (1968) uses 9/10 months as the starting point of stage one, and quotes the example in which a child is told to fetch the fish when presented with a brightly coloured cat (his favourite) and a fish further away. The child initially orients towards the fish, but then reaches for the cat and brings it to the experimenter. Another point of interest is that Wozniak (1972) renames all the stages and sub-stages, such as "simple initiation-inhibition paradigm", "external-signal paradigm", "double-discrete-vocalization paradigm", etc. But these terminologies are meaningful only according to Wozniak's interpretation of Luria's thesis. Finally, empirical studies are arranged in different stages, e.g., Beiswenger illustrates Stage II with experiments that Wozniak employs in his Stage I, because their stages start at different ages. Readers should be warned of these misleading features.

The child is unable to retain a memory trace of a command for more than ten seconds in the presence of a more established motor pattern (Luria, 1959a, 1959c, p.355). Another behavioural tendency of a Stage I child is to respond impulsively to a command. Yakoleva (in Luria, 1959c, 1961a) told a child, "When you see the light, press the ball". The child immediately began to press the balloon without waiting for the light to come on. Even after extensive training to respond to the signal, the child tends to perseverate with involuntary pressing. None of the attempts to stop the child verbally by "no more" or "enough" succeeded in inhibiting him.

At this level, two methods using external signals can inhibit the child's ongoing manual reaction, which seems to be triggered by the stimulation of the balloon in his hand. The first method is to ask the child to press the balloon and then to ring a bell, or touch his knees. In the second way, the child presses the balloon at the onset of the signal and thereby turn it off. 75% of the children at the age of two to two-and-a-half years achieved co-ordination of movements and avoided errors of commission in Yakoleva's experiment as a consequence of employing these methods.

Luria attributes the failure to inhibit motor responses appropriately at this stage to the weak speech system in the child, his underdeveloped muscular senses and diffused neurodynamics in his motor reactions. The mechanism which enables the two methods to succeed is that the exteroceptive signal by the child's movement or the light going out acts according to some kind of feedback principle (Luria, 1961a, p.51)[(2)] -- signalling the discontinuance of an ongoing action (pressing the ball). This, according to Luria, is "the first and simplest model of a voluntary movement in a very young child. This movement is started by verbal instruction and is stopped by visual exteroceptive signals which arise from the child's own movement." (Luria, 1961a, p.38).

Stage II extends from about 3 to 4½ years of age. In the development of the verbal control of behaviour, this is a transitional stage. The child progresses from responding appropriately to external physical signals and adults' instructions and comes under the control of his own external speech. A child was asked to accompany each movement in response to a light with a verbal command "go" from himself. A child younger than three would be in a situation where his verbal system was too weak and his verbal reaction would be overridden by his motor reaction (Luria, 1959c). An older child would have a mobile and flexible speech system to perform the task without omissions or extraneous pressing movements (Peskovskaya; Tikhomirov; in Luria, 1959c).

Note (2): Luria's use of the concept "feedback" deserves some clarification. It is, in a way, akin to the concept of "feedback" as elaborated by Annett (1969), who distinguished between extrinsic feedback -- effective stimulation that arises from some source which is external to the organism, e.g., a light or a buzzer noise -- and intrinsic feedback -- a by-product of the response of the organism experienced either proprioceptively or exteroceptively. But "feedback" can take on a different meaning in cybernetic language, and there it includes a compensatory and correcting function (Weiner, 1948). This idea obviously has developed independently of Luria's usage. Additionally, Luria has appealed to the use of "feedback" in the "acceptor-of-effect" model developed by Anokhin and Sechnov (Luria, 1961a, p.33), which appears to come close to the Test-Operate-Test-Exit (TOTE) system in Miller, Galanter & Pribram (1960). However, the empirical evidence provided by Luria (1961a) does not seem to reflect that TOTE is in operation.

The verbal reactions were co-ordinated with the signals and were more stable than the motor reactions (Luria, 1961a, p.45).

Another study reported by Luria (1959c) shows that a child can produce two successive, discrete squeezes on a ball when he accompanies his responses by saying "go, go" but not when he says "I shall press twice." This brings out Luria's point that although there is some verbal control in children at this stage, the mechanism of control is the "impulse" aspect or the initiative aspect of speech, and not the significative aspect. For this reason, a child finds it difficult to use verbal control in a differentiation task, such as pressing the balloon when he sees a red light and inhibiting the motor reaction to a green signal, and at the same time accompanying the motor reactions with the word "press" at the red light and "don't press" at the green light. The child cannot hold back a motor response when he say "don't press" and the harder he vocalizes, the more intense his motor reaction. According to the results obtained by Tikhomirov (Luria, 1961a, p.58) on a differentiation task, 42% of the three- to four-year old children exhibited impulsive errors to the inhibitory signal in silence, but in the condition involving self-command, the number of disinhibited reactions jumped to 70%.

Luria concludes that the regulation is not through the meaning of the signal. The "regulatory influence proceeds <u>from the nonspecific, impulse aspect of the child's own speech rather than from its elective, significative aspect</u>" (Luria, 1961, p.59).

Stage III (4½ years to 5½ years old) is described in the following terms: "the regulatory function is steadily transferred from the impulse side of speech to the analytic system of elective significative connexions which are produced by speech. . . . it simultaneously shifts from the external to the internal speech of the child" (Luria, 1961a, p.59). The child is capable of grasping more complicated signals and the verbalization "don't press" uttered by the child will influence his motor performance by virtue of its meaning. Only when experimental conditions are made more complicated, for example by accelerating the interstimulus interval or by using a less distinct differentiation stimulus are impulsive errors committed. But as soon as the child brings into use his external verbal system, he can accomplish the task.

Stage IV is mentioned only briefly by Luria. He says that the external form of speech becomes reduced and the decisive influence is executed by the higher form of "internal speech which constitutes an essential component of both thought and volitional action . . . " (Luria, 1961a, p.61).

Apart from discussing the normal trends of development, Luria also presents evidence to support his theory from observations on children and adults with speech defects (Luria, 1957, 1958a, 1959b, 1963, 1966). He highlights the difference between two types of abnormalities, the cerebro-asthenic syndrome and oligophrenia. In the former, the patient's inhibitory process in the cortex is weak and the excitatory one diffused; therefore, verbal instructions by others cannot readily direct his behaviour. In spite of this, the verbal system of the child with cerebro-asthenic syndrome suffers less neurodynamic impairment than his motor processes, and he is consequently capable of some degree of immediate directive influence by self-instructions (Homskaja, in Luria, 1959b). On the other hand, oligophrenics suffer a more deep-rooted dysfunction and fail to restructure the verbal and motor responses himself (Lubovskij [Lubovsky]; Homskaja; Marcinovakaja; in Luria, 1959b).

So far, the description of Luria's position has reflected his reliance on neurophysiology and "feedback" effects. Another important influence on his thinking is Vygotsky's work on language and cognitive development in children. The review will now examine this theme.

Vygotsky's assumptions and Luria's hypothesis

Luria expresses Vygotsky's position by referring to "a process in which functions previously shared between two persons gradually change into the complicated functional system in the mind which form the essence of higher mental activity" (Luria, 1961a, p.3). This points to Vygotsky's idea that a child develops into a social being through the vital activity of associating with others (Leontiev & Luria, 1968). Vygotsky also emphasizes that in the human being, mental development proceeds through the mastery of human experience transcended through subjective activity, and above all, through language. However, the role of language extends beyond the communication between adult and child. Language also enters into the organization of the child's behaviour -- his voluntary action and thinking (Vygotsky & Luria, 1930; Vygotsky, 1962). This process is from other-directedness (an adult influencing the child with commands) to inner-directedness (the child developing inner speech and formulating his plans for action). Luria, as well as other Soviet researchers (e.g., El'konin, 1966/67; Leontiev & Luria, 1968; Manuilenko, 1974/75) have leaned heavily on this "cultural-historical" formulation by Vygotsky.

During the progression from external speech to the internalization of speech, there is a phenomenon called "egocentric speech", that Vygotsky has studied. Luria (1961b) is in line with Vygotsky regarding egocentric speech in verbal control of behaviour. Piaget (1959) also called a particular form of speech egocentric, but Piaget and Vygotsky differ in their interpretation of the nature of egocentric speech and the explanation of its decrease after the age of six. For Piaget, the decline means the growth out of unsocial monologue, as would be expected of a child growing out of his "egocentrism". His evidence is that at a young age, say about four, a child shows a higher "coefficient of egocentrism" when he is with adults than when he is with children of his own age (Piaget, 1959). But in Vygotsky's view, the decline of egocentric speech marks the internalization of external speech which has been serving a regulatory role. To support his case, Vygotsky (1962; and in Luria, 1961b) notes that egocentric speech increases with task difficulty. He also demonstrates that a child is able to discriminate between situations which call for external self-talk and those which do not. Children placed in noisy rooms or with deaf and dumb peers do not produce egocentric speech at all. More recently, Kohlberg, Yaeger & Hjertholm (1968) have produced evidence in favour of Vygotsky's predictions. Their studies examined the relationship between egocentric speech (or "private speech", in Kohlberg's terminology) and age, intelligence and the demands of a social or a task situation. The findings in general support Vygotsky's belief that there is a "curvilinear course of development" leading to the internalization of "private speech", that "private speech" increases with task difficulty in the 4½ and 5-year old children.

Although Luria has borrowed two key notions from Vygotsky's theory -- the internalization and the directive role of speech -- some of the other explanatory concepts in his theoretical framework that owe to other writers may not be compatible with Vygotsky's assumptions, and this is a possible source of confusion when it comes to interpretation.

Let us recall the experiments in which exteroceptive signals are used as feedback signals to terminate superflous motor responses because the proprioceptive feedback from the motor system is too weak on its own (Yaholeva, in Luria, 1959c, 1961a). The sequence is clearly described to show that the feedback comes <u>as a result</u> of the child's action. He turns the light off by pressing the ball, or he touches his knees so that the stimulation from the hand holding the balloon is no longer available. The feedback model is thus far tenable. Luria continues to assume that the feedback effect can be taken over by the child's own voice at the following stage: ". . . <u>similar results can be obtained if we replace the external sanctioning</u>

afferentiation by the child's own speech . . . we replace the regulatory action of the external signal by the child's own verbal command, which, owing to its more perfect neurodynamics and greater controllability, now becomes a good regulating mechanism." (Luria, 1961a, p.46).

Luria's experimental demonstration, however, does not demonstrate clearly that it is consistent with the concept of feedback. The signal as represented by the child's own voice seems to take place concurrently with the motor action, as can be seen in the following passages:

> "We shall offer the child (which must respond with motor reactions to the conditioned optical signal) to accompany each movement performed in response to the verbal instruction by its own verbal command 'go!'" (Luria, 1959c, p.531, italics mine).
>
> "He (Tikhomirov) asked the child to say the word raz! (one!) or more simply -- to give a vocal response tu! whenever he squeezed the ball." (Luria, 1969, p.158, last italics mine).

Children who have achieved the task are described as having strict "co-ordination" between their motor and verbal responses.

This is the first problem. The timing of the verbal response is crucial in determining the mechanism in operation. Simultaneous occurrence of the verbal and motor systems may not be "feedback" in the sense of some overt event taking place contingent on a particular response, yet Luria states explicitly that the verbal system is replacing the external signal. It is possible, in view of Luria's interest in neurophysiology, to suggest that with the verbal system, "feedback" can take on a broader neurodynamic sense, so that irrespective of whether the verbal utterance happens simultaneously or after the motor response, the subject experiences intrinsic reafference -- proprioceptively and exteroceptively -- and produces appropriate motor control. This interpretation can resolve the first problem and accommodate the feedback model, but it is clear already that Luria is sometimes inconsistent with the concepts he uses.

There is a second problem, namely the compatibility of the feedback model (including extrinsic events or neurodynamic events) and Vygotsky's assumption that speech is the superior mode of responding to the motor mode. According to Vygotsky and Luria, the concept "verbal regulation" implies planning and directing, and this should precede the action. Again, this creates difficulties in deciding the order of occurrence of the motor and verbal responses in experimental manipulation. As this source of confusion cannot be resolved immediately, it will be discussed later in connection with the mechanism "mediation".

Next, we shall turn to another source of influence on Luria's theory.

Pavlovian concepts and Luria's hypothesis

In Luria's theory on the verbal control of behaviour he uses concepts like "the first signalling system" and "the second signalling system" which he has adopted from Pavlov.

Luria's theory is influenced by Pavlov's work on the development of higher nervous activity. Although Pavlov has not specificially studied the speech process, his course of scientific thought makes it inevitable that he includes generic ideas and the basic principle of the operation of the speech mechanisms (Zhinkin, 1961). In global terms, the formation of mental processes involve the establishment of new conditioned responses. A conditioned response is formed when two stimuli become linked, albeit temporarily. Whereas stimuli in the "first signalling system" are considered to be concrete, stimuli in the "second signalling system", of an abstract nature, involve the utilization of words. A word has special properties, because it involves abstraction and generalization. It is not merely an utterance of sounds, but it carries meaning. Hence a word is a "signal of the signal" and speech, unique to man, is classified as the "second signalling system".

A child utters a word and only the impulse aspect of it exerts an effect. This is demonstrated by the experiment involving the differentiation of two lights, when the childs says "press" and make a motor response to one light and says "no press" to another light but commits an extraneous motor response. Luria suggests that it is because the child's second signal system is not yet fully developed. The role of the meaning of words is again illustrated by Luria & Vinogradova (1959). They recorded the subject's defensive reflex with physiological measures. The procedure involved giving a mild electric shock to the subject when the word "violin" was presented. Subsequently, marked physiological changes were recorded when a word like "viola" was shown and less so with a word like "flute" or "orchestra". The word "bow" elicited a reaction when it was within a list of musical instruments, but not when it was embedded in a list of weapons. This has implied an "entire complex of relations hidden behind each word" (Luria, 1969) and Luria sums up his ideas with, "Speech, therefore, is one of the essential means whereby the child finds his bearing in the external world, it activizes the generalized connections formed in past experience, which play a substantial part in the *mediated*, specifically human, form of regulation of action" (Luria, 1957, italics mine).

Essential in the participation of the second signalling system, therefore, is its power to re-structure and generalize previous learning experience. Martisinovskaya (Luria, 1961a, 1961b) presented preschool children with two figures -- a red circle on a grey background and a green circle on a yellow background -- and asked the children to make a motor response with the right hand when the first picture appeared and with the left hand when the second one was shown. Controlled experiments indicated that if the dominant feature of the figure was the circle, the child would find no difficulty in differentiating it. If, however, the child was asked to respond to the colour of the background, young children at 3 - 4 years old failed to respond appropriately. Abramyan (in Luria, 1961a, 1961b) altered the methods ingeniously. Using the same colour scheme but replacing the circles with aeroplanes, he asked the children to respond with the right hand on the yellow background (the weather was good and the plane could fly) and respond with the left hand on the grey background (the weather was bad and the plane could not fly). Even with complicated colour combinations of the aeroplanes, the three-year old children responded accurately as instructed.

However, caution is needed here is view of the plethora of works set out to demonstrate the superiority of the second signalling system (Gan'kova, 1960; Lebedinskaia & Poliakova, 1960; Liublinskaya, 1957; Porshnev, 1964; and see Ivanov-Smolenskii, 1960). First of all, within the framework of the signalling systems, it is a serious misunderstanding to exaggerate the role of the second signalling system, this being an apt warning put forward by Ivano-Smolenskii (1960). Luria, among others, has attempted to give the second signalling system an autonomous directive role in the activity of the central nervous system. This may lead to "confusion in the study of the interrelationship between the two signalling systems and to the alienation of the second from the first, and in addition to their severance from objective reality, against which I.P. Pavlov already placed us on guard" (Ivanov-Smolenskii, 1960, p.18). It is theoretically important, according to some critics, to maintain the delicate balance between word and action.

Secondly, looking at the role of the second signalling system in Luria's thesis, there is again the inconsistency between behavioural self-control by speech in the "mediating" sense and the "feedback" sense already described. Classical conditioning theories (Das, 1969; Razran, 1961; Staats, 1968) have conceptualized verbal behaviour in the mediational model

(S - rv - sv - R). Russian applications of verbal self-control (Platonov, 1959; Sokolov, 1972) have adopted the same line. On numerous occasions, Luria also describes the relationship as if it is a mediational one: "At first such speech is mainly an <u>accompaniment</u> to the child's practical activities, or <u>coincides</u> with them: but later on it begins to precede them, the child inhibiting his direct attempt until he has verbally formulated what it is he means to do" (Luria, 1961a, p.14, italics mine). (See also the quotation on p.28, from Luria, 1957). The confusion is mainly due to Luria's liberal use of explanatory concepts. Some writers have suggested that Luria uses "mediation" in its vernacular sense and not in its theoretical meaning (Beiswenger, 1968; Wozniak, 1972). This is the third problem.

The link with Pavlov extends further, especially in connection with the differentiation experiments, when the concept of "inhibition" is brought up. Pavlov (1960) proposes that inhibition can be brought about directly or indirectly, externally or internally; And on excitation and inhibition, Pavlov (1957) has this to say, " . . . if the stimulation coming to a cerebral cell coincides with another extensive stimulation of the cerebral hemispheres, or of a definite lower part of the brain, then it will always remain positive; given the reverse condition, it will sooner or later, become a negative inhibitory stimulus". Differential inhibition is one form of internal inhibition (i.e., it develops gradually and is inherent only in the cerebral hemisphere, <u>vs</u> external inhibition, which appears with the conditioned reflex and is a repetition of the inhibition of the physiology of the lower part of the central nervous system) (Pavlov, 1957). The process involves the removal of an excitation process to a stimulus which may acquire excitatory properties by virtue of its partial similarities to the positive conditioned stimulus in the experiment. Differential inhibition is subject to disinhibition, that is, "becoming temporarily removed under the influence of mild extra stimuli belonging to the group of external inhibitors, so as to reveal the underlying excitatory process" (Pavlov, 1960, p.128).

In Luria's differentiation experiment, the mechanism underlying the positive response in terms of excitation-inhibition is clearcut. The vocalization "go" produces a concentration of excitation, and as it is functionally consistent with the motor reaction required, verbal and motor reactions can co-ordinate. Although young children can respond appropriately to the positive stimulus, with the negative stimulus and the vocalization "no press", they produce substantial commission responses. Luria (1961a) attributes this to "disinhibition". "The verbal reaction 'don't press' accompanying the inhibitory signals resulted not in the inhibition, but in the disinhibition of the motor reactions which . . . are still further stimulated by the verbal impulse that accompanied the given signals" (Luria, 1961a, p.58). The vocalization *per se* has become the external inhibitor to inhibit the inhibition expected to establish with the negative stimulus. But when differentiation is established, the explanation shifts from excitation-inhibition to the second signalling system. This would seem to imply that as long as the vocalization functions in the impulse aspect, differentiation can be of the external kind, hence susceptible to disinhibition, whereas when vocalization takes on the significative sense, differentiation also becomes internal and stable.

Up to this point, the feedback model, Vygotsky's influence, the conditioned reflex and excitation-inhibition, and Pavlov's first and second signalling systems have been referred to. These concepts may overlap, but they are also incongruent with one another in some cases. Difficulty is encountered since Luria is not explicit about when a particular mechanism or a group of mechanisms occur. Wozniak (1972) has made an attempt to reconcile the Russian interpretation and Western analysis of the Luria theory by including on the implicit theoretical level, the three laws of dialectics and cultural-historical studies, and on the explicit theoretical level, Western as well as Russian ideas on feedback and inhibition. Although Wozniak (1972) has expressed his preference for an "inhibition" explanation of the phenomenon, it is undeniable that there is empirical evidence that it cannot accommodate. Moreover, the "reconciliation" cannot obliterate the fact that Luria may have been using his concepts to mean slightly different things.

The Nature of Human Conflict

Many studies of Luria's theory have left out one of his earlier works, The Nature of Human Conflict, which can be revealing in terms of Luria's broad conceptualization of the verbal regulation of behaviour.

A crucial concept in The Nature of Human Conflict is "functional barrier":

> The given stimulus evokes in the system a certain excitation; reaching the central apparatus, it, however, is not connected directly to the motor system, but is restrained by some 'functional barrier', and after the definite preliminary elaboration as a result of which there comes about a linking-up to the motor system, . . . the motor reactions do not show traces of that 'overloading' characteristic of the preliminary central process. (Luria, 1932, p.349)

Luria (1932) notes that the reaction to a signal in the young child of 4 to 5 years usually shows that "each signal mobilized a large amount of excitation, which the cortical activity of the child was not able to control" (p.392). A child's movement usually reflects the intensity of the given stimulus. By contrast, this is seldom seen in the adults, and the reason is that between the stimulus and the reaction in the adult there is a regulating system which monitors the excitation and prevent the excitation from overflowing.

In search of such a mechanism in behaviour, Luria observes, "In the activity connected with speech, . . . the transfer from the primitive, diffuse and direct process to the process (splits) into two functionally different phases -- the phase of preparation and of execution. By virtue of speech, the primitive impulsiveness is overcome, and the direct attempts of adaptation are substituted by the preliminary connections in words; after this comes the motor execution " (p.389).

This model of speech acting as a "functional barrier" leans towards the Vygotsky position. Luria acknowledges that this is not a "natural mechanism" but one of "cultural origin". It would appear that from the standpoint of the course of theoretical development his ideas on feedback are clearly a later development.

It is difficult to evaluate Luria's theoretical framework. The problems mentioned can perhaps be accommodated meanwhile by treating the concepts used by Luria, such as "feedback", "functional barrier", "inhibition" and so on as different levels of analysis. Several possible levels of analysis can be detected. At the lowest level, the analysis is concerned with the actual processes and mechanisms involved in the verbal control of simple and fundamental motor responses. This is the level on which researchers find results controversial and disagree among one another most. On this level, Luria's various assumptions are inconsistent with each other. In fact, it has been suggested that this level of experimentation and analysis is inappropriate for the understanding of verbal regulation (Miller, Shelton & Flavell, 1970). On the second level, speech performs a more abstract role in organizing the execution of action. The work carried out on this level (e.g., Meichenbaum, 1975) is often cited in support of Luria's hypothesis. Finally, the most general level refers to Vygotsky's claim of the embracing function of language and the Pavlovian consideration of language as the "second signalling system". The analysis here is aimed at the "cultural-historical" development of man and society.

Luria has unfortunately created confusion by employing different levels of analysis interchangeably without stating them explicitly. Perhaps recognition of this point would allow a better understanding of the controversy Luria's theory has sparked off in the Western literature. Whereas the feedback model applies better to the basic level, the "functional barrier" model copes well with reality on the second level. Wozniak's (1972) attempted rapprochement is insufficient, and it has been suggested that the Pavlovian and feedback elements may best be treated separately (Bloor, 1977).

Some Russian work on the verbal regulation of behaviour

Only a small proportion of the Russian literature on this topic is available in the West. Moreover, such experimental reports as are available are sometimes deficient in their description of the methodology and statistical treatment of the results. In view of this, it is difficult to give a fair critique. In most of the available work, Luria's assumptions are adopted (e.g., Lebedinskaia & Poliakova, 1960; Paramonova, 1956). Specifically on verbal self-regulation, Yakovleva (1958) concludes that "observations show that a verbal instruction can easily evoke in a child of one and a half to two and a half years a motor reaction, but cannot inhibit the process of diffuse excitation which arises as a result of this reaction and which is manifested in protracted motor reactions of the child, not coinciding in time with the signal." Measures to remedy this phenomenon are reported to be successful. The motor movement is divided into two phases, a "starting" and an "inhibitory" phase. The second phase is "worked up". In one method, the after effect of the motor movement is inhibited by means of a switch to a second movement. Another method is to introduce an additional exteroceptive stimulus into the voluntary motor act; this stimulus, initiated by the child's own movement, signals the end of the required response. This study is particularly reminiscent of Luria's classical experiments (Luria, 1961a; 1961b).

It is reported that Lubosky in the Soviet Union is currently conducting experiments on the Lurian hypothesis, and that he is not in total agreement with the original postulations (Das, personal communication, 1976). However, the exact details have not been published or confirmed in the West.

Western literature on verbal self-regulation of behaviour

Replication studies

The most bitter attack on Luria's theory comes from those who have tried unsuccessfully to replicate his experiments (e.g., Bronckart, 1970; Jarvis, 1968; Miller, Shelton & Flavell, 1970; Wilder, 1969). Some of these studies have been reviewed extensively elsewhere (see Beiswenger, 1968; Wozniak, 1972) and so will be treated briefly here except where there are issues on which the present writer differs from other reviewers.

Jarvis (1968) tested seventy-two children matched for intelligence attending nursery school and first grade. The stimuli were lights on a picture rabbit face. There were three experimental conditions: push when the blue light was on, say "push" and push when the blue light was on, and say "don't push" when the green light was on. There was no support from the results for any age and condition interaction.

It has been argued that Luria did not use sufficient dependent variables to test his hypothesis, and Wilder (1969) has attempted to record mistakes, latency of response, stability of latency and perseveration. The signals in the conditions included a flashing light, a light which remained lit until a response was reduced, a flashing light plus the experimenter's feedback, and a flashing light plus the child's self-instruction. With subjects aged three years and five years, there was no support for an age difference in the performance. The results challenged the view that speech had an impulsive function. This study concluded that speech <u>inhibited</u> additional as well as <u>initial</u> responses in young children.

Miller et al. (1970) launched another attack on Luria's verbal control experiments. Four groups of children with mean ages between 3.2 years and 4.11 years were asked to perform on a two-choice discrimination task, verbalizing to the positive stimulus, the negative stimulus, both stimuli, or not verbalizing at all. The authors found no interaction between age and conditions and observed that the motor responses of the children tend to precede their verbal responses.

Wozniak (1972) comes to Luria's defence on the grounds that failure to replicate Luria's work stems from a misunderstanding of the theory and methodology of the Russian research. He criticizes the experiments for their use of practice training procedures and repeated measures (Wilder, 1969), subjects of the wrong ages (Jarvis, 1968) or too short and too stereotyped interstimulus intervals that disregard the free and natural responses of the subjects (Jarvis, 1968; Miller et al., 1970). Moreover, Wozniak (1972) attaches significance to the fact that all of the studies prescribed the response to be of a vocal-manual sequence, which he thinks to be contradictory to Luria's theory, although Luria's own description is definitely not precise enough to justify this criticism. However, Wozniak (1972), without stating clearly what the original methods should be, attacks other studies for diverging from the "spirit of Soviet research". This criticism lacks substance. Despite the fact that Wozniak (1972) has suggested several possible underlying assumptions in Luria's conceptual framework, based on Soviet political thoughts and experimental trends, it is unjustifiable to criticize replications by referring to the "spirit" that the original work is assumed to have adopted, instead of referring to the original methods. Regarding Wozniak's view on the conceptual framework, he favours the external feedback model and Anokhin's acceptor-of-effect explanation, but is nevertheless aware of certain limitations of these mechanisms; for example, he has suggested that the disinhibition aspect in Luria's differentiation experiment cannot fit in with the acceptor-of-effect paradigm (Wozniak, 1972, p. 34). He is prejudiced towards the interpretation in terms of an "inhibitory" model, i.e., how perseverative responses are controlled, how responses to negative stimuli are withheld, etc., whereas the regulation of motor behaviour should include both the initiation and the inhibition aspects. Moreover, it has been suggested that Wozniak has ignored the developmental link between the impulsive and semantic properties of speech, for his "inhibitory mechanisms" cannot come to terms with the situation when the change over takes place (Bronckart, 1973). Finally, it is hardly satisfactory to accept Wozniak's conclusion that "there is abundant convergent evidence from a wide variety of sources which might be cited as support for the <u>general</u> Soviety propositions ... " (Wozniak, 1972, p. 53). Against Wozniak, it must be pointed out that although he claims to be concerned with the analysis of the specific level of Luria's theory, some of the conclusions he reaches clearly belong to a different level of generality.

Detailed studies on the experimental procedures have shown that some of Wozniak's criticism indeed does not stand empirically (Bronckart, 1970; 1973). The experiment with the rubber balloon (Stage I) is virtually impossible for children under three years of age, and training is a necessary pre-requisite for research with children (Bronckart, 1973). Although Luria has not commented on this point, Wozniak is insistent that pretraining confounds the results. It would seem that most workers with children are aware that it is essential to familiarize the subject with the situation, and to ensure that the instructions are understood before the proper experiment is conducted (Bijou & Baer, 1966).

The order of the verbal and the motor responses has been a much-debated issue. Whereas Miller et al. instructed the child to speak before squeezing, the children in other experiments were left to produce whichever sequence they preferred. The subjects co-ordinated their responses in verbal-motor, or motor-verbal combinations, and some produce both responses simultaneously.

Deliberate attempts to manipulate the sequence of the verbal and motor responses have produced different results. Bronckart (1970), who instructed the children: "When you see the light, squeeze and say, 'I squeeze'", did not find any better performance with motor regulation.

Birch (1971) divided his subjects (aged 3½ to 6 years) into two groups. The first group were asked to make a vocal reaction on a block of trials, followed by a manual reaction block. Then they performed the vocal and motor responses combined. Half of the subjects were given the first two trial blocks in reverse order, then the combined block. The results suggested that the verbal and the motor systems are not independent from each other and some co-ordination did occur among the children of four or older. There was synchronization between the vocal and the manual responses in the combined condition, but the overall proportion, 18%, is not as large as to be significant. The proportion was stable in the vocal-manual group (24%), but increased gradually during training in the manual-vocal group (from 9% to 19%). Although the figures are too small to be used to challenge the verbal-then-motor-response behavioural sequence (Wozniak, 1972), they suggest a complicated interaction between the verbal and motor systems which may perhaps be related to age and task (Birch, 1971) or to the type of motor response, which, according to Wolff & Wolff (L972) relates to verbal behaviour when gross motor responses are produced, and not so when fine motor responses are studied.

Susman (1971) supported Birch (1971) with an experiment very similar to Birch's study. A stimulus was paired with a vocal and a manual response. One of two lights appeared and the subject performed in one of three conditions: a) repeat the name of the light, b) name the colour of the alternate light, and c) give a nonsense syllable. The motor response was either to touch the target of the same colour as the light that comes on, or a target of the alternate colour. The dependent measure was the latency of the verbal and motor responses. The results suggested that when there was competition between the modalities, the latency became longer. This may imply that the motor and the verbal response tend to compete with each other, rather than one controlling the other, as Bloor (1977) has proposed.

Bronckart (1970) took the issue further. He studied the motor response to stimuli which varied between 0.5 and 5 seconds in duration under a silent condition and a condition with the verbal accompaniment, "I squeeze". An interesting age trend appeared. Whereas in the silent conditions, all children from three years upwards responded with a duration depending on the duration of the stimuli, the duration varied in the verbal condition. From 3 to 4 years, the results were partial or total suppression of this dependence; from 4 to 5 years, partial suppression; and from 5 years onwards, the dependence on the stimulus duration was present. When speech was used, the motor responses were produced at the end of the stimulus and sometimes after it. Bronckart (1970) suggests that the effectiveness of verbal control depends on its preceding the motor response.

Bronckart (1970, 1973) further argues that Wozniak's inhibitory model is inadequate. At the age of 3½ to 4, some improvement can be obtained by means of the impulsive aspect of speech. In cases when a deterioration of performance occurs, especially among younger children, it is by virtue of the extra complexity of the task when a vocal response is added to a motor one. Bronckart thinks that the problem of regulation in 3½ to 4½ years old children has nothing to do with the inhibitive effect of speech. "This regulation has to do with the initiation of a motor act, a rhythmic facilitation due to the motor aspect of vocalization" (Bronckart, 1973, p. 434). His rejection of the inhibitory mechanism in favour of the initiative aspect of speech also leads him to reject the "disinhibition" explanation in the differentiation task. "If there is a first inhibition followed by this second disinhibition, the first inhibition should become effective before the potential response and the disinhibition before the effect of the first inhibition ... it seems hardly reasonable to imagine an inhibitory mechanism which intervenes after the occurrence of the mechanism or the response it is supposed to inhibit" (Bronckart, 1973, p. 432). This argument is based on sequential analysis. A further proposal he makes about the temporary difference between the verbal and motor response mode is that the awareness of regulatory feedback at 3½ to 4½ of age is better at the subcortical level (for vocal organization) than at the spinal level (for motor organization). Bronckart suggests that the verbal control of motor behaviour could be due to the rhythm or mode of compatibility in the response and hence, speech is by no means the only instrument which can assist a child to achieve sensorimotor control. Even if it is, Bronckart doubts that it is a very apt instrument!

In fact, there can be marked differences between adults' performance and children's on the same tasks when verbal response is used. Reaction time had been shown to increase when adults vocalize and respond to a disjunctive manual reaction-time task. On the other hand, vocalization reduces the reaction time in children (Fletcher, 1962).

Rondal (1974, 1976) publishes evidence generally in line with Bronckart's view. He carried out four sets of experiments using normal children aged between three and thirteen as subjects. He also used an adult subject group. There were fifteen studies ranging from partial replication of Luria's experiments to the investigation of inner speech recorded on the electromyograph. His experiments were designed to study the role of exteroceptive feedback, the impulse and semantic aspects of speech in motor behavioural control. The results consistently demonstrated the regulatory value of the impulse of rhythmic aspect of speech on motor behaviour, but failed to show any semantic effects. For example, children asked to say "strong" to a red light and "light" to a white light with equal intensity did not press in accordance with the meaning of the words. On the other hand, when they vocalized "strong" with an accent they pressed hard, and pressed gently when they said "light" softly. Works on inner speech in adults revealed interesting results. When spontaneously used, meaningful inner speech did not occur frequently. It was recorded massively at the beginning of a task, but if the problem was easy, it dissipated quickly. Spontaneous inner speech seems to have a flexible role, different from the external speech prescribed in the experiments reviewed so far. Its purpose may be to organize the task initially, delineate the problem after an error has been committed (Rondal, 1974, 1976). There are, however, flaws in Rondal's designs. His subjects took part in four to five experiments, each consisting of at least four conditions. There is no report how long the entire study took, or how long was the interval between each study. He does not account for any learning effects, nor does he correct the variance in his repeated measures designs by appropriate statistical techniques.

Even so, Rondal's experiments are among the few (e.g., Sokolov, 1972) that study inner speech. The marked difference in overt verbalization and covert verbalization discovered is important. When speech becomes automatized, its role is a planning one, operating somewhat like the TOTE system (Miller, Galanter, & Pribram, 1960). In Russian terminology, this is related to Anokhins (1955) acceptor-of-effect system. However, overt speech regulation in young children participating in the experiments mentioned so far hardly performs any planning or mediating role. Miller et al. (1970) have pointed out there is no evidence to support verbal mediation in a press/don't press experiment. The underlying mechanism, therefore, would seem to be totally different.

There is another problem that concerns the studies at the basic fundamental response level; namely, how to come to terms with the explanation of the performance to the positive stimulus and that to the negative stimulus.

Miller et al. (1970) found that verbalization to the positive stimulus resulted in more motor omission - and the result was significant. They reported too a trend that saying "don't press" to the negative stimulus increased commission responses. Rondal (1976) observed an opposite phenomenon with his subjects responding to the negative stimulus. Children aged 3½ to 4½ years showed an improvement in performance when verbalization was used, as commissional responses decreased. This was also contradictory to the finding of Luria & Tikhomirov (Luria, 1961a). Rondal (1976) suggested that the verbalization "no" he had used could be grasped more easily than Luria's syntactically complicated "I don't press". He then carried out another experiment to show that, with the same age group, performance without speech to the negative stimulus was superior.

However, an indirect piece of evidence may prove Rondal wrong. Higa, Tharp, & Calkin (1978) tested kindergarden and second grade children on the discrimination experiment. One group was asked firstly to combine verbalization with motor response, and then to respond only manually. Another group performed the conditions in reverse order. The results consistently showed that verbalization increased omission errors in the positive stimulus, in line with Miller et al. (1970). However, there is a significant repeated measures effect on commission errors: commission errors to the negative stimulus decreased from the training phase with motor response alone to the phase with motor response and speech combined. Verbalization seemed to improve performance in the negative stimulus situation, while it was detrimental to performance in the positive stimulus situation in the same experimental paradigm. These findings contradict Luria's findings in general, and may suggest that a correct response to the negative stimulus should be viewed differently from a correct response to the positive stimulus. One of the experiments to be reported later will attempt to investigate this problem. We shall now leave the first level of analysis.

When verbal regulation of behaviour is discussed at a more general level, the perspective opens up. De Laguna (1926) has discussed the role of language in directing behaviour, and he lists the following features of a verbal self-instruction:

1. the need to inhibit the features of a situation to which responses must not be made, or to specify the features of a situation to which response must be made, and differentiating them from other features of a situation;
2. the explicit specification of the details for carrying out a course of action;
3. the simplication of complex situations by focussing attention on the relevant property of a situation for a given purpose;

4. the specifying of the relationship of objects to one another, or the properties of many objects, or of the absence of a property.

In short, language structures and organises, and De Laguna sees internalized verbalization as the first step, ontogenetically, of thinking, which is remarkably similar to the view of Vygotsky (1962) and Luria (Luria & Yudovich, 1959). Obviously, in the West, one is not short of a conceptual framework in which to study the verbal regulation of behaviour. "The saying out to oneself what one is about to do is a preparation for the primary acts that are to follow. It is not simply that each act is individually and separately prefigured and thus prepared, but the serial organization of behaviour is thus preestablished by speech ..." (De Laguna, 1927, p. 301). De Laguna goes on to discuss language and its ability to control behaviour conceptualized as "mediatedness of behaviour" in her terminology. This assumption is shared by many, although the idea may be expressed in different concepts, such as "plan" (Miller, Galanter & Pribram, 1960), "schema" (Piaget, 1970) and "routine and subroutine" (Bruner, 1973). Quite possibly Luria's assertion that speech "mediates" higher mental functions comes close to these interpretations. Therefore, it must be pointed out that when Wozniak (1972) argues strongly against the use of mediation as S-rv-sv-R mediation, he is correct insofar as mediation is referred to in its narrow meaning, or as it has been used by Kuene (1946), Jeffrey (1953), Kendler & Kendler (1959), Reese (1962), etc. Moreover, as mentioned earlier, Wozniak has been limited by his preference for the mechanism, and failed to look at the problem from another angle. It is regrettable that he has to reject studies that support Luria's findings either in terms of mediation (Joynt & Cambourne, 1968) or in terms of initiation (Bem, 1967). Now that the concept of mediation or mediatedness has been explored, it may be safe to accept the assumption made in the studies to be reviewed below that speech may act as a mediating mechanism at the higher level of organization.

Support for the verbal self-regulation of behaviour

Birch (1966) found that if children (aged 4 to 7½ years) were asked to press a lever down and keep it down, there was a tendency for them to release the lever after 30 seconds. If the children were given a command to maintain the press, the tendency to release decreased. However, constant verbal reminders were needed to maintain performance. Although this study is not concerned with self-instruction, it implies that a verbal command, though effective, can be short-lived.

Bem (1967) aimed at training children as young as three to four years old in self-instruction. The task involved the child counting aloud the number of lights lit up on a panel. Afterwards, they were asked to repeat the count or to press a lever down to turn off the lights, or to do both. The three-year old subjects were correct only 27.6% of the occasions when they pressed and counted. Bem suggested that failure in verbal self-regulation was a learning deficit and not a developmental deficit, as the three-year olds could be taught and benefited from a training programme using fading techniques. However, it is suspected that counting is a special kind of speech form. In this study, apart from providing an estimate of the number of lights, it provides a rhythm for the pressing. The success of counting to control behaviour cannot be generalized perhaps to other types of verbal self-instructions.

Beiswenger (1971) carried out an extensive study on the psycholinguistic aspect of language in organizing behaviour. He went further than the Lurian type instructions and investigated the difference between commands of different syntactical structures. He found that a conditional-type command was most difficult for his subject. Although the instructions were given by an experimenter in this study, the implications would be equally valid for self-instructions.

Independent of Luria's influence are the group of operant studies on the verbal and nonverbal responses. They have highlighted the close relationship between the verbal and the motor modes. The basic premise is that verbal and motor behaviour belong to the same category of operants. An "interaction" can take place on the basis of some shared cue properties (Lovaas, 1961, 1964a). This can be a common reinforcing stimulus so that the manipulation upon one behaviour change may lead to a responding change on another behaviour; or a stimulus generated by one behaviour can function as a secondary reinforcer for another behaviour; or any behaviour reinforced can serve as a discriminative stimulus to another behaviour. The majority of studies report selectively reinforcing some aspect of verbal behaviour and consequently observing an increased incidence of nonverbal behaviour. This has been demonstrated in aggressive behaviour (Lovaas, 1961), food intake (Lovaas, 1964b), playing and the choice of toys (Sherman, 1964), the speed in responding on a lever (Lovaas, 1964a) and paper-picking (Kurtz, Neisworth, Goeke, & Hanson, 1976). Lovaas (1964a) claims that "the interaction observed between verbal and nonverbal operants could potentially be observed between any operants." Successful results have been reported when the reinforcement is contingent on the correspondence between saying and doing (Risley & Hart, 1968). Israel & O'Leary (1973) suggest that an established "say-do" correspondence is more stable than the correspondence established by reinforcing "do-say". They stress that simply reinforcing verbal behaviour is insufficient to bring about nonverbal behaviour change and that it is necessary to reinforce the correspondence of two operants. Although these operant studies have illustrated the interdependence between verbal and motor behaviour, their assumption has diverged from the stand of most of the studies reviewed here, as verbal behaviour is treated without any reference to its wider intellectual context, e.g., the link with thinking.

An impressive attempt to bridge the gap has been made by Meichenbaum (Meichenbaum, 1973, 1974, 1975). However, some of his earlier experiments have several flaws. Meichenbaum & Goodman (1969a) compared the influence of instructions such as "faster", "slower" and a two-letter control word on children's tapping task along three parameters: experimenter delivered, overt self-verbalized and covert self-verbalized. While in the experimenter-controlled condition, the rate of the instruction to be delivered was calculated individually from the subject's baseline rate, subjects in the self-instructed conditions were simply told to tap "according to the way the word means". Consequently, the timing of the self-instructions was not controlled, and it was not clear whether this could affect the rate of tapping, or for that matter, whether the self-instructed group could be compared with the experimenter-instructed group. The results, according to Meichenbaum & Goodman (1969a), supported the semantic influence of speech on behaviour. However, this applied only to the utterance "slower". The effectiveness of the word "faster" was observed only in the overt condition of the kindergarten group and the covert condition of the first grade children. Meichenbaum suggested that may be in some ways the production of a verbal response also interfered with the production of a manual response, so that the final result could not be always facilitative. But the experimenters were more concerned with the general findings, and there was not enough evidence from the data to substantiate particular interactions between the meaning of the word and motor response.

The study was replicated (Meichenbaum & Goodman, 1969b) and also reported was a study using a differentiation task. The performance on the two tasks was related to conceptual tempo -- reflection-impulsivity (Kagan et al., 1964). In the discrimination task a random sequence of twelve blue and twelve yellow lights were presented. Children were pretrained to say "push" to one colour and "don't push" to another colour. Then the children were asked to push a foot pedal down when the blue light came on and not to push when it was the yellow light. Meichenbaum & Goodman (1969b) labelled it the covert verbalization condition (it would seem more like a silent condition). In the next condition -- the overt condition -- they accompanied the motor reaction with verbalization.

The subjects were given the Kagan Matching Familiar Figures Test (MFFT) for a measure of their conceptual tempo. Apart from a faster baseline rate in the impulsive children, conceptual tempo was found to bear no significant relation to the effects obtained in the verbalization to the single-tapping task. Otherwise, the results of the original experiment were replicated.

On the foot-lever experiment, there was a marked difference in the performance between the impulsive and the reflective subjects. Impulsive children emitted three times as many commission errors in the covert condition as the reflectives in the same condition, whereas in the overt condition no difference was found. The facilitative function of speech on the impulsive group in the overt condition provided support for Luria's hypothesis, though there might be several possibilities in interpreting the results in the covert condition:

a. Although the children were not instructed to use covert verbalization, the reflectives could have made a connection between the pretraining and the foot lever experiment and have therefore used covert verbalization, whereas the impulsive children did not.

b. If both groups had used covert verbalization, the impulsive children used it less effectively for some unknown reason. Wozniak (1972) thinks that it was because the impulsive children responded too fast in their motor response for the verbalization to occur.

c. If neither group connected the verbal pretraining with the foot-lever task and neither group used covert verbalization, the difference in performance would be related to other unspecified individual differences.

The problem lies in the design; there is no genuine silent condition in which the subjects did not get any verbal pretraining. Moreover, covert verbalization, assuming that it had occurred, was difficult to record or monitor. It seems that only the results in the overt condition can be accepted with confidence.

The ambiguous results in the covert condition have led to misinterpretation. Wozniak (1972) asserts that impulsive children responded too quickly with their foot for verbalization to occur. This is unsatisfactory and the problem stems from the fact that his "inhibitory mechanisms" eschew other interpretations in terms of initiation or mediation. For example, the child is expected to press the balloon and then say "press" so that superflous responses are inhibited. Verbal self-instruction is not expected to inhibit the pressing of the lever. However he has to include results that would support Luria's claim, results not including this inhibitory mechanism in the interpretation. Wozniak (1972) concedes that in Stage III, "it demands that verbalization *precedes* response since the effect of the verbalization is to *organize* the behaviour" (p. 50, italics mine), because the inhibitory model has difficulty in explaining the transition from the impulsive control to the regulation by the significative aspect of speech. On the other hand, Rondal (1976) would regard "organization" as belonging to a higher level of mental processing, and inner verbalization usually precedes motor response.

Wozniàk (1972) justifies himself, "This explanation would be supported by mean latencies to the overt verbalization of "don't press" in impulsive children but not in reflective children which were longer than mean latencies to errors of commission in the covert condition, suggesting, in other words, that latency to verbalize was long to enough to preclude the average occurrence of verbal responses preceding errors of commission in the covert condition" (p. 50). He has made two assumptions here. Firstly, that the covert condition involves covert verbalization and not a silent condition. Secondly, he assumes that covert verbalization in impulsive children differs from that in reflective children as they have differed in overt verbalization. Meichenbaum (1971) only reported that impulsive children used the verbal utterance as a tapping metronome, whereas the reflective children tapped several times to an instruction, which served more like a cue, or reminder of how to respond. Among other studies, those by Birch (1971) also deal only with overt verbalization. All evidence reported on covert verbalization suggested that it precedes a motor act (Rondal, 1976) and was faster in latency than an actually spoken one (Sokolov, 1972). Since Meichenbaum & Goodman (1969b) did not report this data, we may doubt Wozniak's description of their work as "perhaps the clearest evidence yet published in support of the empirical phenomena which Luria has described" (Wozniak, 1972, p. 50).

There is one more aspect of the finger-tapping task that is worth discussing. The children in Meichenbaum & Goodman (1969a) were five years old (kindergarten and first grade) and should be at approximately Stage III in Luria's paradigm when the semantics of the word can assume an influence. However, the word "fast" actually slowed down the finger-tapping relative to the baseline in some children, and this was glossed over by Meichenbaum & Goodman (1969a) when they suggested some "functional control" by speech on behaviour, without specifying the direction of the control.

When the rate of pressing is compared with the baseline rate, verbalization of the two-letter word depressed lever pressing, which may suggest that verbalization was an extra task for the subjects to cope with. The semantic influence of "slow" combined with the utterance per se produced a more pronounced slowing down effect. The word "fast" created inconsistent results because there was a conflict between the semantic aspect to tap "fast" and the extra verbalization. There has already been a suggestion that combining motor and verbal responses results in an overall increase in latency compared with the two modes performed separately (Birch, 1971). It would also appear that the effects of verbalization would be different for a task requiring continuous performance, e.g., tapping and when the latency is a dependent variable, and for a task requiring accuracy of discrete responses, e.g. discrimination.

Despite the methodological constraints of Meichenbaum's earlier studies (Meichenbaum & Goodman, 1969a, 1969b) the potential of the regulatory power of self-instruction has far-reaching implications. Self-instruction is now applied to a more abstract level to regulate complicated behaviour in a clinical setting (Meichenbaum, 1975). And it is probably at this level that the more abstract version of Luria's theory receives most convincing support. Refinements of the procedures have included a package to train patients through modelling, learning to verbalize overtly and then covertly (Meichenbaum, 1971; Meichenbaum & Goodman, 1971) and in formulating problems and individual specific instructions for the patients to repeat to themselves (Meichenbaum, 1973, 1974, 1977).

An alternative interpretation

It has been suggested in the review of Meichenbaum & Goodman (1969a) experiment that verbalization has different effects on performance, depending on the meaning of the word uttered. Bloor (1977) suggested that the effects of verbal self-regulation should be analysed in terms of "load", according to the "limited capacity theory" (Broadbent, 1958).

Bloor (1977) gave subjects a sequence of red and blue lights, and they were asked to give the name of either red or blue and press either a red or a blue button. There were four experimental conditions: 1) the colour of the light, the button pressed and the verbal response were all the same; 2) the button pressed agreed with the light, but not with the verbal response; 3) the verbal response agreed with the light, but not the button pressed; and 4) the verbal response was the same as the button pressed, but incompatible with the light. The predictions according to the Capacity Theory and Luria's theory would differ. On Luria's hypothesis, the performance on Conditions 1 and 4 would be similar because the speech regulated the response, whereas the Capacity theory would expect the verbal response to be a burden, so condition 4 would be the most difficult because the subject had to cope with switching both the verbal and the motor responses round to a different stimulus colour. The results supported Bloor's view.

Regarding Conditions 2 and 3, when either the verbal or the motor system comes into conflict with the stimulus, the Lurian prediction would expect the dominance of the verbal system, whereas the Capacity theory would predict the performance to be based on the factors governing whether either or both the verbal and the motor system exceeded their capacity. The observation on "opposite" responses showed that whenever the response modality was incompatible with the stimuli, that response mode give more "opposite" responses. The system which was compatible with the stimulus would dominate. This was in line with the Capacity theory, although attempts to find out quantitative values of the capacities of the response modes gave unconclusive results. The Capacity theory, however, is not the final answer, because Bloor has only provided those data that best support the Capacity point of view. He has admitted that there are results which could equally be explained according to Luria's hypotheses and has tried to match the Luria's thesis with the Capacity theory. According to him, Luria's theory would fare better when the two motor and verbal responses were incompatible with one another and the Capacity theory would explain the situation better when the stimulus and only one mode of response is compatible. It seems that Luria's explanation would still be plausible in some cases.

Variables associated with verbal self-control

Notwithstanding the controversy over the validity of the verbal regulation phenomenon described by Luria and the debate over the underlying mechanisms that relate the motor and the verbal systems, many other studies have been carried out inspired by Luria's suggestion. Most of them are empirical in nature, such as testing the Lurian model on different samples of children (Joynt & Cambourne, 1969; Schubert & Cropley, 1972), relating self-instruction to other methods of instruction (Bender, 1976), studying how talking to oneself aloud may vary with the manipulation of external variables (e.g., time allowed) and its subsequent effect on performance (Murray, 1979), as treatment packages, and so on. Bain (1976) studied the verbal regulation process in bilingual children, but this study only mentioned adult-delivered instructions. Tizard (1962) studied the connection between performance on a Lurian-type task of normal children who were classified into either a "timid" or an "aggressive" group by their teachers. But the findings were inconclusive, possibly due to the fact the children were not rated on a proper children's personality scale.

Katz (1974) examined the effects of aging on the verbal control of behaviour. He developed an Impulsivity Scale based on a 24-item list of different types of tasks described by Luria. It was used with three to four-year old children in an earlier study he described. The scale was given to two groups of elderly subjects, aged between 65 and 75 years and between 80 and 96 years. The results suggested that verbal control of behaviour tends to persist fairly late into life, but at and after 80 years, this function begins to deteriorate.

Social class is also a much studied variable. Golden, Montare & Bridger (1977) reported that two-year old middle class children responded better to verbal command, while Meade & Saltz (1972), when comparing lower class black and middle class white families, found that lower social economic class children produced a considerable degree of impulsive and omission errors in a Lurian-type task at both nursery and first grade level.

Other studies are concerned with the practical applications of verbal self-regulation (Schubert, 1969, 1970, 1973). Schubert (1973) argues that Luria's theory on verbal regulation is directly related to a theory of intelligence because the ability to utilize verbal concepts in learning and to organize the environment is a major factor in learning. He has designed a Verbal Regulation of Behaviour (VRB) Apparatus to measure this aspect of intelligence. The tests have the advantage of covering various learning situations, and the battery has been administered to white children as well as Canadian Indian subjects (Schubert & Cropley, 1972) and to cerebral palsied children (Burland, 1969). However, the results from a different ethnic group have indicated that the test is not "culture-fair" (Schubert & Cropley, 1972). Work is being carried out to standardize the test but to date no further data are available.

Apart from being used as an assessment tool, verbal self-instruction also serves as a means to promote behavioural change: it can regulate the movements of cerebral palsied children (Cotton & Parnwell, 1968), increase studying time (Miller & Gimpl, 1972), focus concentration and the thinking process in college students (Klinger, 1974), correct hand-writing (Robin, Atmel, & O'Leary, 1975), promote the habit of picking up waste paper from the floor (Kurtz et al., 1976) and, above all, modify overactive behaviour (Bender, 1976; Bornstein & Quevillon, 1976; Douglas, Parry, Marton, & Garson, 1976) or decrease impulsive performance in school children (Nelson & Birkimer, 1978; Palkes, Stewart, & Freeman, 1972; Palkes, Stewart, & Kahana, 1968).

In view of the theoretical evaluation presented at the beginning of this chapter, it is interesting to note that while researchers are debating whether the initiation or the inhibitory mechanism explains verbal regulation, and mostly agree on the former (Bem, 1967; Bronckart, 1973; Rondal, 1974; 1976), the parctical applications of verbal self-regulation are mostly concerned with inhibiting and controlling behaviour. The data in the experiments by Meichenbaum & Goodman (1969a) and by Higa et al. (1978) have suggested that to speed up a response or to produce one could be explained by a different mechanism from slowing down a response or inhibiting one. Indeed, if Bloor's (1977) suggestion that the Capacity theory accommodates verbal self-regulation better was correct, it would be expected that it would explain the initiating and inhibitory aspect of behaviour. Moreover, as the review has proposed dividing the observations into various levels of analysis, the Capacity theory too should be tested for its applicability at least on the basic and middle level of generality.

Before going into the experimental sections of this thesis, the concept of verbal self-control will be examined in one group of studies, namely, the delay of gratification.

Delay of gratification and verbal self-control

The perspective is broadened by the inclusion of delayed response studies - the delay of gratification, or resistence to temptation, as it is sometimes called. Self-instruction is an important component in the delay of gratification paradigm and is relevant to the present review.

Earlier studies by Mischel (1966), which focussed on the external processes which may influence voluntary delay of gratification, have systematically demonstrated the relationship between a decision to delay rewards and the direct measures of variables which could be subsumed under an ego-strength construct in psychodynamic literature. It has been found that among children aged between 6½ and 11½, the willingness to wait for a delayed but greater valued reward rather than obtain an immediate but less valued reward decreased with the increase of the time interval they were required to wait. This was especially marked among older children, who were more sensitive to temporal discrimination (Mischel & Metzer, 1962). The delayed reward is preferred subject to its availability (Mischel & Masters, 1966) and the child's previous experience of being rewarded (Mischel & Staub, 1965). Modification strategies have also focussed on the external correlates through the use of modelling, including such experimental manipulations as live or symbolic models, "rewarding" or "nonrewarding" models (Bandura & Mischel, 1965; Mischel, 1966; Toner, Parke & Yussen, 1978), black or white model (Crane & Ballif, 1976) or the subject having acted as a model himself (Toner, Moore & Kidder, 1977).

But there is also a congitive aspect to the delay of gratification. The attentional factor has been examined in depth (Mischel & Ebbesen, 1970) and there is evidence that when the child is distracted while he is waiting for the reward, or if the reward is out of sight, the child finds it easier to wait longer. This latter finding calls in question the conventional expectation that waiting in the presence of reward lengthens waiting time. The distraction can be provided by having other toys available to play with, thinking about something else, or if the reward is present, thinking about the reward (Mischel, Ebbesen & Zeiss, 1972).

Even when the subjects are not given anything else to do or to think about (in the "nothing" or control condition), many of them generate spontaneous means of distraction, such as singing to themselves or repeating the contingency of the delay. Attention to the delayed reward, therefore, seems to be but one component that produces effective results in the delay of gratification paradigm. Anecdotal reports by subjects suggest that other methods also enhance delay effectively. For example, some subjects wait passively for the reward, in spite of thinking about the outcome. It is possible that ideas or images are difficult to control, in the sense that subjects can still concentrate on different aspects of the same object.

As a result, some experimenters decide to ask their subjects to verbalize overtly what they are thinking in order to control the subject's activity or ideation during the time they wait. In some ways, the results from verbalization studies have confirmed Mischel's results on ideation that verbalization of the reward could considerably reduce waiting time to even less than the no verbalization condition (Toner & Smith, 1978). But a follow-up study by the same authors did not find any systematic relation between the subject's verbalization and their looking at the reward placed on the table (Toner & Smith, 1978). The most effective instruction to encourage resistence to temptation is to verbalize the rules (Miller, Weistein & Karnoil, 1978; Toner & Smith, 1978). This is supported by Fry (1978) who further demonstrated that children who engage in self-instruction for a longer time (the high-verbalizers, Fry's terminology) resist temptation better than the low-verbalizers, and that the effectiveness of verbalization the rules also interacts with locus of control (Fry & Preston, 1979). Children who are high internalizers (who think that they have a higher degree of control of their life events) respond better to verbal self-control than low internalizers. Karoly & Briggs (1978) have suggested that verbalizing the rationale in a delay paradigm rather than some arbitrary rule facilitates waiting. Sawin & Parke (1979) did a study on second grade children in a resistence to temptation situation. One type of verbalization involved simply stating the prohibitive rule, while another type of instruction focussed the subjects' attention on an alternative permissible behaviour during the waiting time. The latter self-instruction was more effective. These findings, together with work on verbal self-control against rule-breaking (Burron & Bucher, 1978; Monahan & O'Leary, 1971; O'Leary, 1968) have refined substantially the method of self-control by verbal self-instruction.

Instead of analysing the technical details of verbal self-instruction to resist temptation, Patterson & Mischel (1975a, 1975b) deal with broader cognitive/attentional factors in the delay of gratification situation -- they interpret the instructions as "plans". Children were shown a box on which was painted the face of a clown, and were told that they could play with it as long as they did not touch or look at the toy in the experimenter's absence. They were provided with "plans" to resist the temptation when the clown box "asked" them to play. A "task-facilitating plan" was: you can just look at the pegboard (the task the subjects were asked to do) and say "I'm going to look at my work." The "temptation-inhibiting" plan was: to say "I'm not going to look at Mr. Clown Box." A third condition was to combine the task-facilitating and the temptation-inhibition plans. Patterson & Mischel (1975a) showed that the temptation-inhibiting plan was more effective in resisting temptation, and that the combined condition was not better than the temptation-inhibiting plan operating alone. These results may be compared with those obtained by Hartig & Kanfer (1973), who found that verbalization of the positive consequence or the negative consequence or the instruction not to transgress enabled the subjects to resist temptation successfully. Both studies imply that if the verbalization can be directed toward the exact purpose of the situation, it is more effective than any less related instructions. Furthermore, the more elaborated and substantive the "plans", the more effective they are in delaying the urge for gratification (Mischel & Patterson, 1976). This comes very close to the suggestion made by Meichenbaum (1977) that the self-instruction should be detailed in describing the problems and also the coping methods in his cognitive-behaviour modification techniques.

Despite all these reports on successful manipulation, the lasting effects of verbal self-instruction or resisting temptation are doubtful. Monahan & O'Leary (1971) reported 69% of cheating incidents subsequent to a correct self-instruction. The same study also suggested that if the children could cheat by another means, like tempering with the timer which controlled the length of the session in their case, the self-instruction, albeit correctly repeated, had no effect. So a lot seems to depend on the task variable chosen for a study and a careful design, if confounding results are to be avoided.

Summary

This chapter began with a description and a critique of Luria's hypothesis on the verbal regulation of behaviour. Special attention was paid to the replication studies and studies that have been conducted within Luria's framework. The mechanisms underlying the concept "verbal regulation of behaviour" have been examined, and several possible explanations have been discussed. The suggestion that one can reject the idea of verbal regulation simply on the grounds that researchers have failed to replicate Luria's findings is dismissed.

There are suggestions that speech regulates through its initiative or impulse aspect (Bronckart, 1971, 1973; Rondal, 1976). The same authors found no evidence to support the semantic aspect of verbal self-control, i.e., when the meaning of the instruction is involved. Wozniak (1972), on the other hand, favoured "inhibitory mechanisms" as an explanation. Others, like Birch (1971) and Susman (1971) approached the problem by studying the co-ordination and temporal order of speech and motor behaviour, to determine which of these two system was superior to the other. The phenomenon has also been analysed in terms of operant psychology. Meichenbaum, before developing his clinical treatment techniques using verbal self-control, also studied the semantic regulation of speech on motor behaviour (Meichenbaum & Goodman, 1969a, 1969b, 1971). One of the most convincing alternative explanation is that of Bloor (1977), who proposed that verbal regulation of behaviour can also be understood in terms of the Limited Capacity Theory.

In sum, most of the studies have suggested that Luria's theory stands in need of refinement. But, these studies have belonged to different levels of generality and have criticized Luria from their particular perspective. Luria's hypothesis spans several levels of abstraction and a critique of his work is difficult because he is an ecletic theory builder whose work has spanned from the most technical experimentation of elementary responses to the postulation of an abstract and general theory of socio-cultural basis of human behaviour.

Some empirical studies adopting Luria's ideas have been mentioned, but most of them employed Luria's methods or broad framework without understanding the underlying mechanisms.

The present investigation focuses on behavioural self-restraint, so the last section of the review, dealing with studies on delay of gratification, and especially recent attempts to employ self-verbalization in enabling subjects to resist temptation, provides a link between Luria's conceptual line and the control and inhibition of behaviour.

CHAPTER TWO

VERBAL SELF-INSTRUCTION AND DELAYED RESPONSE PERFORMANCE

(Experiment 1)

It was suggested in the previous chapter that Luria looked at the phenomenon of verbal behavioural control from different levels of generality. Although he does not point this out clearly, attempts to replicate and interpret his hypothesis have shown that different models can be postulated to explain the regulatory role of speech depending on the type of tasks chosen and the verbal strategies employed. The present experiment and the two others to be reported in this part are adaptations of Luria's experiments on simple motor responses in lever-pressing and discrimination. Based on the results of this level of experimentation, the experiments in Part III will deal with other types of tasks at the next level of execution.

One type of behavioural control is inhibition (as opposite to initiation). In Luria's classical experiments, a child is said to have developed inhibitory control when:

a) he does not perseverate on a response he makes to a stimulus;
b) he does not press when the negative stimulus is presented in a discrimination task.

For a child who cannot perform these tasks, self-instruction can help according to Luria's paradigm:

a) he can say "press" to himself and make a single response; say "go, go" and press twice, and older children can say "twice" and press twice;

b) say "no press" to himself and not react in the motor mode when the negative stimulus is presented.

However, when the regulatory speech has only reached the impulse stage, the child will:

a) press only once when he instructs himself, "twice";

b) press even when he has instructed himself "no press".

The most common explanation is that when this happens, speech is not yet functioning on the significative level. Wozniak (1972) gives a slightly different explanation, that the inhibitory mechanism of speech is only at the "discrete" stage (Wozniak's label for this stage). "Twice" or "I shall press twice" produce discrete responses because the reafferent feedback prevents further responses from being produced. Wozniak also argues that a commission response to the negative stimulus represents a failure and is due to "disinhibition". The confusion of this interpretation has been discussed (see p.42) and will not be repeated here. Another plausible explanation is the application of Broadbent's Limited Capacity Theory (Bloor, 1977). None of these explanations have been tested in a delayed response paradigm, and this is what the present experiment investigates.

It has been implied that initiation and inhibition may be under the control of different mechanisms (Higa et al., 1978). Therefore, it seems appropriate to look at responding and nonresponding separately, under conditions in which either self-instruction or no self-instruction is employed. The responding situation requires the child to make a motor response on the presentation of a visual stimulus; the nonresponding situation (actually delaying a response) requires the child to wait for a specified period of time before making a motor response. A delayed response has the advantage of demonstrating whether a subject can actually wait, or inhibit his response temporarily, because it is often difficult to decide whether the absence of a response indicates genuine inhibition, or merely that the subject is not paying attention and hence not responding.

Another issue of interest is the order of the verbal and the motor responses, often the source of debate as to how verbal regulation operates. Beiswenger (1971) mentions that young children between the ages of 3 and 5 respond to the temporal order of clauses rather than the syntax of the temporal indicator. Consequently, the instructions "to say 'go' in response to each flash of light and at the same time press the ballon" (Luria, 1961a) would imply the same temporal order to the child as "to say 'squeeze' whenever the positive stimulus appeared and then squeeze the ball" (Miller et al., 1970). The present experiments are not designed specifically to test this particular issue, but the children are left to adopt their spontaneous sequence, which is noted so that the comparison can be made.

In general, it is expected that the ability to perform on the delayed response task will increase with age. Other predictions included:

1. In the responding condition , all the subjects will perform better when verbal self-instruction is used than when it is not. This follows from Luria's verbal regulation prediction. The inhibitory interpretation predicts results in the same direction

as Luria. On the other hand, the competition or limited capacity theory would predict poorer response in the speech condition in terms of motor commission and possibly verbal omission.

2. In the delayed response condition, the use of self-instruction will be detrimental to the performance of the youngest (3-year old) age group and possibly the middle (4½-year old) age group, because according to Luria's prediction, they are still responding to the impulse aspect of speech. The older group will be facilitated by verbal self-instruction. The competition hypothesis would predict better performance in the speech condition, because the verbal utterance will substitute for any superflous motor responses. However, the competition hypothesis also expects a "paying back" or compensation effect, in that the delayed response required will also be omitted, because the verbal response has curtailed the motor one. This is inhibition of a kind, although Wozniak's "inhibitory" explanation would predict the results in line with Luria's prediction.

As mentioned in the Introduction, individual differences in personality are another variable related to behavioural restraint. Conventional belief would lead one to predict that "impulsive" children will find it harder to restrain themselves. However, the conceptualization and methods of measurement of impulsiveness are varied (see Chapter Seven), and particularly when the subjects are young children, there is a shortage of appropriate personality measures. It is for this reason that a teacher's rating scale has been developed (see Chapter Six). The scale provides a measure of extraversion, neuroticism, psychoticism and what a teacher would consider to be a "good" child. It is predicted that children who are rated by the teachers as high on extraversion and high on neuroticism will be less able to perform well on inhibition trials than those rated by their teachers as low on extraversion and neuroticism. Children considered to be "good" by the teachers are predicted to attain high accuracy on the trials. No specific predictions are made regarding the scores on Psychoticism.

Methods

Subjects

The children participating in the experiment came from Preston Park Infant and Nursery School and Kinton Nursery Group in Sutton, Surrey. The sample consisted of 48 children (25 girls and 23 boys) divided into three age groups. The first group was made up of 8 boys and 8 girls (mean age = 77 months). The second group had 7 boys and 9 girls (mean age = 54 months) and the third group consisted of 8 boys and 8 girls (mean age = 42 months). They will be referred to as the Old, Middle and Young age groups respectively. (See Table 1 for the means and standard deviations.)

Apparatus

The apparatus was made up of three portable components. The response unit was an 8" x 8" x 8" metal box. On the top right hand corner of the front panel was a buzzer. Two light bulbs, one blue and one yellow, were placed 6" apart on the top half of the panel. A response lever with a red rubber ball attached to its end protruded from the centre. The response lever could be pressed

Table 1 Means and standard deviations of the ages of the subjects (in months)

	Total Sample		Male		Female	
	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.
Total Sample	65.08	18.85	65.66	16.19	65.08	17.25
Old Group	77.13	3.05	77.38	1.13	76.87	5.27
Middle Group	54.50	4.93	54.85	6.83	53.56	4.78
Young Group	38.94	4.27	38.75	3.92	39.13	4.88

downwards but not in any other direction. The response box was shown and described to the subjects as a "funny face with two eyes and a long red nose" (Figure 1a and b).

A digitimer was used to regulate the time and sequence of the light and buzzer stimuli. The first decade (see Figure 1a) was used to regulate the time of the full cycle. This means the length of time taken between the onset of the light to the termination of the sound of the buzzer plus one second. The second decade regulated the time interval between the onset of the light and the onset of the buzzer. In the experiment, it was set to vary between 2 seconds and 4 seconds. The third decade controlled the length of the buzzer, set to last one second. The fourth decade marked the interval between the buzzer going off and the onset of the light. This was set at 4 seconds, allowing sufficient time for the experimenter to record the response and reset the delay interval. The last decade was not used. The latency of the motor response was recorded by a Reaction Timer, which reset itself automatically and started recording every time the light came on. Finally, there was a hand switch connected to the response box for the experimenter to select the colour of the light to come on. The circuit diagram of the entire unit is shown in Appendix 1.

The verbal response of the subjects was recorded by a portable casette tape-recorder. The noise made by the press on the lever was also recorded. This served as a guide to check the sequence of occurrence or the co-ordination between the motor and the verbal responses.

Figure 1a Apparatus for Experiments 1-3

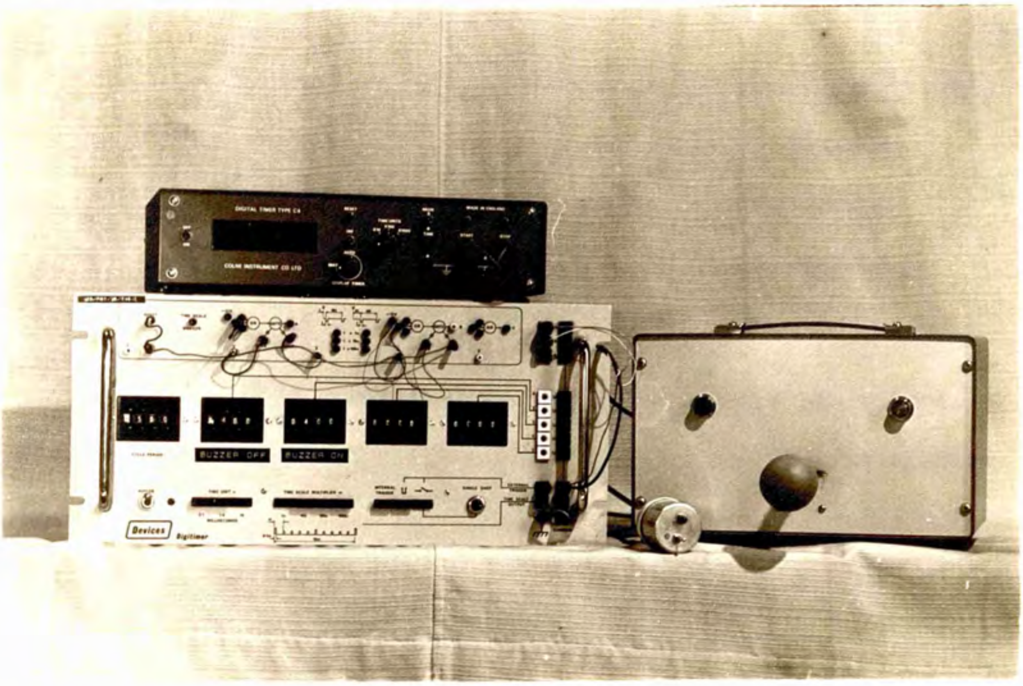
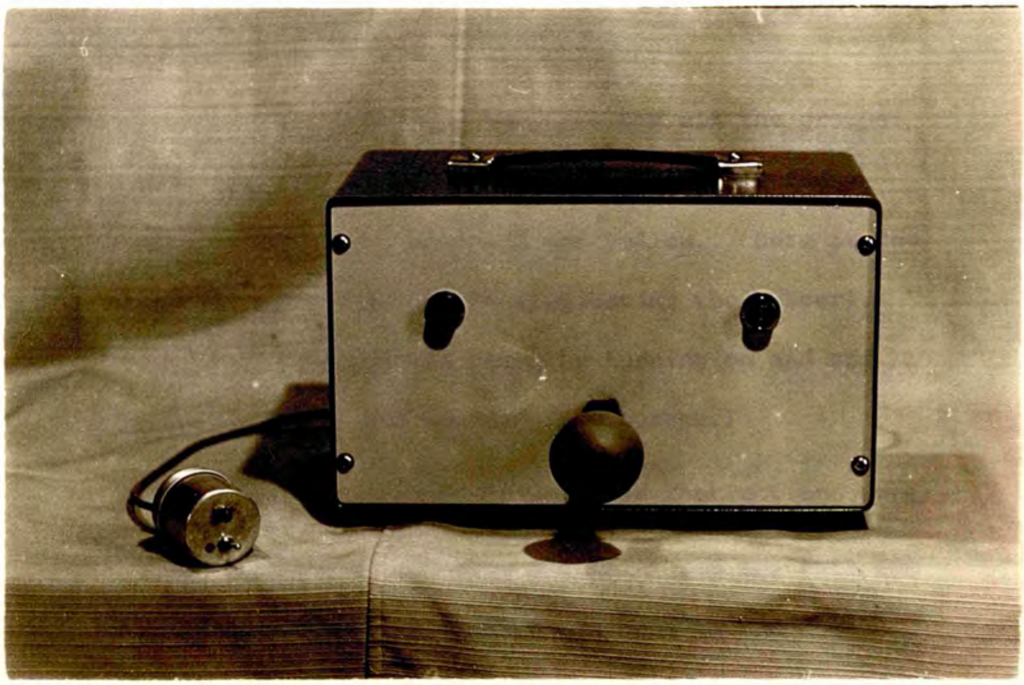


Figure 1b Responding unit in Experiments 1-3



Procedure

In view of the young age of the subjects, the experimenter (E) had acquainted herself with the children by spending two sessions with each group of children. She joined the Old Group in their painting class and generally mixed with the Middle Group and the Young Group with the school activities.

The experiment was carried out in a small room in the school. The subjects were seen individually. They were allowed to familiarize themselves with the apparatus before being tested. The subjects in each age group were randomly assigned to one of the four experimental conditions:

1. no speech - responding (NoSp-R)
2. speech - responding (Sp-R)
3. no speech - delayed responding (NoSp-DR)
4. speech - delayed responding (Sp-DR)

The introduction to the experiment was the same for all the groups: "Now we are going to have a look at my toy. You see this funny face here. It has two eyes, one blue and one yellow. Here is the long red nose. It can make a noise too (indicating the buzzer). I'll show you. (A demonstration was given by turning on and off the lights, pressing the lever and sounding the buzzer.)

To the respective experimental groups, the instructions were:

1. NoSp - R "Now, we are going to play a game. You see this eye up here. When it is bright, I want you to bang on the nose, like this (demonstration). Bang quickly. When you hear this noise, you must not bang any more. Wait till the eye is bright

and then you start again. Now let us try this a few times."
(practice trials)
"Now you'll do this on your own. Watch carefully and I want you to do your best."

2. Sp - R "Now, we are going to play a game. You see this eye up here. When it is bright, I want you to tell yourself loudly 'BANG' and bang on the nose, like this (demonstration). Do it quickly. When you hear the noise, you must not bang at all. Wait till the eye is bright, and then you start again. Now let us try this a few times." (practice trials)
"Now you'll do this on your own. Watch carefully and I want you to do your best."

3. NoSp - DR "Now we are going to play a game. You see this eye up here. When it is bright, I want you to wait and do nothing. And when you hear the noise, you can bang on the nose, like this (demonstration). Now let us try this a few times. Remember, wait while the eye is bright." (Practice trials)
"Now you'll do this on your own. Watch carefully and I want you to do your best."

4. Sp - DR "Now we are going to play a game. You see this eye up here. When it is bright, I want you to tell yourself loudly 'NO' and this means you do nothing and wait. When you hear the noise, you can bang on the nose, like this (demonstration). Now let us try this a few times. Remember, wait while the eye is bright." (practice trials)
"Now you'll do this on your own. Watch carefully and I want you to do your best."

The sequence of the stimuli was presented as shown in Figure 2:

Figure 2 Stimulus Sequence

2" to 4" 1" 4"

light buzzer light

The interval between the light stimulus and the buzzer varied between 2 seconds and 4 seconds randomly. The light went off if the lever was pressed or at the end of the trial marked by the end of a buzzer, whichever came earlier. The buzzer would invariably be sounded at the end of a trial. The subject was given 5 training trials, followed by a block of 30 experimental trials. The yellow light was chosen to be the stimulus for half of the subjects in the responding condition and half of the subjects in the delayed responding condition. The same applied to the blue light. During the training trials, the instruction was repeated if the subject did not perform correctly the first time. Demonstration was repeated. Verbal and physical prompting were used to assist the subject to produce at least three correct trials on his own before the proper experiment began. As all the children could reach the criterion, there was no need to discard any subjects.

If the subject responded correctly, E said, "That's right," or "Good, well done"; and for incorrect responses, E said, "Not quite", but did not correct S during the experiment.

The criteria for coding the response were: a motor response during the interval between the light and the buzzer was a correct response in the Responding condition. The correct motor response in the Delayed Responding condition was the absence of any commissional motor responses during the interval between the light and the buzzer. Four types of errors were coded:

Motor errors of omission was the absence of a motor response during the responding interval in the Responding condition, or an omission of the motor response at the sound of the buzzer in the delayed responding condition.

Motor errors of commission was an extra response to the buzzer or after a press had already been performed to the light in the responding condition, or any response during the light and buzzer interval in the delayed responding condition.

Verbal errors of omission and verbal errors of commission are self-explanatory.

Although motor commission to the buzzer in the responding condition and motor omission to the buzzer in the delayed responding condition were coded, they were not penalized, because the accurate score only included the performance between the light and buzzer interval. Other data recorded were the latency of the first motor response in the responding condition and the response mode. The response mode was defined as V-M (verbal response preceding motor response), M-V (motor response preceding verbal response) or Sim (Simultaneous).

Personality Measures

The New Teacher's Rating Scale

The teachers of the children were asked to fill in the New Teacher's Rating Scale. Details of this Scale are provided in Part II. The children in this experiment formed part of the standardization sample in the development of the scale. The results used for this experiment were those scored according to the final version of the scale. Briefly, the class teacher rated each child on a five-point scale of 36 adjectives. These adjectives made up four subscales, namely "Good" (NTRS-G), "Extraversion" (NTRS-E), "Neuroticism" (NTRS-N) and "Psychoticism" (NTRS-P). By adding the standard scores the child obtained on each adjective, he had a score on each of the four subscales.

Results

The design can be described as a three-way analysis of variance design with Age X Response Mode X Vocal Mode (3 x 2 x 2). The mean frequency of the accurate responses and the mean latency of the accurate responses in the responding conditions are presented in Tables 2 and 3.

There was a ceiling effect according to the raw scores of the Old Group. The scores were subsequently transformed into the square root of the total number of trials minus the frequency of accurate motor responses (Winer, 1971, p. 399). A three-way analysis of variance was performed and the ANOVA is presented in Table 4.

There was only one significant result, due to the main effect of vocal mode ($F(1,36)=10.80$, $p < .005$). Accompaniment by verbal self-instruction in both the responding and the delayed responding conditions turned out to be detrimental. The age trend predicted was not supported. The means of the four groups of errors are shown in Tables 5 to 8. The scores of the motor omissions and motor commissions were transformed into square roots before the variance was analyzed. The ANOVA tables are presented in Tables 9 to 10.

Table 2 Means and standard deviations of the number of accurate motor responses

	Young Group		Middle Group		Old Group	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
CONDITIONS						
No Sp-R	28.00	1.83	28.75	0.96	29.25	0.96
Sp-R	25.50	13.32	24.75	5.50	28.25	1.71
No Sp-DR	25.75	6.13	29.25	0.96	28.75	1.89
Sp-DR	16.50	11.21	26.50	3.11	24.75	9.84

Table 3 Means and standard deviations of the latency of response in the responding groups (in seconds)

	Young Group		Middle Group		Old Group	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
CONDITIONS						
No Sp-R	1.32	0.37	1.04	0.21	0.88	0.30
Sp-R	1.42	0.39	1.46	0.45	1.26	0.49

Table 4 ANOVA of Motor Accuracy Scores

Source	SS	df	MS	F	df	Sig
age (A)	7.05	2	3.53	2.86	2.36	N.S.
response (R)	0.24	1	0.24	0.19	1.36	N.S.
speech (S)	13.29	1	13.29	10.80	1.36	<.005
A x R	1.62	2	0.81	0.66	2.36	N.S.
A x S	2.37	2	1.19	0.97	2.36	N.S.
S x R	1.05	1	1.05	0.85	1.36	N.S.
A x R x S	6.60	2	3.30	2.68	2.36	N.S.
within cells	44.53	36	1.23			
Total	76.75	47				

Table 5 Means and standard deviations of the frequency of motor omissions

	Young Group		Middle Group		Old Group	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
CONDITIONS						
No Sp-R	1.25	1.89	1.25	0.96	0.75	0.96
Sp-R	4.50	3.32	4.50	4.12	2.25	2.06
No Sp-DR	1.75	0.50	0.25	0.50	0.75	1.50
Sp-DR	4.50	5.20	2.25	1.50	0.25	0.50

Table 6 Means and standard deviations of the frequency of motor comissions

	Young Group		Middle Group		Old Group	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
CONDITIONS						
No Sp-R	1.25	1.25	0.75	0.96	1.00	1.16
Sp-R	1.25	1.50	0.75	0.50	0.75	1.50
No Sp-DR	5.00	5.60	0.50	0.58	1.00	1.41
Sp-DR	13.50	7.86	3.25	2.75	5.00	9.35

Table 7 Means and standard deviations of the frequency of verbal omissions

	Young Group		Middle Group		Old Group	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
CONDITIONS						
Sp-R	13.75	7.90	1.50	1.29	6.75	11.00
Sp-DR	5.00	4.32	8.25	8.88	0	0

Table 8 Means and standard deviations of the frequency of verbal commissions

	Young Group		Middle Group		Old Group	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
CONDITIONS						
Sp-R	0	0	2.50	0.50	0.25	0.50
Sp-DR	0	0	8.50	8.70	0	0

Errors of verbal omission were also transformed into square roots and analyzed by ANOVA (Table 11) whereas the verbal errors of commissions were analyzed by nonparametric methods.

The analysis of variance of the frequency of motor omission errors produced a significant effect due to the vocal mode ($F(1,36)=5.24$, $p. < .01$). Making a self-instruction resulted in more omissions to the light stimulus in the responding condition and also omissions in the delayed responding condition by not responding to the buzzer after waiting.

In terms of motor commission responses, the analysis of variance showed that all the three main effect - age, motor response mode and vocal mode - were significant. Regarding the age main effect ($F(2,36)=6.18$, $p < .001$), trend testing indicated that the linear trend was a highly significant one ($F(1,36)=9.79$, $p < .001$) and it accounted for nearly 80% of the variance due to age. The quadratic trend was not significant. The response mode main effect ($F(1,36)=13.06$, $p < .001$) indicated that the delayed responding condition was the more difficult one in the sense that more commission errors were recorded in delayed responding, and these errors would have occurred during the waiting interval between the light and the buzzer. By comparison, therefore, children in the responding condition did not omit as many impulsive or superflous responses. As for the vocal mode main effect ($F(1,36)=4.86$, $p < .05$), it also demonstrated consistently the interfering effect of speech, because self-instruction led to more commission errors.

However, the main effects must be interpreted in the light of several interactions in the analysis which were also significant.

These included the Age X Response mode effect ($F(2,36)=4.20$, $p < .025$), the Vocal mode X Response mode interaction ($F(1,36)=5.62$, $p < .025$) and the Age X Response mode X Vocal mode interaction ($F(2,36)= 9.95$, $p < .001$). As most of these results were not predicted, the Scheffé post-hoc test was carried out to examine the difference between the cells (Edwards, 1968, p. 150). Throughout the comparison, the value of F employed to calculate the value of F' is at $\alpha = 0.10$. The results indicated that only in the Young Group was the number of motor commission significantly higher in the delayed responding group than the responding group ($F(5,42)=19.79$). The Young group also produced significantly more commission errors than the other two groups, but only in the delayed responding condition ($F(5,42)=20.50$). As for the interaction between the Vocal mode and the Response mode, this occurred when delayed responding was the condition, and when the presence or the absence of self-instruction differentially affected the frequency of commission responses, and self-instruction accompaniment produced more errors ($F(4,12)=10.48$). The three-factor interaction is a measure of the additivity of the two-factor interaction. Analysis revealed that it was the Young group that produced significantly more commission responses in the delayed responding condition with self-instruction than the responding condition with self-instruction.

ANOVA of verbal errors of omission produced a significant main effect due to age ($F(2,18)=4.11$, $p< .05$) and the linear age trend was a highly significant one ($F(1,18)=8.14$, $p<.05$). The highest number of verbal omissions was obtained in the youngest age group.

Table 9 ANOVA of the frequency of motor omissions

Source	SS	df	MS	F	df	Sig
Age (A)	5.23	2	2.61	3.23	2,36	N.S.
Response (R)	0.62	1	0.62	0.76	1,36	N.S.
Speech (S)	4.25	1	4.25	5.24	1,36	<.01
A x R	1.74	2	0.87	1.07	2,36	N.S.
A x S	1.65	2	0.83	1.02	2,36	N.S.
S x R	0.17	1	0.09	0.11	1,36	N.S.
A x R x S	4.09	2	2.05	2.53	2,36	N.S.
within cells	29.25	36	0.81			
Total	47.70	47				

Table 10 ANOVA of the frequency of motor commissions

Source	SS	df	MS	F	df	Sig
Age (A)	9.15	2	4.58	6.18	2,36	<.001
Response (R)	9.67	1	9.67	13.06	1,36	<.001
Speech (S)	3.60	1	3.60	4.86	1,36	<.050
A x R	6.21	2	3.11	4.20	2,36	<.025
A x S	0.91	2	0.46	0.62	2,36	N.S.
S x R	4.16	1	4.16	5.62	1,36	<.025
A x R x S	14.74	2	7.37	9.95	2,36	<.001
within cells	26.74	36	0.74			
Total	75.18	47				

Table 11 ANOVA of the frequency of verbal omissions

Source	SS	df	MS	F	df	Sig
Age (A)	15.85	2	2.93	4.11	2,18	$<.05$
Conditions (C)	2.43	1	2.43	1.26	1,18	N.S.
A x C	11.25	2	5.63	2.91	2,18	N.S.
within cells	34.70	18	1.93			
Total	64.23	23				

FIGURE 2 MEAN ACCURACY SCORES OF THE THREE AGE GROUPS

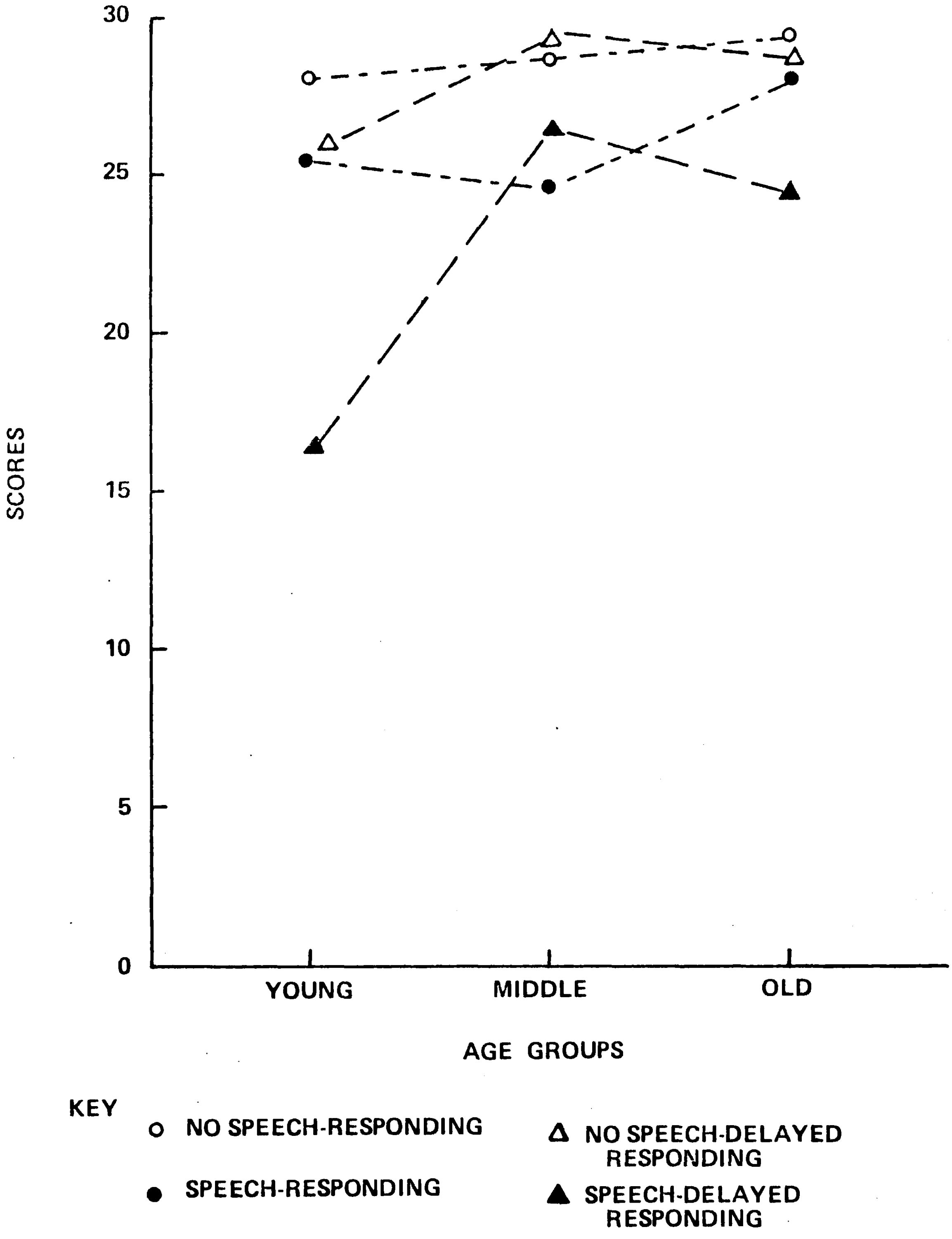
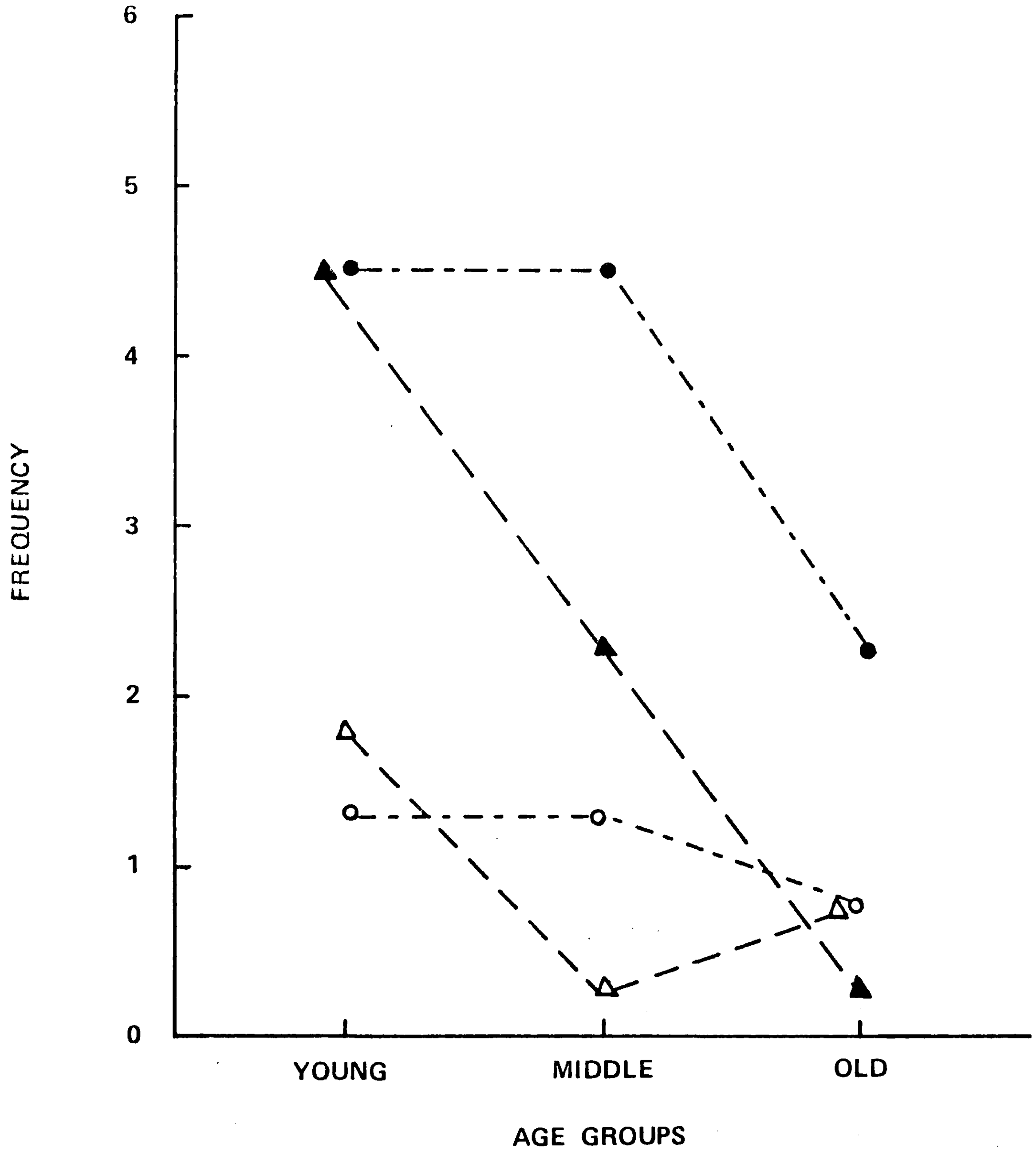


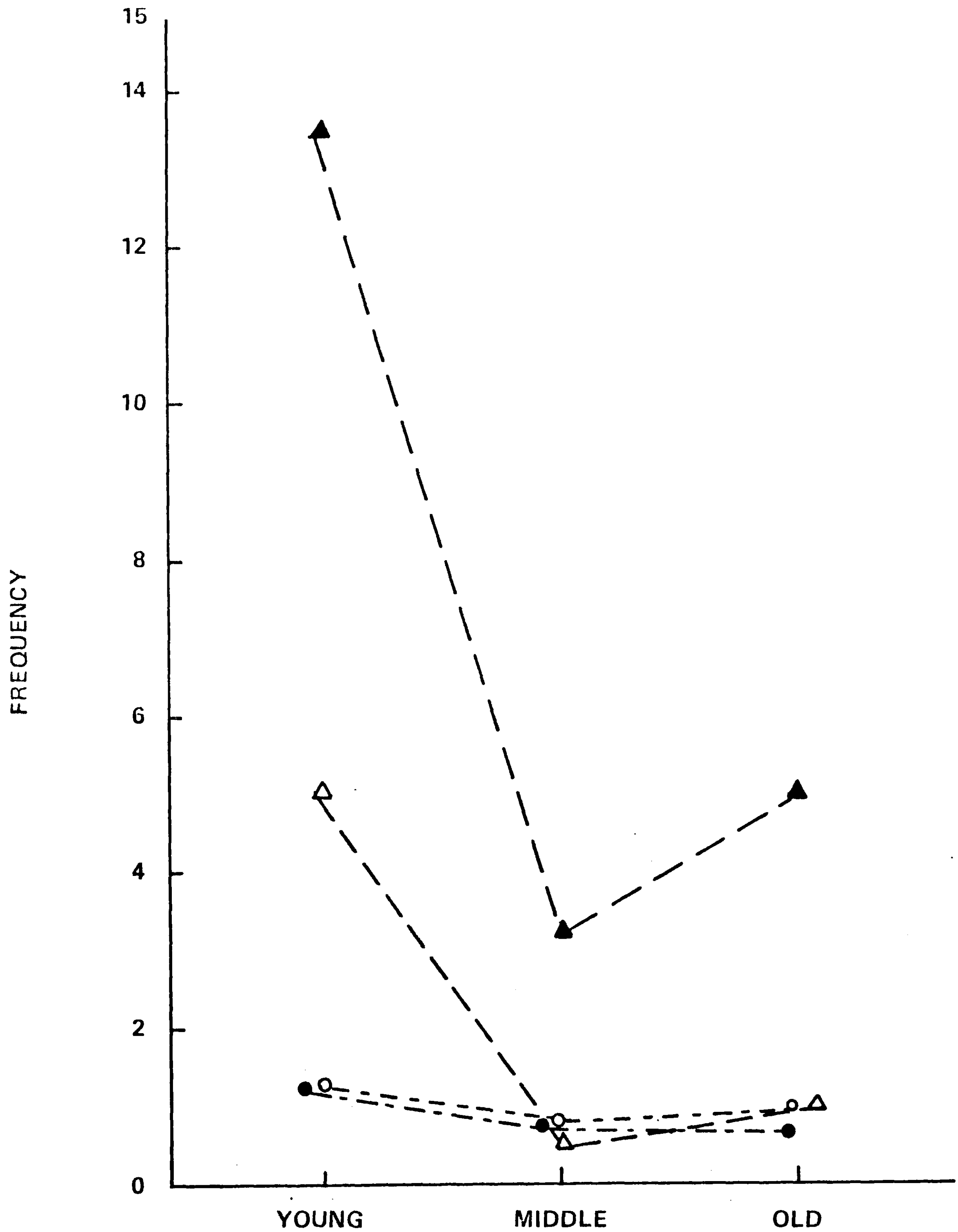
FIGURE 3 MEAN FREQUENCY OF MOTOR ERRORS OF OMISSION



KEY
● SPEECH-RESPONDING
△ NO SPEECH-DELAYED RESPONDING
○ NO SPEECH-RESPONDING
▲ SPEECH-DELAYED RESPONDING

(EACH POINT IS THE MEAN OF 4 SUBJECTS

FIGURE 4 MEAN FREQUENCY OF MOTOR ERRORS OF COMMISSION



KEY

o NO SPEECH-RESPONDING

Δ NO SPEECH-DELAYED RESPONDING

● SPEECH-RESPONDING

▲ SPEECH-DELAYED RESPONDING

(EACH POINT IS THE MEAN OF 4 SUBJECTS)

Since the distribution of verbal errors of commission (Table 8) showed that there was an absence of any commission responses in the Young group and a high frequency in the Middle group in the Sp-DR condition, the data were rearranged so that the Middle group could be compared with the other groups in terms of either producing no errors of verbal commission or producing one or more errors of verbal commission. The 2 X 2 contingency table yielded p=.028, suggesting that the proportion of the errors of commission in the Middle group was higher than that of the other age groups (Appendix 3).

Response modes

The data on the order of the motor and verbal responses were obtained only in the responding condition with speech accompaniment, and only for cases in which both modes of responses were observable. The means and standard deviations of the frequency in each response mode are shown in Table 12.

Two analyses were carried out: firstly, the differences among the age groups in the tendency to produce simultaneous and non-simultaneous (either motor-verbal or verbal-motor) responses; secondly, the difference among the age groups in their tendency to produce the verbal response before or after the motor response.

In the first analysis, an index was calculated for each subject by the formula: $\frac{S-\bar{S}}{n}$,

where S = the number of simultaneous responses,

$\bar{S}$ = the number of non-simultaneous responses,

n = the number of total responses.

Table 12 Means and standard deviations of the frequency of different response modes in the speech-responding (Sp-R) conditions

	Young Group		Middle Group		Old Group	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
MODES						
V-M	9.25	7.59	10.00	5.00	21.00	9.56
SIM	2.50	4.08	12.50	6.86	0.75	1.50
M-V	3.25	3.30	2.00	3.37	0.50	0.58

When there was an absence of either response type, a value of -1 was assigned. Kruskal-Wallis one-way analysis of variance (Siegel, 1956) yielded the value of H=7.43, which was significant at the .05 level (Appendix 4a).

In the second analysis, the data on each subject were transformed into an index by the formula: $\frac{B-A}{n_{ba}}$,

where B = the number of verbal-motor responses,

A = the number of motor-verbal response,

n_{ba} = the sum of the verbal-motor and motor-verbal responses.

A value of 1 was assigned to any subject with either one of the response mode missing. The result was not significant according to the Kruskal-Wallis one-way analysis of variance (H = 3.33), (See Appendix 4b).

The results indicated that there was a significant tendency for the Middle group to produce more simultaneous responses than the other age groups, but the tendency for the verbal-motor response mode to increase with age did not reach statistical significance. The trends, nevertheless, were extremely interesting. They suggest that with the change in age, the correspondance between the verbal mode and the motor mode of responding changes towards the preceding of the motor response by the verbal response, in line with the expectation that speech precedes action, in order to plan or to mediate.

The latency of the correct responses in the responding condition has not yet been commented on. In fact, there was only a slightly longer latency of the motor response when self-instruction was used. However, there are insufficient data to justify further discussion of the relationship between motor and vocal responses in the absence of data on the latency of the verbal response. One would expect that producing two responses would impose a larger "load" on the subject, according to the Limited Capacity Theory, which might perhaps lead to the longer motor response latency in the Sp-R condition.

Relationships between experimental measures and the New Teacher's Rating Scale

The tables of correlation coefficients are presented in Tables 12 to 15 and the means of the variables are in Appendix 5. The accuracy scores were transformed by the method already mentioned (see p.80), so that a large figure would indicate low accuracy and vice versa. The motor and verbal commissions and omissions were transformed into their square roots. This was necessary because of the ceiling on this relatively simple motor task. The New TRS subscales were standard scores. Children whose ratings were incomplete are not included; only 33 children are in the correlation analysis.

The tables of correlation are presented in separate conditions. It can be seen that the correlations are only small to moderate. Nevertheless, some of the trends may be worth mentioning.

As we shall see later in Chapter Six, children who score high on NTRS-G tend to adopt a reflective and systematic attitude towards school work. NTRS-E may be a scale of activity with more adjectives on action and impulsiveness than sociability. NTRS-N measures emotionality and NTRS-P contained adjectives that were used to describe the characteristic of somebody scoring high on the Psychoticism dimension in Eysenck's personality theory. (Eysenck & Eysenck, 1976).

Looking at the respective experimental conditions arranged in Tables 13 to 16, the correlations between NRTS-G and the behavioural measures are low. However, it would seem meaningful to suggest that with the exception of the speech-responding (Sp-R) condition, NRTS-G correlates negatively with motor commission errors (DRMCOM). A careful child is less likely to produce impulsive responses, and moreover, the correct response he produces are longer in latency, as indicated by the positive correlation between NTRS-G and the latency of the motor response (DRMLAT) in the no speech-responding (NoSp-R) condition. However, NTRS-G contributes little to the prediction of the actual accuracy of performance between the light and buzzer interval, compared with the other measures of the New TRS subscales.

Except in the speech-delayed responding (Sp-DR) condition, NTRS-E correlates with the accuracy measure (DRMACC) in the other three conditions. This suggests that to do well in this experiment is related to scoring high on extraversion. At the same time, a low score on neuroticism would predict high accuracy, as DRMACC in all the conditions is correlated positively with NTRS-N. NTRS-P correlates positively with DRMACC in speech-responding, no speech-delayed responding and speech-delayed responding conditions (from .39 to .51), but it is negatively correlated with DRMACC in no speech-responding condition (r=-.11). Caution must be exercised in interpreting these results because DRMACC signifies different types of responses in the various conditions. In the responding (R) conditions, a response would be accurate if a press was made in response to the light, whereas the delayed responding (DR) condition required no response at all. The latter would represent an index of temporary inhibition of a response, and NTRS-P is consistently related to a low score on the ability to inhibit. Moreover, NTRS-P also correlates positively with motor errors of commission during the inhibition interval for both the no speech-delayed responding and speech-delayed responding conditions. As far as accuracy is concerned, the correlations with teacher-rated neuroticism and "good" pupil measure have come out in the direction predicted by the hypotheses.

One marked feature of the data is that the use of self-instruction has affected the direction and size of the correlations between the motor response measures and the teachers' ratings. For example, while NTRS-N correlates with DRMCOM in NoSp-R (r=.60), the same variables correlate only at r=.03 in Sp-R. In Sp-R NTRS-N correlates negatively with verbal commission (DRVCOM) (r=-.64) and positively with verbal omission (DRVOMI) (r=.54) by contrast. It also seems that the verbal responses correlate better than the motor responses with NTRS-G and NTRS-E. The correlation between DRVOMI and NTRS-G (r=-.75, p=.027) and that between DRVOMI and NTRS-E (r=-.92, p=003, two-tailed) in Sp-R are the only two significant correlations in the same direction

Table 13 Correlation between behaviour measures in no speech responding condition (No Sp-R) and teacher's ratings (N = 8)

	NEW TRS G	E	N	P
DRMACC	.06	-.26	.33	-.11
DRMCOM	-.56	.29	.60	.19
DRMOMI	:25	.08	-.41	-.59
DRMLAT	.50	-.01	.03	.03

Table 14 Correlation between behaviour measures in speech-responding condition (Sp-R) and teacher's ratings (N = 7)

NEW TRS

	G	E	N	P
DRMACC	.10	-.23	.11	.39
DRMCOM	.39	-.40	.03	-.22
DRMOMI	.10	-.23	.11	.39
DRMLAT	-.08	-.01	-.73	-.27
DRVCOM	.44	.33	-.64	-.52
DRVOMI	-.75 (.027)	-.92* (.003)	.54	.30

*two-tailed test

Table 15 Correlation between behaviour measures in no speech-delayed response condition (No Sp-DR) and teacher's ratings (N = 8)

NEW TRS

	G	E	N	P
DRMACC	.04	-.44	.07	.41
DRMCOM	-.17	-.58	.30	.53
DRMOMI	.06	-.56	.25	.35

Table 16 Correlation between behaviour measures in speech-delayed response condition (Sp-DR) and teacher's ratings (N = 10)

NEW TRS

	G	E	N	P
DRMACC	-.10	.12	.18	.51
DRMCOM	-.09	.16	.27	.48
DRMOMI	.03	-.14	-.17	.16
DRVCOM	-.34	-.49	.01	-.31
DRVOMI	-.20	-.57	-.18	-.20

in Sp-DR. It is reasonable to suggest that a thoughtful and cautious child is less likely to omit a verbal response he is asked to do, and that a child scoring high on extraversion would be more prone to make commission responses and not to omit responses. But unfortunately, these results were not predicted in advance. Given the size of the sample and the fact that other results which were not totally in accord with these two significant results, further conclusions could not be drawn.

Discussion

The only significant results in the ANOVA of the accuracy measure is the speech main effect. The deleterious effect of self-instruction in both the responding and the nonresponding condition is opposite to the general assumption of the Luria's verbal regulation hypothesis. But in terms of a capacity theory, the extra load induced by the self-instruction may make the task more difficult. Figure 2 shows that the worst condition was Sp-DR. The low accuracy was caused by superflous motor responses being emitted between the buzzer and the light. A low accuracy score in Sp-R was the result of a response being omitted during the light-buzzer interval. This effect of verbal accompaniment has also be found by Higa et al. (1978) in their work on discrimination. Although they found verbalization helpful with inhibition to the negative stimulus, they found that verbalization produced more omission responses to the positive stimulus. The same results also led Miller,et al. (1970) and Wilder (1969), whose subjects were of the same age as the Young and Middle groups of the present experiment, to doubt Luria's theory.

The ANOVA of motor omissions also supported the above suggestion. The only significant effect was due to speech. This implies that verbalization not only led to the omission of a response in Sp-R, it also led to the omission of the delayed response in Sp-DR, though the latter error was not taken into account in the calculation of the accuracy index.

As for the age trends, Hypothesis 1 was not supported by the analysis of accuracy scores and of motor omission. But the age effect was highly significant with motor commission. Commission errors decreased markedly with age. These commission responses included all impulsive responses during the experiment in addition to those that were penalized for failing to delay in the DR conditions. Post-hoc analysis revealed that the age effect was due to the Young group producing a large number of commission responses in the Sp-DR condition. This aspect agrees with Luria's prediction, because the Young group is not expected to respond to the semantic aspect of the verbal instruction. However, the Old group, which should have responded to the meaning "NO", did worse when speech was used. The number of motor commission errors was more than that produced by the Middle group, which nevertheless, produced a large number of verbal commission and verbal omissions in the Sp-DR condition, which suggests that they found the condition with speech accompaniment more difficult to cope, though the erroneous responses they produced belonged to another mode. There is little support so far for Luria's hypothesis.

Although the "load" hypothesis is tenable, the delayed responding condition seems to be a more difficult task by itself, and particularly so when self-instruction is used with the Young children. One can argue that it is harder than the requirement for a no-response in a discrimination task to the negative stimulus. Whereas the motor response is totally inhibited in response to the negative stimulus, subjects have to bear in mind that they still have to make a response after the wait in delayed responding. The expectation to respond may cause premature responding. The greater degree of difficulty with delayed responding may be amplified by the use of verbalization. In order to demonstrate the acceptability of different predictions, it is necessary to replicate Luria's discrimination experiment, and such a replication will be reported in Chapter Three.

The results on response mode have demonstrated a clearcut preference by the different age groups in the sequence of the verbal and motor responses they adopt, irrespective of the fact that all of them were given the same instruction, which encouraged them to produce the motor response after the verbal one. The preferred sequence of the Young age group was the motor-verbal sequence, whereas the Old age group clearly preferred the verbal-motor sequence. The motor-verbal sequence was also found by Miller et al. (1970) who used it to reject Luria's hypothesis of mediation altogether. However, the children in Miller et al.'s experiment were aged between 3.2 to 4.11 years; therefore his results would not rule out the possibility of it being demonstrated here that older children performed in accordance with Luria's hypothesis. It was shown in the present experiment that only when children reached the age of six and beyond would they spontaneously adopt a verbal-motor mode. This supports the view that the pattern of motor and verbal correspondence changes with age, and this may demand a different interpretation of the effect which the verbal system has on the motor one.

Attempts to correlate the Simultaneity Index (first analysis) with the accuracy scores did not produce any significant results, but it was found that the tendency to produce verbal-motor responses correlated significantly with accuracy scores (Kendall $\underline{r}=0.42$, $z=1.9$, $p=0.0287$) in the Sp-R condition. Even though age may have to be taken into consideration, this correlation implies that the verbal-motor mode is also the more effective mode of sequencing verbal and motor responses, in contradiction to the claim made by Wozniak (1972) that the response sequence should be a motor-verbal one.

Finally, the correlation between the behavioural measures and personality measures is of a relatively small scale in this experiment. The results suggest that the use of self-instruction can alter the pattern of correlations quite drastically, and that the personality measures reveal better correlations with the verbal responses than the motor responses. One set of correlations which has withstood the change in experimental condition is that between NTRS-P and the motor responses in the delayed responding condition. If delayed responding can be considered to be one measure of behavioural control, it seems highly likely that the ability of a child to restrain himself is related to scoring low on Psychoticism. That is a point that will be explored in greater detail in the review and experimental findings in Part III of the research. Other than this, the quality of being stable and extraverted may also be related to performing well in the experiments, and this agrees with the common conception that stable extraverts usually adjust better to new situations. However, bearing in mind that the correlations are not significant and the small size of the sample involved, further speculation at this stage would be unwise. We shall return to these issues in Chapter Seven.

Summary

The experiment described in this chapter demonstrated that verbal self-instruction does not assist performance in a motor task requiring immediate responding or delayed responding. Children with a mean age of 5½ years produced significantly more errors of motor omissions and errors of motor commission when they were asked to utter aloud an instruction, such as "Bang" or "No" which described the motor response they were supposed to make. Younger children tended to perform worse than the older ones.

Children of different age groups tended to have their preferred mode of sequencing their motor and verbal responses. Children in the Middle age group produced significantly more Simultaneous responses (making the motor and the verbal response at the same time) than children in the Old age group and the Young age group. The trend was that younger children tended to precede their verbal response by the motor one, whereas the older children preferred to produce the verbal response before the motor one.

The relation between behavioural performance and individual differences in personality was examined. The children were rated by their teachers on a five-point teacher's rating scale of Extraversion, Neuroticism, Psychoticism and how "good" they were as pupils. The correlations tended to be small and insignificant, but there was an indication that scoring low on Neuroticism was related to accuracy in their behavioural performance, and scoring high on Psychoticism was related to low ability in behavioural self-restraint.

CHAPTER THREE

VERBAL SELF-INSTRUCTION AND REACTION TIME PERFORMANCE

(Experiment 2)

There was modest support for some of Luria's prediction from the results of the last experiment. Although in terms of the mode of responding, the verbal-motor sequence correlated with motor response accuracy in the Speech-responding (Sp-R) condition, this is not sufficient evidence to postulate the superiority of speech. On the other hand, there is some suggestion from the correlation of the behavioural measures with teachers' ratings on the child's personality that the inclusion of verbal responses would affect the pattern of correlation between the motor responses and teachers' ratings. Does it imply then that speech is somehow the more influential mode of response, or more stable, because it is related more to relatively stable aspects of a child's personality?

The present experiment uses a reaction time task to find out whether the verbal response is more stable and more accurate than the motor response. It also attempts to find out whether if a motor response and a verbal response are paired together, one will be affected by the other, facilitatively or detrimentally. Instead of treating the motor response as the dependent variable as in the last experiment, the question of dependence is left open for the time being.

The Teacher's Rating Scale will again be used in this experiment as a measure of children's personality. As the findings of the last experiment do not seem conclusive, the same hypotheses will be set for the present study. It is expected that children scoring high on the "good" subscale will perform better than those having a low score. High ratings on Extraversion and Neuroticism will be related to poorer performance, including a higher frequency of errors of omission and errors of commission.

Methods

Subjects

Ninety-six children (48 boys and 48 girls) from the Robin Hood Infant School and the Thomas Wall Nursery School in Sutton, Surrey took part in the experiment. The two schools were in the same neighbourhood and the children came from middle to lower middle class families. The children were divided into four groups according to age with matching number of boys and girls in each group. Their age distribution is shown in Table 17.

Apparatus

The apparatus was the same one used in the previous experiment. The verbal responses were recorded by a cassette tape recorder.

Procedure

The subjects in each age group were randomly assigned to one of three conditions,but with equal numbers of boys and girls in each condition:

1. Motor response reaction (M condition)
2. Speech and motor responses combined reaction (M-V condition)
3. Speech response reaction (V condition)

The experimenter (E) had spent two sessions acquainting herself with the children before taking them individually to a small

Table 17 Means and standard deviations of the ages of subjects (in months)

	X	S.D.
All subjects	58.20	14.12
All M	58.43	13.87
All F	57.90	14.52
6-year old group	77.04	2.65
M	77.08	2.75
F	77.00	2.66
5-year old group	64.50	2.72
M	64.17	2.69
F	64.83	2.82
4-year old group	50.63	2.67
M	51.50	2.84
F	49.67	2.23
3-year old group	40.79	3.01
M	41.25	2.70
F	40.00	2.83

room in the school to be tested. In the testing room, the children were given the same familiarization procedure as the children in Experiment 1. After introducing them to the apparatus, they were given the following instructions:

1. Motor response reaction: "Now you see this light up here. Every time it is bright, I want you to bang on the nose, like this" (demonstration).
   "Now you try" (practice trials).
   "Now you'll do it on your own for a few more times. Watch carefully and I want you to do your best."

The instructions for the other two groups were the same except for the task-specification section.

2. Speech and motor responses combined reaction: "You see this light up here. Every time when it is bright, I want you to say loudly to yourself 'BANG' and bang on the nose, like this" (demonstration).
3. Speech response reaction: "You see this light up here. Every time when it is bright, I want you to say loudly to yourself 'NO' and this means you must sit and do nothing, like this" (demonstration). When the children asked what they would do with the pressing bar, an evasive answer was given that it would be used for another game.

Each subject was given five practice trials, and all of them grasped the idea quickly. The yellow and the blue light were selected at random as the stimulus - half of the subjects responded to the blue light and the other half responded to the yellow light in each condition. It had been discovered that children participating in this simple experiment soon stopped paying attention, and as a result, after the pilot testing, the subject was alerted before each presentation of the light with the instruction "Watch". Then the light came on after one second and it went off automatically after four seconds, or when the lever was pressed, whichever was earlier. The latency of the motor responses was indicated on the reaction timer and was recorded immediately. The procedure in this experiment differed from the previous one in that the onset of the stimulus was controlled manually, so that from where E was positioned, the small click of the light control button could be recorded on the tape recorder. This signified the onset of the light stimulus and was used for later scoring purposes. Time was allowed for recording to be done, and the interstimulus interval was about 2 seconds.

Since the child in the speech response reaction did not have to press the bar, the latency of the verbal reaction had to be recorded in an indirect way. Every time the child made a vocal response, it was recorded on the casette tape, which was played back afterwards in order for E to re-enact the procedure and press the bar whenever a vocal reaction was made to score the latency. When the child produced both the motor and verbal responses, the motor response was scored on the spot, whereas the verbal response was tape-recorded and timed afterwards by E in the same manner as in the verbal reaction condition. E had a relatively stable reaction time of .5 second, which was taken into account when calculating the children's verbal latency subsequently.

The experiment was composed of a block of thirty trials. If a response was performed within the limited time, E would say "good" or "well done". If a child committed an error by responding to the reminder "Watch", which happened very infrequently anyway, he was told, "Not quite, try again". The subject was also informed if an omission error was made.

Results

The mean frequency of accurate responses and the mean latency are presented in Tables 18 to 21. Three types of accuracy are considered in the M-V condition. Apart from the motor reaction and the verbal reaction being recorded separately, the "general M-V accuracy" score represents the performance when both the verbal and the motor responses had to be correct.

An accurate motor response was defined as a press on the lever within the 4-second interval, during which the light stimulus was on. A correct verbal response was the utterance being emitted during that interval. If a response was not produced, it was classified as an omission error. Any extraneous responses taking place in addition to the response required within the response interval were commission errors. If the child responded to the signal "Watch", it was an error of commission, and the trial was cancelled. The occurrence of this behaviour was very uncommon.

The raw data showed a ceiling effect with the 5- and 6-year old groups. The accuracy was therefore transformed by substracting it from 30 and then obtaining the square root. This could be taken as an "inaccurate" index. The square roots of the commission errors and omission errors were obtained. The results were analyzed by comparing the motor response in the M reaction condition with that in the M-V condition. The same was applied to the verbal responses.

Table 18 Means of accuracy and latency (in seconds) of motor responses (S.D.s in parenthesis)

CONDITIONS		AGE GROUPS 3	4	5	6
M Reaction	Accuracy	23.88 (4.67)	28.12 (1.46)	28.75 (1.04)	29.00 (0.93)
	Latency	1.24 (0.45)	0.87 (0.23)	0.84 (0.34)	0.58 (0.19)
M-V Reaction	Accuracy	25.88 (8.98)	28.63 (1.69)	29.50 (1.41)	29.38 (1.19)
	Latency	1.46 (0.65)	1.17 (0.23)	1.00 (0.44)	1.04 (0.22)

Table 19 Means of accuracy and mean latency (in seconds) of verbal responses (S.D.s in parenthesis)

CONDITIONS		AGE GROUPS 3	4	5	6
V Reaction	Accuracy	20.25 (3.88)	25.62 (3.38)	27.13 (3.80)	28.38 (1.92)
	Latency	1.09 (0.20)	1.15 (0.30)	0.85 (0.25)	0.96 (0.15)
M-V Reaction	Accuracy	21.13 (8.77)	25.00 (6.50)	28.75 (3.15)	29.12 (1.46)
	Latency	1.52 (0.60)	1.17 (0.22)	0.89 (0.35)	1.02 (0.18)

Table 20 Mean General Accuracy of Speech and Motor Reaction (S.Ds in parenthesis)

CONDITIONS	AGE GROUPS 3	4	5	6
M-V Reaction	20.38 (8.80)	24.38 (7.39)	28.75 (3.15)	29.13 (1.46)

Table 21 Mean frequency of motor commission and motor omission errors (S.D.S. in parenthesis)

CONDITION	AGE GROUPS 3	4	5	6
M Reaction				
omission	2.75 (2.82)	0.25 (0.46)	0.13 (0.35)	0 (0)
commission	3.50 (3.07)	1.63 (1.60)	1.13 (0.99)	1.00 (0.93)
M-V Reaction				
omission	0.63 (1.19)	0.38 (0.52)	0.50 (1.41)	0.13 (0.35)
commission	3.50 (1.35)	1.00 (1.41)	0 (0)	0.50 (0.03)

Table 22 Mean frequency of verbal omission and commission errors (S.D.S. in parenthesis)

CONDITIONS	AGE GROUPS 3	4	5	6
V Reaction				
omission	4.00 (2.07)	1.25 (1.49)	0.63 (0.92)	0.13 (0.35)
commission	5.75 (4.30)	3.13 (2.50)	2.25 (3.28)	1.63 (1.92)
M-V Reaction				
omission	8.88 (8.77)	5.00 (6.50)	0.75 (1.75)	0.63 (1.41)
commission	0 (0)	0 (0)	0 (0)	0 (0)

This was done by a 4 x 2 two-way analysis of variance design with Age and Condition being the main effects. Then the motor response was compared with the verbal response in the single response reaction condition. Comparison was also made with these responses in the motor and speech reaction combined condition by analysis of variance with repeated measures (Winer, 1971). The ANOVA tables and the summaries of results are presented in Tables 23 to 34.

Table 23 ANOVA of accurate motor responses in M and M-V conditions

Source	SS	df	MS	F	df	Sig
Age (A)	12.11	3	4.04	4.08	3,56	$<.05$
linear	9.23	1	9.23	9.32	1,56	$<.01$
quadratic	2.35	1	2.35	2.37	1,56	N.S.
cubic	0.53	1	0.53	0.54	1,56	N.S.
condition (C)	6.19	1	6.19	6.25	1,56	$<.05$
A x C	2.06	3	0.69	0.70	3,56	N.S.
within cells	55.52	56	0.99			
Total	75.88	63				

Table 23 shows the ANOVA of motor response performance in the motor response condition and the dual motor-verbal response condition. The significant main effect due to Age ($F(3,56)=4.08$, $p < .05$) shows that motor accuracy increases with age, and the linear trend, which is significant ($F(1,56)=9.32$, $p < .01$) accounts for 76% of the age variance. The Condition main effect ($F(1,56)=6.25$, $p < .05$) indicates that the motor response in the M-V condition is more accurate than that in the M condition.

Table 24 ANOVA of accurate verbal responses in V and M-V conditions

Source	SS	df	MS	F	df	Sig
Age (A)	41.98	3	13.96	11.26	3,56	$<.001$
linear	39.14	1	39.14	31.56	1,56	$<.001$
quadratic	2.73	1	2.73	2.20	1,56	N.S.
cubic	0.11	1	0.11	0.09	1,56	N.S.
condition (C)	4.03	1	4.03	3.25	1,56	N.S.
A x C	1.24	3	0.41	0.33	3,56	N.S.
within cells	69.52	56	1.24			
Total	116.77	63				

The analysis of the accuracy of verbal responses in the V and M-V conditions (Table 24) produces results that are similar to the last analysis in the significant Age main effect ($F(3,56)=11.26$, $p < .001$). The linear trend is highly significant ($F(1,56)=31.56$, $p < .001$) and accounts for over 90% of the age variance.

When the latency of the motor response of the M condition was compared with that of the M-V conditon (Table 25), a significant condition main effect emerged ($F(1,56)=7.14$, $p < .01$), indicating that the latency of the motor response in the M-V condition was longer than that of the M conditon. There was also an Age X Condition interaction ($F(3,56)=4.35$, $p < .01$), even though the Age main effect did not reach significance level. One of the significant post-hoc comparisons showed that the latency of the 3-year old group was markedly different from that of the 6-year old group in the single response condition ($F(7,56)=13.06$), whereas the same comparison in the dual response condition did not reach significance.

Table 25 ANOVA of motor response latency in M and M-V conditions

Source	SS	df	MS	F	df	Sig
Age (A)	1.11	3	0.37	2.64	3,56	N.S.
Condition (C)	1.36	1	1.36	7.14	1,56	$<.01$
A x C	1.83	3	0.61	4.35	3,56	$<.01$
within cells	7.86	56	0.14			
Total	12.16	63				

Table 26 ANOVA of verbal response latency in V and M-V conditions

Source	SS	df	MS	F	df	Sig
Age (A)	1.77	3	0.59	6.08	3,56	$<.01$
linear	1.49	1	1.49	15.38	1,56	$<.001$
quadratic	0.24	1	0.24	2.06	1,56	N.S.
cubic	0.02	1	0.02	0.21	1,56	N.S.
Condition (C)	0.30	1	0.30	3.09	1,56	N.S.
A x C	0.43	3	0.14	1.44	3,56	N.S.
within cells	5.42	56	0.097			
Total	7.92	63				

Table 26 shows that only the Age main effect is significant ($F(3,56)=6.08$, $p < .01$) in the analysis of the verbal latency in the V and M-V conditons. More than 84% of the age variance is accounted for by the linear age trend ($F(1,56)=15,38$, $p < .001$). Latency decreases with the increase in age.

When motor response and verbal response are compared in conditions in which only a single response mode is required (Table 27), there is a significant main effect due to Age ($F(3,56)=15.52$, $p < .001$) and the age variance accounts for as much as 88% by the linear trend

($F(1,56)=41.23$, $p < .001$). The condition main effect is also significant ($F(1,56)=6.11$, $p < .05$). The results indicate that performance improves with age and that in single response condition, the motor response is more accurate than the verbal response.

Table 27 ANOVA of response accuracy in single response (M, V) conditions

Source	SS	df	MS	F	df	Sig
Age (A)	29.75	3	9.93	15.52	3,56	<.001
linear	26.38	1	26.38	41.23	1,56	<.001
quadratic	2.96	1	2.96	4.62	1,56	<.05
cubic	0.41	1	0.41	0.64	1,56	N.S.
Conditon (C)	3.91	1	3.91	6.11	1,56	<.05
A x C	0.93	3	0.31	0.48	3,56	N.S.
within cells	36.09	56	0.64			
Total	70.68	63				

The response accuracy in the dual response (M-V) condition is analysed by two-way analysis of variance with repeated measures (Winer, 1971). The results (Table 28) did not show any between-subject main effect in Age, but the within-subject main effect due to response mode is significant. Consistent with the results of the single response mode comparison, the motor response is more accurate than the verbal response ($F(1,28)=17.93$, $p <.001$). This time, both the verbal and the motor reactions are produced by the same subject.

Table 28 ANOVA of response accuracy in dual response (M-V) condition

Source	SS	df	MS	F	df	Sig
Between subjects	99.91	31				
Age (A)	23.42	3	7.81	2.86	3,28	N.S.
Subjects within groups	76.49	28	2.73			
Within subjects	23.82	32				
Response (R)	8.07	1	8.07	17.93	1,28	<.001
A x R	3.29	3	1.10	2.44	3,28	N.S.
R x Subjects within groups	14.46	28	0.45			

Table 29 ANOVA of response latency in single response (M, V) conditions

Source	SS	df	MS	F	df	Sig
Age (A)	1.61	3	0.54	7.01	3,56	<.001
linear	1.58	1	1.58	20.60	1,56	<.001
quadratic	0.02	1	0.02	0.25	1,56	N.S.
cubic	0.01	1	0.01	0.13	1,56	N.S.
Condition (C)	0.31	1	0.31	4.02	1,56	<.05
A x C	0.76	3	0.25	3.25	3,56	<.05
within cells	4.34	56	0.08			
Total	7.02	63				

As for the response latency in the single response condition, the significant main effect due to Age ($F(3,56)=7.01$, $p < .001$) shows that reaction time generally decreases with age. The age variance is predominantly accounted for by the linear trend ($F(1,56)=20.60$, $p < .001$). The other main effect due to Condition is also significant ($F(1,56)=4.02$, $p < .05$) showing that the verbal response is significantly slower than the motor response. Further comparisons in view of the A x C interaction ($F(3,56=3.25, p < .05)$ indicate that the 3-year old group differs significantly from the 6-year old group in the motor latency ($F(7,56)=24.73$) (Scheffé test). The age groups do not differ very much in terms of verbal latency.

Whereas motor and verbal latency differ in the single response mode, they do not differ statistically in the dual response condition when the subjects produce both verbal and motor response. The only significant effect is a between-subject Age effect ($F(3,28)=3.96, p < .05$) (Table 30). Latency becomes shorter as the subjects' ages increase. The linear trend is the only significant trend ($F(1,28)=8.86, p < .01$).

Table 30 ANOVA of response latency in M-V condition

Source	SS	df	MS	F	df	Sig
Between subjects	9.33	31				
Age (A)	2.74	3	0.91	3.96	3.28	<.05
linear	2.03	1	2.03	8.86	1.28	<.01
quadratic	0.64	1	00.64	2.82	1.28	N.S.
cubic	0.07	1	0.07	0.30	1.28	N.S.
Subjects within groups	6.59	28				
Within subject	2.40	32				
Response (R)	0.01	1	0.01	0.13	1,28	N.S.
A x R	0.05	3	0.02	0.25	3,28	N.S.
R x Subjects within groups	2.34	28	0.08			

So far the analysis has been on the accuracy and latency of the verbal and motor modes of responding. The errors will be considered next. According to the method of scoring, omission errors always affect the accuracy score, but not the commission errors, as only the impulsive responses to "Watch" are penalized. It is necessary to consider the errors in their own right. Examination of the data showed that certain types of errors are non-existent, e.g. verbal commission in the M-V condition, and the number of errors taken by their separate categories was relatively small. In order to allow a more powerful analysis to be applied, the frequency of the commission and omission responses were combined to form a total error frequency, the square root of which was tested by analysis of variance.

Table 31 ANOVA of total frequency of motor errors in the M and M-V conditions

Source	SS	df	MS	F	df	Sig
Age (A)	13.37	3	4.46	6.46	3,56	<.005
linear trend	11.44	1	11.44	16.57	1,56	<.001
quadratic	1.87	1	1.87	2.71	1,56	N.S.
cubic	0.06	1	0.06	0.09	1,56	N.S.
Condition (C)	7.47	1	7.47	10.82	1,56	<.001
A x C	12.80	3	4.20	6.09	3,56	<.005
within cells	38.48	56	0.69			
Total	72.12	63				

There is a significant age main effect in Table 31 ($F(3,56)=6.46$, $p < .005$). A trend test indicates that the linear trend is highly significant ($F(1,56)=16.57$, $p < .001$) as expected and it explains over 85% of the age variance. The condition main effect is also significant ($F(1,56)=10.82$, $p < .001$), with the subjects in the M-V groups producing fewer errors overall than the M group. But in light of the A x C interaction ($F(3,56)=6.09$, $p < .005$). A Scheffé post-hoc test was carried out and the results showed that the 3-year old group performed significantly worse than the other age groups in the M condition ($F(7,56)=15.52$). (As in the previous experiment, the calculation of the F' value was taken at $\alpha = .10$.) The age groups did not differ statistically in the M-V condition.

Table 32 ANOVA of total frequency of verbal errors in the V and M-V conditions

Source	SS	df	MS	F	df	Sig
Age (A)	47.35	3	15.78	37.65	3,56	<.001
linear	44.97	1	44.97	35.41	1,56	<.001
quadratic	2.27	1	2.27	1.78	1,56	N.S.
cubic	0.11	1	0.11	0.09	1,56	N.S.
Condition (C)	5.77	1	5.77	4.54	1,56	<.05
A x C	1.63	3	0.54	0.43	3,56	N.S.
within cells	71.33	56	1.27			
Total	126.08	63				

The main and interaction effects were all significant in the analysis of the frequency of verbal errors in the V and M-V conditions (Table 32). Further analysis of the Age main effect ($F(3,56)=37.65$, $p < .001$) showed that the linear trend is significant ($F(1,56)=35.41$. $p < .001$) and accounts for nearly 95% of the age variance. Children tended to perform better with the increase in age. The Condition main effect agreed with the analysis of motor responses in that the M-V condition produced fewer errors than the V condition ($F(1,56)=4.54$, $p < .05$).

Table 33 ANOVA of total response errors in single response (M, V) condition

Source	SS	df	MS	F	df	Sig
Age (A)	29.97	3	9.99	15.13	3,56	$<.001$
linear	26.38	1	26.38	39.97	1,56	$<.001$
quadratic	3.17	1	3.17	4.81	1,56	$<.05$
cubic	0.42	1	0.46	0.64	1,56	N.S.
Condition (C)	3.92	1	3.92	5.93	1,56	$<.05$
A x C	0.78	3	0.26	0.39	3,56	N.S.
within cells	36.72	56	0.66			
Total	71.39	73				

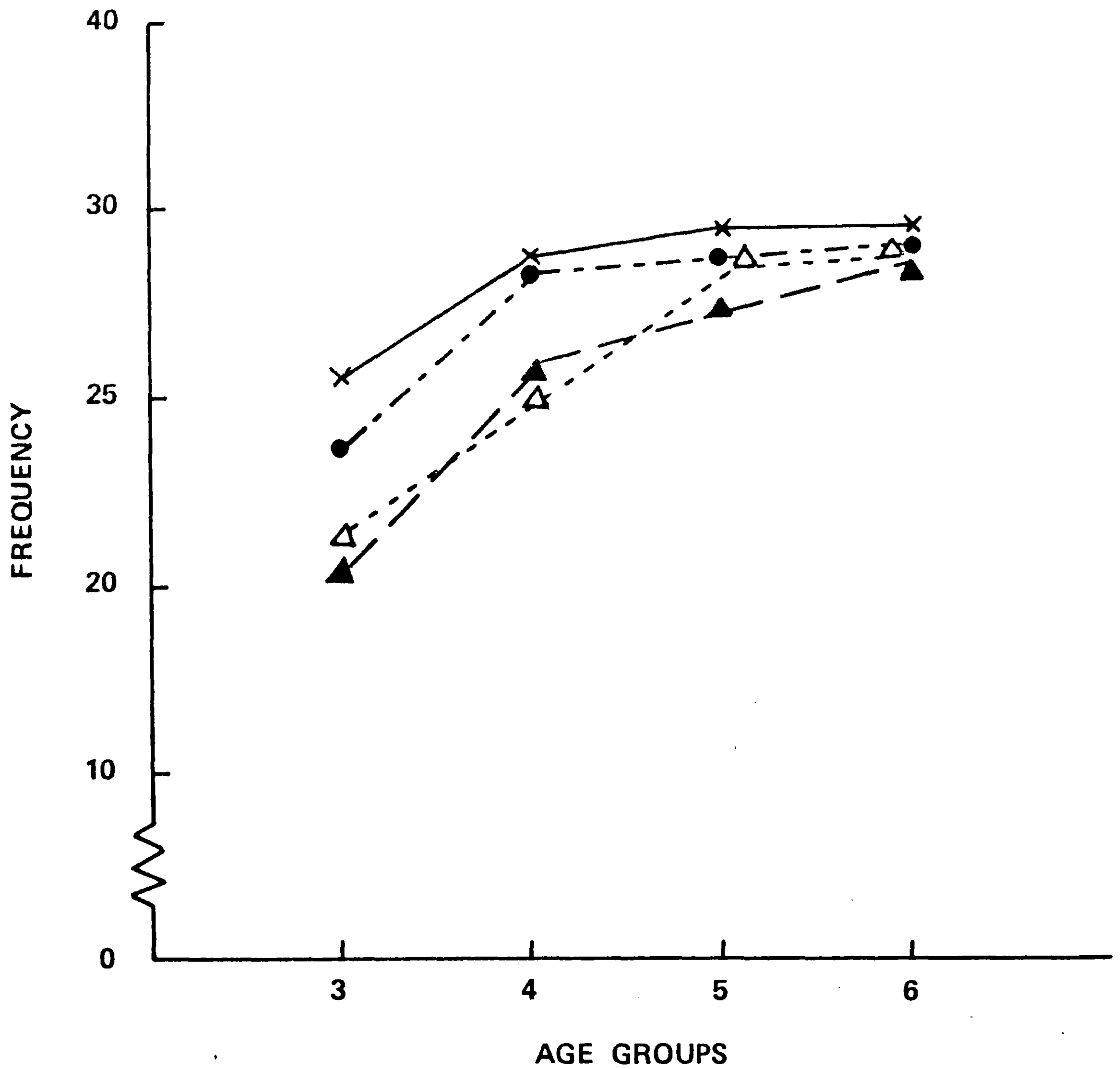
According to Table 33 on the verbal response and the motor response in the single response condition, the Age main effect is again significant ($F(3,56)=15.13$, $p < .001$), and the quadratic trend is also significant, but to a lesser degree ($F(1,56)=4.81$, $p < .05$). The main effect is also significant ($F(1,56)=5.93$, $p < .05$) indicating that the motor response produces fewer errors than the verbal response and that performance improves with age.

Table 34 ANOVA of total response errors in dual response (M-V) condition

Source	SS	df	MS	F	df	Sig
Between subjects	31.99	31				
Age (A)	24.13	3	8.04	28.71	3,28	$<$ .001
linear	21.61	1	21.61	77.17	1,28	$<$ .001
quadratic	0.75	1	0.75	2.68	1,28	N.S.
cubic	1.76	1	1.76	6.32	1,28	$<$ .05
Subjects within groups	7.86	28	0.28			
Within subjects	85.87	32				
Response (R)	65.64	1	65.64	152.65	1,28	$<$ .001
A x R	8.06	3	2.69	6.26	3,28	$<$ .01
R x subjects within groups	12.17	28	0.43			

The response accuracy in the M-V condition is analysed by analysis of variance with repeated measures (Winer, 1971) and the results are in general agreement with those of the single response conditions (Table 34). There is a significant Age main effect ($F(3,28)=28.71$, $p < .001$), with older children doing better. The linear trend is also highly significant ($F(1,28)=77.17$, $p < .001$) and it explains nearly 90% of the Age variance. The condition main effect ($F(1,28)=152.65$, $p < .001$) again shows that motor response produces fewer errors than the verbal response produced by the same subject. As for the Age x Condition interaction ($F(3,28)=6.26$, $p < .01$), post-hoc testing (Scheffé) shows that it is due to the significant difference between the two oldest age groups and the two youngest age groups in their verbal responses ($F(7,56)=61.32$), whereas these age groups do not differ significantly with their motor responses ($F(7,56)=5.8$). At the same time, whereas

FIGURE 5 MEAN FREQUENCY OF MOTOR AND VERBAL ACCURATE RESPONSES



KEY

× MOTOR IN DUAL RESPONSE REACTION

△ VERBAL IN DUAL RESPONSE REACTION

● MOTOR IN SINGLE RESPONSE REACTION

▲ VERBAL SINGLE RESPONSE REACTION

FIGURE 7 MEAN FREQUENCY OF MOTOR AND VERBAL OMISSIONS

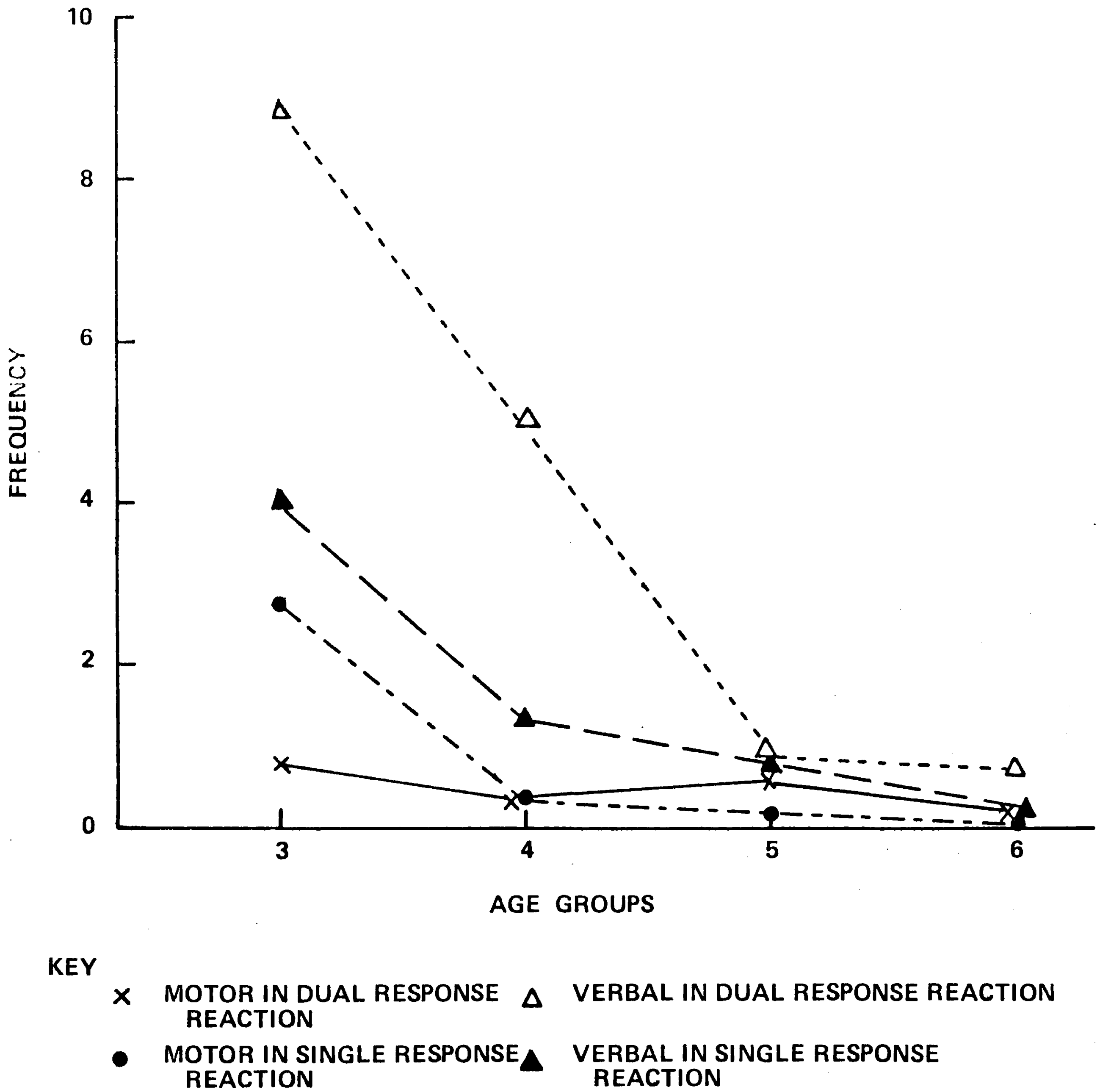


FIGURE 6 MEAN LATENCY OF ACCURATE MOTOR AND VERBAL RESPONSES

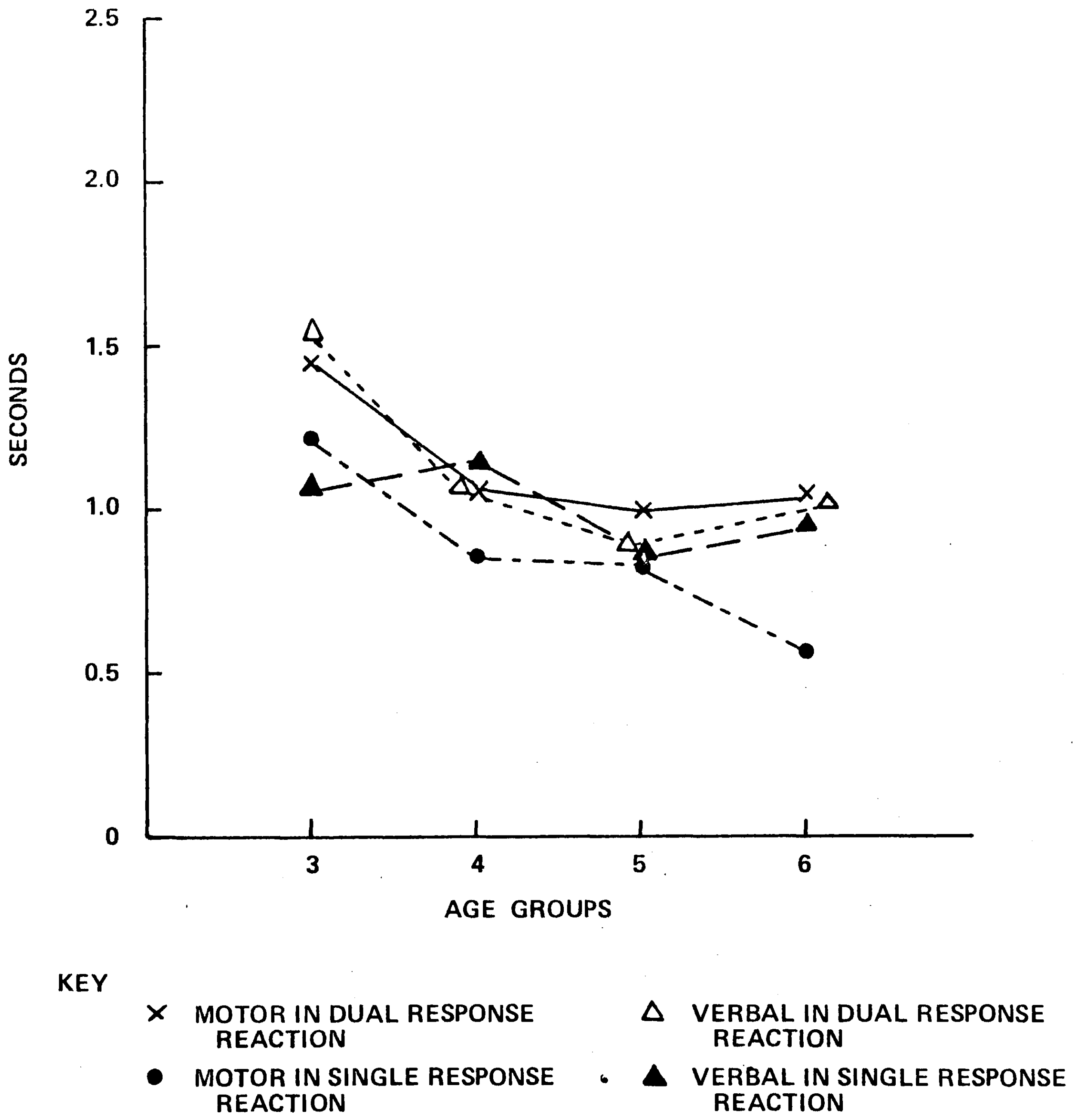
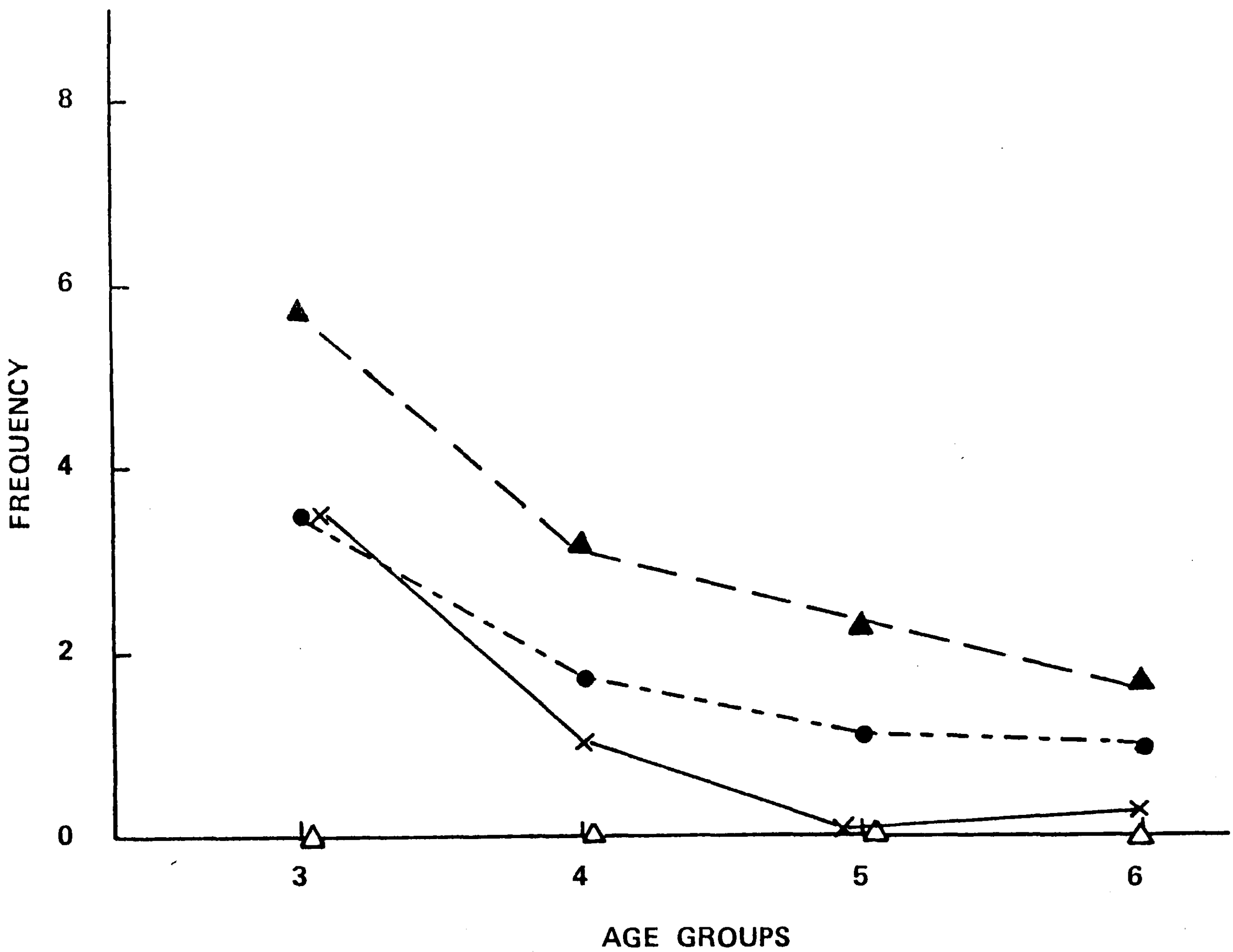


FIGURE 8 MEAN FREQUENCY OF MOTOR AND VERBAL COMMISSIONS



KEY

× MOTOR IN DUAL REACTION

● MOTOR IN SINGLE RESPONSE REACTION

△ VERBAL IN DUAL RESPONSE REACTION

▲ VERBAL IN SINGLE RESPONSE REACTION

the subjects in the youngest two age groups produced motor responses that are significantly better than their verbal responses ($F(7,56)=13.44$), the two response modes are similar in accuracy for the two oldest age groups.

Further contrast was analysed between the frequency of errors of motor commission and errors of motor omission in the single motor response condition in each separate age group. The results indicated that according to a Wilcoxon Matched-Pairs Signed-Ranks Test (Siegel, 1956), the null hypothesis that there was no difference between the frequency of commission and omission errors could be rejected in the four-year old group and above. Similarly for the comparison between verbal commission and verbal omission responses, at and after the age of four, the children produced significantly more commission errors than omission ones. It suggests that children tend to mature faster on omission responses than commission responses. Trend analysis (Jonckheere Trend Test) was applied to the single response conditions separately for the motor responses and the verbal responses. The age trend for motor commission errors yielded $Z=1.53$ ($p=.063$) while for motor omission errors, $Z=3.93$ ($p=.00005$). As for verbal commission errors, $Z=1.53$ ($p=.063$) and for verbal omissions, $Z=.57$ ($p=.28$, N.S.).

Responses mode analysis

Data were collected to allow comparison with results obtained in the last experiment. The response modes were recorded in the dual response (M-V) condition (N=32). The classification of the response mode was the same as in Experiment 1 and the method of transformation into the Simultaneity Index and the Before/After Index were also the same. The mean frequency of the modes of response are presented in Table 35.

The comparison on Simultaneity preference did not yield any significant difference (H=1.08, df=3). As for the Before/After preference, the null hypothesis that the groups do not differ in the preference for a verbal-motor or a motor-verbal response mode was rejected (H=30.55, Z=6.27 at .001 level). The 3-year old group was using a predominantly motor-verbal mode. The trends generally replicated that of Experiment 1.

The correlation between response mode and accuracy of response also yielded similar results to those of the earlier experiment. The accuracy score used was the General Accuracy Index, which required both a correct motor and a correct verbal response in the dual response reaction. The Kendall r between simultaneity and accuracy is 0.169, which was not significant (Z=1.36, p=0.0869). However, the Before/After preference and correctness correlated significantly (r=0.62, Z=4.97, p was highly significant - not listed) (Siegel, 1956).

Reaction time response and New TRS ratings

The next set of results are the correlation of the behavioural measures with teacher's ratings of the children's personality. The children in this experiment also formed part of the standardization sample of the New TRS scales. Scores on the four TRS subscales were calculated as in the final version of the scales. The correlations of the respective conditions are set out in Tables 36 to 38. The means and standard deviations of the variables are

Table 35 Means and standard deviations of the frequency of response modes

		AGE GROUPS			
		3	4	5	6
Modes					
V-M	$\overline{X}$	0.50	1.87	7.75	8.00
	S.D.	1.41	2.99	10.25	10.81
SIM	$\overline{X}$	14.13	22.00	21.00	20.25
	S.D.	11.03	9.86	9.64	10.38
M-V	$\overline{X}$	5.75	0.50	0	0.88
	S.D.	5.87	1.07	0	1.46

presented in Appendix 8. One point to bear in mind in interpreting the correlations is that the accuracy measures (RTMACC and RTVACC) are expected to correlate with the personality measures in the same direction as the commission and omission responses, because of the transformation procedure in the analysis.

Few correlation coefficients reached statistical significance, but the direction of the correlation was fairly consistent. The NTRS-G subscale correlated negatively with the response measures, apart from verbal latency (RTVLAT) in the single response reaction condition. This is in line with the hypothesis that children rated by the teacher as reflective and thoughtful are less inclined to commit verbal and motor errors in reaction time tasks. Its relation with latency, when negatively correlated, was very low and not significant. In fact, the positive correlation of RTVLAT and NTRS-G ($r=.12$) in the V condition may suggest that a careful child produces responses with longer latency.

The correlation between NTRS-E and the behavioural measures are too low to warrant further interpretation. The direction of the correlation between NTRS-N and the behavioural measures is reversed when the single response condition is compared with the dual response condition. The same phenomenon appeared in the correlations obtained in Experiment 1. This may imply that combined verbal and motor reaction has changed the demand and nature of the task, but it might also be due to the lability of the characteristic Neuroticism.

However, Psychoticism as measured by the NTRS-P is consistent in its correlation with the reaction time variables across conditions,

Table 36 Correlation between motor reaction time measures (M conditions) and teachers' ratings (N = 32)

NEW TRS

	G	E	N	P
RTMACC	-.24	.001	-.21	.37* (.036)
RTMCOM	-.26	-.08	-.10	.45* (.010)
RTMOMI	-.24	.07	-.15	.16
RTMLAT	-.03	.13	-.24	.07

(*two-tailed test)

Table 37 Correlation between verbal reaction time measures (V condition) and teachers' ratings (N = 23)

NEW TRS

	G	E	N	P
RTVACC	-.16	-.09	.13	.05
RTVCOM	-.14	-.002	-.01	.04
RTVOMI	-.01	-.19	.22	.02
RTVLAT	.12	.001	.21	-.03

Table 38 Correlation of motor and verbal reaction time measures with New TRS ratings (M-V condition) (N = 32)

NEW TRS

	G	E	N	P
RTMACC	-.30	.04	.18	.21
RTMCOM	-.29	.06	.20	.21
RTMOMI	-.20	-.01	.06	.16
RTMLAT	-.07	-.05	.22	-.002
RTVACC	-.13	.16	-.07	.27
RTVOMI	-.18	.12	-.09	.28
RTVLAT	-.05	.05	.06	.04
RTGEAL	-.20	.14	-.08	.29

(RTVCOM not correlated because frequency = 0) which partially repeats the findings of Experiment 1. NTRS-P correlated significantly with motor accuracy (RTMACC) ($r=.37$, $p=.036$) and with motor commission (RTMCOM) ($r=.45$, $p=.010$) in the single response M condition. This suggests that Psychoticism is clearly related to impulsive responding, and that this affects the accuracy of performance. It is also correlated positively with motor omission (RTMOMI). Although nonsignificant, the direction of the correlation between psychoticism and motor response measures is the same in the dual response condition. However, there is virtually no correlation between NTRS-N and the latency of both verbal and motor responses. One interesting finding is that in single mode responding (V condition), NTRS-P does not correlate with the verbal measures at all, but the magnitude of the correlation increases in the dual response reaction condition, which again suggests that combining responses can dramatically change the style of responding in the child.

Discussion

Reaction Time Performance

The results strongly suggest that there is no evidence to support the assumption that the verbal response is a more stable or faster mode of response, qualities which would enable the verbal response to regulate the motor response at the elementary level of execution. This is particularly marked in the younger age group, but even when performance improves with age, there is still no indication that the verbal mode is "superior" to the motor mode according to the measures taken in the experiment.

On the contrary, the motor response is better than the verbal response in terms of accuracy index in both the single response mode comparison and the dual response mode comparison. The latency of the motor response is also shorter in the single response conditions comparison. However, there is no difference between motor and verbal latency in the dual response reaction. This can, nevertheless, be explained by looking at the latency of each response mode when it is produced singly or combined with another response. Motor latency in the combined response condition is significantly longer than the single response condition, whereas verbal latency is similar in both the single and combined response conditions. This suggests that when motor and verbal responses are required together, some temporal adjustment takes place and that the motor response is slowed down to co-ordinate with the verbal response. One consequence is that the accuracy in the M-V condition for both the motor and the verbal response increases as compared with conditions in which only either individual response is required. Motor accuracy is significantly higher in the M-V condition than in the M condition, while verbal accuracy, though improved, does not differ significantly between the single and dual responding condition. At any rate, motor accuracy is higher than the verbal one throughout. It seems that if accuracy is a gain in combining motor response with verbal response, it is at the expense of motor latency. Moreover, since verbal accuracy also improves, the mechanism is unlikely to be one mode exerting an influence upon another mode. Instead, it seems that the improvement is due to two responses being required together.

The analysis on errors will clarify the issue further. In terms of total errors, the dual response condition produced fewer errors than the single response conditions. Moreover, once the errors are divided into commissions and omissions, the verbal mode is more affected by the dual response condition. There is on the one hand a complete absence of verbal commission, but on the other hand an extremely high frequency of verbal omission responses, which suggests that when the children are asked to produce both motor and verbal responses, the tendency is to ignore the verbal response altogether. This had resulted in the verbal total errors (contributed by verbal omissions alone) being significantly higher than total motor errors in the M-V condition, especially marked among the two youngest age groups. This confirms the findings in the previous experiment that while verbal commissions are few (except the Middle Group), there is a preponderance of verbal omissions in the responding condition with speech accompaniment.

Many studies have concentrated only on the accuracy of the response, and even when Wilder (1969) included a wider range of measures including latency, amplitude and errors, he dealt only with the motor mode. The present attempt to abandon the presupposition that verbal behaviour is the independent variable has proved useful. It now seems that Luria's and Vygotsky's assumption that speech is the superior mode of responding is not borne out by the reaction time experiment.

These results favour the hypothesis that verbal and motor responses are interdependent in that there is some temporal adjustment when two responses take place together. There may be a facilitative effect on accuracy but the latency of the motor response is lengthened, which can be explained by the "load" hypothesis. Birch (1971) has studied the latency of responding in the motor and verbal mode, but he has found initial vocal responding to be faster than the motor responding. He has nevertheless suggested that motor and verbal responses would synchronize provided the subjects were given training with vocal reaction first. But then Birch (1971) judged the role of verbal response only according to measures of latency, and he made the assumption that subjects trained in the vocal response first would use it to co-ordinate the manual response, but not if the subjects were trained in the reverse order. This only shows that verbal reactions may benefit more in training, and cannot be used to suggest that spontaneous verbal response is a superior mode in "controlling" behaviour. Unfortunately, the data provided by Birch do not assist in determining whether when motor and verbal responses are co-ordinated, the adjustment is at the expense of the responses either in terms of speed or errors. Such "compensation" would be accommodated by the "load" hypothesis, although it needs to be specified why some aspects of a response mode are affected and not others.

There is a similarity between the present M-V condition and the Sp-R condition in Experiment 1, but in the present case speech accompaniment resulted in better performance than single response condition. When the data are examined, it seems that the increase in accuracy frequency in the present M-V condition is not as large as the decrease in accuracy frequency in the Sp-R condition in Experiment 1. Another reason, perhaps, is that with an extremely straightforward task like reaction time, even when the interpretation is made in terms of "load", the task may still be within the "limited capacity" of the subject. Consequently, the effects of dual responding can be marginal. In other words, it is possible that speech accompaniment may be either facilitative or deleterious, depending on the task.

Response Mode

The replication of the analysis of response mode is generally a successful one. The same progression of age trend is observed in the preference for simultaneity and the verbal-motor mode of responding, although the Simultaneity analysis does not reach statistical significance, whereas the Before/After analysis does. This is the reverse of the results of the last experiment. The correlation between the Before/After preference and response accuracy is also replicated.

Once again, there is no evidence that all children tend to make a motor response before a verbal one. Left to themselves, younger children adopted a motor-verbal mode, and yet they perform poorly compared with older children adopting the alternative response mode. The age effect which has been demonstrated time and again cannot be ignored. But the development of a preference for the verbal-motor sequence is not the only change which occurs with advancing age and we cannot be certain that it lies at the root of the improvement in the ability to perform a task with speech accompaniment.

Reaction time and personality variables

Although few significant correlations have emerged, it seems that a measure of psychoticism is related to reaction time performance, and particularly to the emission of impulsive responses. Children scoring high on psychoticism are poor at controlling themselves. Even in a reaction time task in which there is the opportunity to press on a lever, the children with high NTRS-P produce more superflous responding. Theoretical discussion of this finding will be postponed until a later chapter.

Summary

The present study involved a reaction time task, which was designed to investigate the performance of children asked to make a single motor response, a single verbal response or a motor-verbal combined response reaction. There was no evidence that the verbal response is "superior" to the motor response, either in terms of stability or in terms of short response latency. The results suggested that when motor and verbal response occur together, the accuracy of both responses is enhanced. The latency of the motor response is adjusted according to that of the verbal response by a significant increase in reaction time. Consequently, whether the effect of pairing a motor response with a verbal one can be considered to be facilitative depends on the aspect of performance being evaluated.

Correlations between personality and behaviour variables suggested that Psychoticism is related to a tendency to produce motor errors of commission. However, few other correlation coefficients reached statistical significance, or they were too low to warrant further interpretation. But consistent with previous findings, when verbal and motor responses were paired together, the pattern of correlation between the personality variables and behavioural measures appeared to be different from the pattern which was obtained when motor and verbal responses took place on their own.

CHAPTER FOUR

VERBAL SELF-INSTRUCTION AND PERFORMANCE ON A DISCRIMINATION TASK (Experiment 3)

It was suggested in the interpretation of the first experiment according to the limited capacity or "load" hypothesis that the marked deleterious effect of speech accompaniment on the delayed response task was in part due to the extra demand of the task, and not due to the imposition of a verbal response alone. The children knowing that they were required to press the lever at the end of a waiting session could be "motivated" to respond earlier. This is to suggest that delaying a response may be harder than inhibiting a response. In order to clarify the problem, the "load" hypothesis will again be tested in Luria's discrimination experiment, in which it is the production of a response to the positive stimulus and the total inhibition of a response to the negative stimulus that is being compared.

The experiment consisted of four conditions, so that verbal accompaniment could be arranged to occur with both, none or either of the responses to the positive and the negative stimulus. The conditions are:

1. responding to the positive stimulus and not responding to the negative stimulus, both without self-instruction (R-NoR)
2. responding to the positive stimulus with self-instruction and not responding to the negative stimulus, without self-instruction (SpR-NoR)

3. responding to the positive stimulus and not responding to the negative stimulus, both with self-instruction (SpR-SpNoR)
4. responding to the positive stimulus without self-instruction and not responding to the negative stimulus, with self-instruction (R-SpNoR)

The predictions are based on the results of the previous experiment, which seems best explained by the "load" hypothesis, and on Luria's theory. Taking the discrimination paradigm as a whole:

1. The condition where no speech is involved is predicted to be the easiest condition according to the "load" hypothesis, while Luria's regulation theory will predict the worst performance from this condition.
2. The condition in which self-instruction accompanies the reactions to both the positive and the negative stimulus would be seen as the most demanding by the "load" hypothesis, but the regulation hypothesis would predict best performance, at least for the oldest age group (i.e., 5 and 6 years old), because the younger children are reported to be susceptible to "disinhibitive" effect in their reaction to the negative stimulus.
3. When the verbal response accompanies only one of the discriminative responses, the regulatory hypothesis predicts more or less similar performance by all the older age groups, because the theory make no assumption about the nature of the tasks. The youngest group will perform better in SpR-NoR than in R-SpNoR, because the ability to control inhibitive behaviour by speech is said to develop later.

The prediction generated by the "load" hypothesis will depend on three different assumptions:
Firstly, if it is assumed that a "no motor response" is the same as "producing a motor response" in terms of task demand, then SpR-NoR will not differ from R-SpNoR. If it is assumed that not having to respond reduces the response burden, the prediction is that SpR-NoR will be similar in terms of difficulty to R-SpNoR.

But, if it is assumed that inhibiting a response is harder than producing one, R-SpNoR will certainly impose more load and lead to poorer performance than SpR-NoR. Actually the test of the "load" hypothesis depends much on the nature of the task and how demanding it is determined to be, and so far there is no quantitative measure of the demand of a task. In order to decide on the "load" imposed by the production and inhibition of a response, we must scrutinize the positive response and the negative response separately. The predictions are in line with those stated, but applied to the specific modes.

Assuming that "no motor response" is the same as producing a motor response, the S- and S+ will not differ when no verbal response is involved, or when both are accompanied by the verbal self-instruction. Whichever condition is accompanied by verbal self-instruction will be deleteriously affected. The deleterious effect on the negative response would be predicted also by the regulation hypothesis for the younger age group.

If it is assumed that not responding is easier than responding, then the negative response in R-NoR and SpR-SpNoR would be more accurate than the positive response. When self-instruction accompanies the positive response, the negative response will definitely be superior. If verbal accompaniment is with the negative response, both the negative and the positive responses will be similar in the degree of difficulty, (i.e., assuming that the verbal and motor responses are not dominated by each other), or the negative response will be less accurate than the positive one.

If inhibiting a response is harder than producing one, there will be more errors when related to the negative stimulus than the positive stimulus when there is no verbal accompaniment to both the positive and the negative response, or when there is verbal accompaniment to both responses. With the SpR-NoR condition, the positive response will be more difficult than the negative one if the "load" imposed by self-instruction is more difficult than the attempt not to respond. However, it is not certain in what ways the "load" presented by self-instruction and by inhibiting a response will differ from one another. Should they impose the same "load", the negative and the positive response may not differ in terms of accuracy in the SpR-NoR condition. In the R-NoSpR condition, the negative response is expected to be unfavourably affected.

There are four groups of children belonging to different age groups in the experiment, and if each discrimination task is taken as a unit, the design can be seen as a two-way analysis of variance design with age and condition being the main effects.

Alternatively, when the positive response and the negative response are looked at separatively, the design is a more complicated 4 x 2 x 2 x 2 (Age x Vocal response to S+ x Vocal response to S- x

Response) analysis of variance with repeated measures on the last factor.

Methods

Subjects

The subjects were randomly selected from the Robin Hood Infant school and the Thomas Wall Nursery School in Sutton, Surrey. There were 128 children in the experiment, with an equal number of boys and girls. The subjects were divided into four age groups with equal numbers of subjects and balanced for sex. The mean age of the entire sample was 63.9 months (S.D.=30.45). The mean age of all the male subjects was 67.32 months (S.D.=14.92) and that of all the female subjects was 60.94 months (S.D.=13.85). The age distribution according to the separate age groups is shown in Table 39.

Apparatus

The apparatus was the same as that used in Experiments 1 and 2. A tape recorder was used to record the proceedings of the experiment.

Procedure

The children in each age group were randomly assigned to one of the four experimental conditions. There were eight children in each condition (4 boys and 4 girls). The children were familiar with the experimenter (E) who had attended their classes and talked to them. The subjects were seen individually in a small quiet room in the school. The introduction to the apparatus was similar to that in the previous experiments. The instruction on the discrimination tasks was as follow:

Table 39 Means and standard deviations of ages of subjects (in months)

		AGE GROUPS 3	4	5	6
Total Sample	$\bar{X}$	41.00	51.03	64.59	76.53
	S.D.	2.29	2.78	2.56	2.48
Male	$\bar{X}$	41.13	50.06	64.50	76.06
	S.D.	2.58	3.02	2.28	2.72
Female	$\bar{X}$	40.88	51.18	64.88	77.00
	S.D.	2.03	2.88	2.89	2.19

1. R-NoR "When one of these eyes is bright, I want you to bang on the nose quickly. But when the other eye is bright, I want you to wait and do nothing. Now I'll show you."
(demonstration)
"All right? Now let us try this a few times" (practice trials). Good. Now I want you to do a few more times on your own. Remember, watch carefully and I want you to try your best."

The instruction to the other groups varied according to how speech was to be paired with the discriminative response.

2. SpR-NoR "When one of these eyes is bright, I want you to say to yourself loudly 'BANG' and bang on the nose. But when the other eye is bright, I want you to wait and do nothing."
3. SpR-SpNoR "When one of these eyes is bright, I want you to say to yourself loudly 'BANG' and bang on the nose. But when the other eye is bright, I want you to say to yourself loudly 'NO' and this means you must wait and do nothing."
4. R-SpNoR "When one of those eyes is bright, I want you to bang on the nose. But when the other eye is bright, I want you to say to yourself loudly 'NO' and this means you must wait and do nothing."

During the demonstration, the colour chosen to be the positive stimulus (S+) and negative stimulus (S-) were the same as those presented to the subject in the practice trials and the experiment proper. The demonstration was given slowly with E repeating the instruction. A minimum of five practice trials were given. Verbal and actual prompting were used to ensure that the subject understood the instructions and could perform at least one trial each on the S+ and S- correctly on their own.

A block of thirty trials was given, with 15 trials each on the S+ and the S-. The stimuli were presented in random sequence, with no more than three successive presentation of any one colour (Gellermann, 1933). Half the subjects in each condition were given the blue light as S+ and the yellow light as S-. The other half of the subjects had blue light as S- and the yellow light as S+.

Each trial began with a ready signal "Watch", followed by a count of two (one second). Then the stimulus came or and stayed on for as long as four seconds, or until the lever was pressed, whichever was earlier. The next trial began two to five seconds after the offset of the light. The light stimuli were operated manually be E.

When a correct response was made, E praised the child, "Good, well done". When an incorrect impulsive response was made, E said, "Not quite, try again" and when a child omitted a response, E said, "You have forgotten this one. See what happens next".

The positive and negative motor response was the dependent variable. A correct response was a press on the lever within 4 seconds during the onset of the S+, or no motor response during the 4-second when the S- was on. Other response categories that were also recorded were:

Commission responses: These were divided into motor and verbal commission responses. Any extraneous responses, such as a response to the reminder "Watch", or a motor response to S-, were considered to be commission responses. But unlike the previous experiment (Experiment 2), a motor or verbal commission to the "Watch" signal did not cancel the trial.

Omission responses: A response was required during the four-second interval and it did not occur; this was scored as an omission error.

A General Accuracy Index was calculated, which was the frequency of trials in which all the verbal and motor responses required by the conditions were accurate.

NEW TRS Ratings

The teachers of these children were asked to fill in the New TRS. The results were used to standardize the New Teacher's Rating Scale and the data used in this experiment were the scores of the final version of the NEW TRS subscales (See Chapter Six).

Results

The means and standard deviations of the correct motor responses are listed in Table 40. The frequency of both commission and omission errors was low, so they were combined. The group totals are presented in Table 41 to 44. A General Accuracy Index which represented only those responses that were correct verbally as well as manually was also calculated (Table 45).

Treatment of results

First, the discrimination paradigm was considered as a whole, and the scores obtained by the subjects in the four conditions were expressed in terms of a Correctness Index, which had the semblance of a signal-detection analysis. Given that S+ and S- represented the positive and the negative stimuli, and R and NoR represented responding and not responding, then,

Table 40 Means and standard deviations of accurate motor responses

CONDITIONS		AGE GROUP 3		4		5		6	
		S+	S-	S+	S-	S+	S-	S+	S-
R-NoR	$\overline{X}$	11.50	14.50	13.75	14.75	13.87	14.13	14.50	14.63
	S.D.	3.96	0.76	1.75	1.46	2.10	0.83	0.53	0.74
SpR-NoR	$\overline{X}$	6.75	13.63	13.00	14.88	13.13	14.38	14.13	14.25
	S.D.	4.50	2.00	1.41	0.35	2.10	0.92	1.13	1.39
SpR-SpNoR	$\overline{X}$	11.00	8.00	14.13	14.38	14.50	14.75	15.00	11.13
	S.D.	3.12	4.60	1.25	0.92	1.07	0.46	0	5.22
R-SpNoR	$\overline{X}$	10.25	13.13	8.63	13.25	14.00	14.88	14.88	14.00
	S.D.	3.96	2.90	6.23	2.43	0.93	0.35	0.35	1.20

Table 41 Means and standard deviations of motor errors (commissions and omissions) to positive stimulus

	AGE GROUPS							
	3		4		5		6	
CONDITIONS	X	S.D.	X	S.D.	X	S.D.	X	S.D.
R-NoR	3.50	3.96	1.25	1.75	1.13	2.10	0.50	0.53
SpR-NoR	4.25	4.50	2.00	1.41	1.87	2.10	0.88	1.13
SpR-SpNoR	4.00	3.12	0.88	1.25	0.50	1.07	0	0
R-SpNoR	4.75	3.96	6.38	6.23	1.00	0.93	0.13	0.35

Table 42 Means and standard deviations of motor errors (commissions only) to negative stimulus

	AGE GROUPS							
	3		4		5		6	
CONDITIONS	X	S.D.	X	S.D.	X	S.D.	X	S.D.
R-NoR	0.50	0.76	0.25	0.46	0.88	0.83	0.38	0.74
SpR-NoR	1.38	2.00	0.13	0.35	0.63	0.92	0.75	1.39
SpR-SpNoR	7.00	4.60	0.63	0.92	0.25	0.46	3.88	5.22
R-SpNoR	1.88	2.90	1.75	2.43	0.13	0.35	1.13	1.13

Table 43 Means and standard deviations of verbal errors to positive stimulus

	AGE GROUPS							
	3		4		5		6	
CONDITIONS	X	S.D.	X	S.D.	X	S.D.	X	S.D.
2. SpR-NoR	9.25	3.84	2.00	3.50	2.25	3.19	0.75	1.39
3. SpR-SpNoR	9.38	4.37	2.38	4.37	0.50	0.75	0.25	0.46
4. R-SpNoR*	1.00	1.60	3.88	4.85	0.13	0.35	0.75	1.16

Table 44 Means and standard deviations of verbal errors to negative stimulus

	AGE GROUPS							
	3		4		5		6	
CONDITIONS	X	S.D.	X	S.D.	X	S.D.	X	S.D.
3. SpR-SpNoR	6.75	5.03	0.75	1.16	0.50	0.75	0.38	0.52
4. R-SpNoR	7.13	6.15	2.13	2.64	1.13	1.36	0.88	1.46
2. SpR-NoR*	0.38	0.74	0.25	0.46	0	0	0.88	1.73

*Verbal commission only

Table 45 Means and standard deviations of the general accuracy index

		AGE GROUPS							
		3		4		5		6	
CONDITIONS		S+	S-	S+	S-	S+	S-	S+	S-
SpR-NoR	$\bar{X}$	4.00	13.63	11.13	14.75	12.38	14.38	13.88	14.13
	S.D.	4.50	2.00	4.52	0.46	2.92	0.92	1.36	1.73
SpR-SpNoR	$\bar{X}$	4.38	5.75	12.00	13.13	14.13	14.25	14.63	10.50
	S.D.	4.27	4.43	4.28	2.00	1.13	0.71	0.74	5.37
R-SpNoR	$\bar{X}$	10.88	8.25	8.50	11.38	14.00	13.75	14.38	13.75
	S.D.	4.76	5.50	6.14	4.21	0.93	1.39	0.92	1.58

$$\text{CORR} = \frac{ad - bc}{\sqrt{pqxy}}$$

where,

	R	NoR	
S+	a	b	x
S-	c	d	y
	p	q	

Figure 9

The mean Correctness Indices of the age groups are presented in Table 46.

Table 46 Means and standard deviations of Correctness Index

CONDITIONS		AGE GROUPS 3	4	5	6
R-NoR	$\bar{X}$	.758	.908	.870	.941
	S.D.	.25	.09	.17	.07
SpR-Nor	$\bar{X}$	.389	.869	.840	.894
	S.D.	.34	.07	.17	.15
SpR-SpNoR	$\bar{X}$	.282	.904	.953	.757
	S.D.	.38	.10	.06	.34
R-SpNoR	$\bar{X}$	.592	.488	.928	.929
	S.D.	.28	.46	.07	.09

A score of 1.00 on the correctness index signified maximum accuracy, and zero means nil accuracy. The scores were analysed by 4 (age groups) x 4 (conditions) analysis of variance (Table 47).

There is a significant main effect by Age ($F(3,112)=19.72$, $p < .001$). The variance is explained mainly by the linear term ($F(1,112)=45.02$, $p < .001$) and the quadratic term ($F(1,112)=13.76$, $p < .001$). The Condition main effect is also significant ($F(3,112)=2.79$, $p < .05$). According to the table of means, the sum of the mean Correctness for all the age groups in R-NoR is 3.48, in SpR-NoR is 2.00, in SpR-SpNoR is 2.90 and in R-SpNoR is 2.94. Planned comparison showed that the correctness index is significantly higher in R-NoR than the other three conditions ($F(15,112)=34.40$) which did not differ significantly among themselves. This supports the "load" hypothesis that the condition without the use of verbal self-instruction is the easiest condition.

Table 47 ANOVA of Correctness Index

Source	SS	df	MS	F	df	Sig
Age (A)	3.17	3	1.06	19.72	3,112	$<.001$
linear	2.42	1	2.42	45.02	1,112	$<.001$
quadratic	0.74	1	0.74	13.76	1,112	$<.001$
cubic	0.01	1	0.01	0.20	1,112	N.S.
Condition (C)	0.44	3	0.15	2.79	3,112	$<.05$
A x C	1.87	9	0.21	3.90	9,112	$<.001$
Within cells	6.02	112	0.05			
Total	11.49	127				

The other hypotheses regarding the degree of difficulty of the other conditions was not supported, though the direction suggested that SpR-SpNoR had scored least in the correctitude index.

There is also a significant Age x Condition interaction ($F(9,112)=3.90$, $p < .001$). Post-hoc analysis indicated that in the SpR-SpNoR condition, the three-year old group did significantly worse than the other age groups ($F(15,112)=41.59$). In SpR-NoR, the three-year old groups also performed significantly worse than the other age groups ($F(15,112)=27.50$), but not in the other two conditions. Another difference is between the two youngest age groups and the two oldest one in R-SpNoR ($F(15,112)=24.18$) with the younger children scoring significantly less on correctness. This suggests that the three year old children are having difficulty in using self-instruction, which also created a problem for the four-year old children when it was used singly with the negative response and not when it was used with both positive and negative responses.

The second index is the Bias Index. With reference to Figure 9 on p.154, the difference between p and q will indicate the response bias of the subject. A positive index suggests a tendency to press, even if the negative stimulus is presented, and a negative index means a tendency to omit responses. The larger the score, the greater is the bias towards the direction indicated by the sign. This index is related to the Correctness Index in that a correctness score of 1 will always yield a bias index of zero.

The mean of the Bias Index is shown in Table 48. The analysis of variance of the index is in Table 49.

Table 48 Means and standard deviations of Bias Index

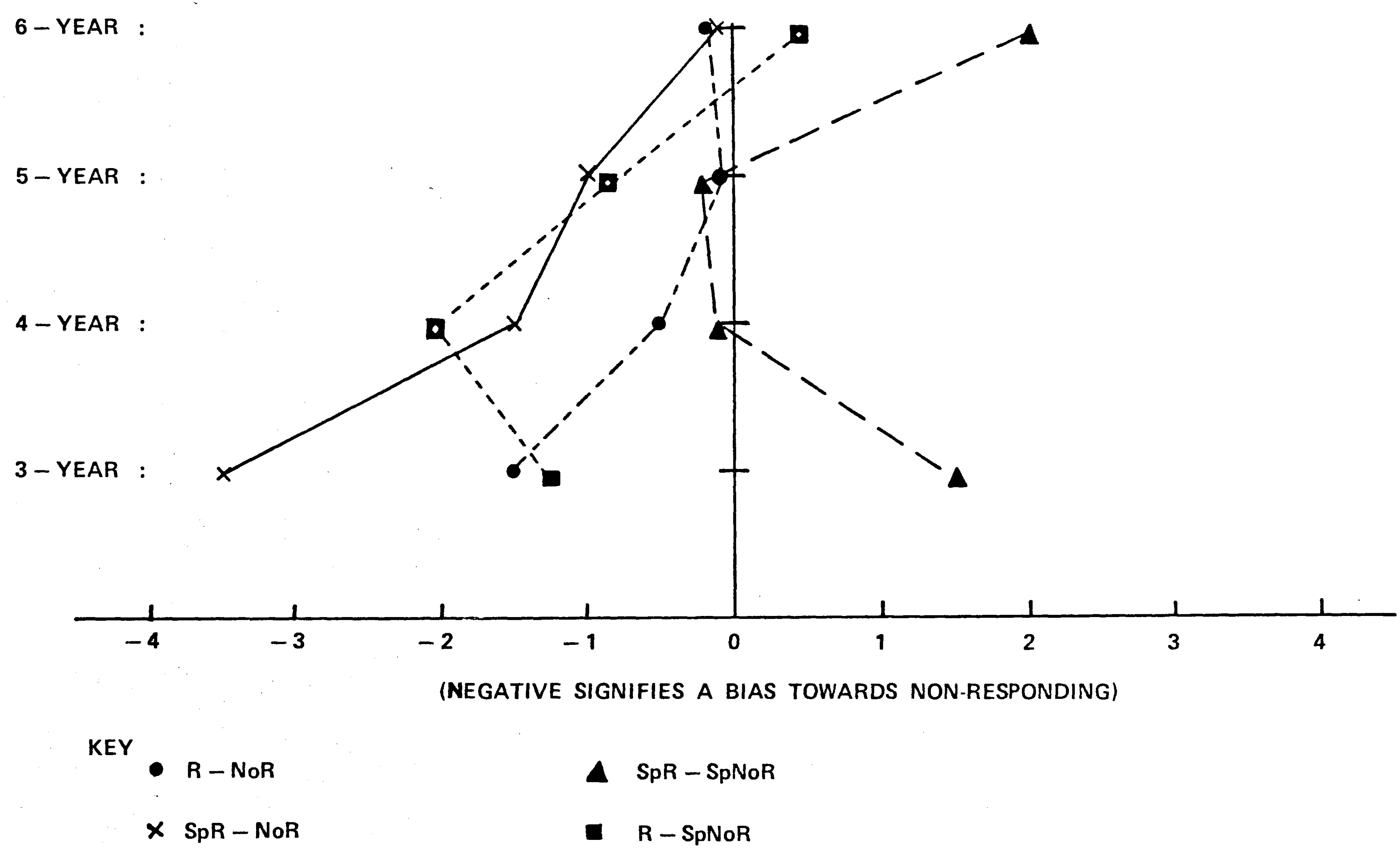
CONDITION		AGE GROUP 3	4	5	6
R-NoR	$\overline{X}$	-6.00	-2.00	-0.50	-0.25
	S.D.	7.63	4.00	3.05	0.28
SpR-NoR	$\overline{X}$	-13.75	-3.75	-2.50	-0.25
	S.D.	10.17	3.28	3.66	2.25
SpR-SpNoR	$\overline{X}$	6.00	-0.50	-0.50	7.75
	S.D.	10.74	3.16	2.56	10.44
R-SpNoR	$\overline{X}$	-5.75	-9.25	-1.75	1.75
	S.D.	10.71	12.28	1.67	2.25

The square root of the Bias Index (preserving the sign) was used for the analysis of variance. The results demonstrate a significant main effect in Age ($F(3,112)=26.15$, $p < .001$). The linear trend ($F(1,112)=58.26$, $p < .001$) accounts for nearly 75% of the variance contributed by age, suggesting that there is a significant trend from not producing a response to producing one as children get

Table 49 ANOVA of Bias Index

Source	SS	df	MS	F	df	Sig
Age (A)	65.58	3	21.86	26.15	3,112	<.001
linear	48.94	1	48.94	58.26	1,112	<.001
quadratic	14.17	1	14.17	16.87	1,112	<.001
cubic	2.47	1	2.47	2.94	1,112	N.S.
Condition (C)	127.90	3	42.63	51.00	3,112	<.001
A x C	17.91	9	1.99	2.38	9,112	<.05
within cells	93.61	112	0.84			
Total	305.00	127				

FIGURE 10 RESPONSE BIAS AMONG CONDITIONS



older. The quadratic trend is also significant. There is a Condition main effect ($F(3,112)=51.00$, $p < .001$), in which SpR-NoR has produced a significantly stronger bias towards non-responding than the three other groups ($F(15,112)=205.94$). The three other conditions differed significantly from one another in the post hoc analysis, with the exception of R-NoR and R-SpNoR. However, there is also a complicated Age x Condition interaction ($F(9,112)=2.38$, $p < .05$). One of the more unusual results is that the 3-year old group and the 6-year old group had a stronger bias towards responding when compared with the 4- and 5- year old children in SpR-SpNoR. The 3-year old group also reacted markedly differently in SpR-NoR and SpR-SpNoR. The children in SpR-NoR were biased toward not responding but the bias swung towards responding in SpR-SpNoR. The Bias Index is significantly different on post-hoc analysis ($F(15,112)=109.25$). The same comparison with the other age groups was not significant although all of them have a stronger bias towards not responding in SpR-NoR.

Accuracy analysis

The accuracy score to the S+ and S- was substracted from 15 (number of trials) and transformed into a square root. The transformation was made necessary by the ceiling effect among the oldest age group. The analysis is presented in Table 50.

The significant age effect is demonstrated again ($F(3,112)=17.98$, $p < .001$). The linear term accounts for 74% of the age variance ($F(1,112)=43.45$, $p < .001$). The quadratic term is also significant ($F(1,112)=10.76$, $p < .005$). The other main effects, which are whether or not a vocal response is made to S+ and to S-, are not significant.

There are however, significant interaction effects between Age and Vocal response to S+ (Y x A) ($F(3,112)=4.68$, $p < .005$) and between Age and Vocal response to S- (Y x B) ($F(3,112)=3.11$, $p < .05$). Scheffé post-hoc analysis indicates that when self-instruction accompanied performance to the S+, the 3-year old group did significantly worse than the other age groups combined ($F(7,248)=53.02$). The difference does not appear when the children did not vocalize to the S+. When self-instruction accompanied the S-, the 3-year olds again did significantly worse than the other age groups combined, ($F(7,248)=38.19$). When they did not use speech with the S-, the difference was not marked, and the 3-year olds differed only marginally from the 6-year olds ($F(7,248)=13.84$).

Within subject analysis indicates a significant difference in the accuracy to the S+ and to the S- ($F(1,112)=11.15$, $p < .005$) which suggests that performance on the negative response is better than the positive response. But there is also an Age x Response (Y x C) interaction ($F(3,112)=7.83$, $p < .001$) and post-hoc test shows that it is only in performance to the S+ that the ages differ. The 3-year old group did significantly worse than the other groups combined ($F(2,248)=45.57$). The four- to six-year old groups did not differ among themselves in their accurate response to S+, nor did all the age groups show any difference in their accuracy to S-. Whereas the children performed better on S+ with the increase with age, the 6-year groups displayed a deterioration in their performance on the S-, which can also be responsible for the interaction.

As for B x C (Vocalization to S- Response) interaction ($F(1,112)=10.75$, $p < .005$), post-hoc analysis shows that where the

Table 50 ANOVA summary of discrimination accuracy

Sources	Ss	df	MS	F	df	Sig
Between Subjects	159.09	127				
Age (Y)	43.14	3	14.38	17.98	3,112	<.001
linear	34.02	1	34.76	43.45	1,112	<.001
quadratic	8.61	1	8.61	10.76	1,112	<.005
cubic	0.32	1	0.32	0.04	1,112	N.S.
Vocal response to S+ (A)	1.16	1	1.16	1.45	1,112	N.S.
Vocal response to S- (B)	0.88	1	0.88	1.10	1,112	N.S.
Y x A	11.21	3	3.74	4.68	3,112	<.005
Y x B	7.47	3	2.49	3.11	3,112	<.050
A x B	2.38	1	2.38	2.98	1,112	N.S.
Y x A x B	3.36	3	1.12	1.40	3,112	N.S.
Subjects within groups	89.50	112	0.80			
Within Subjects	120.34	128				
Motor response (C)	7.14	1	7.14	11.15	1,112	<.005
Y x C	15.03	3	5.01	7.83	3,112	<.001
A x C	1.38	1	1.38	2.16	1,112	N.S.
B x C	6.88	1	6.88	10.75	1,112	<.005
Y x A x C	0.31	3	0.13	0.20	3,112	N.S.
Y x B x C	5.23	3	1.75	2.73	3,112	<.050
A x B x C	10.30	1	10.30	16.10	1,112	<.001
Y x A x B x C	2.35	3	0.78	1.22	3,112	N.S.
C x Subjects within groups	71.72	112	0.64			

negative responding mode is concerned, speaking to S- produces lower accuracy than not speaking to S- ($F(3,244)=8.55$). When there is no self-instruction at all, the accuracy in the negative response is superior to the accuracy of the positive response ($F(3,244)=17.94$). The separate age groups follow the same trend, except for the 6-year olds who performed worse to the negative response when they spoke to the S-. The results, however, are not significant in the 6-year old group. Analysis in the light of the Age x Vocalisation to S- x Response accuracy shows that the only significant results were in the 3-year old groups, whose performance on the negative response was superior to that on the positive response, when they did <u>not</u> vocalize to the negative stimulus.

Finally, the interaction between Vocalization to S+ x Vocalization to S- x Response is examined ($F(1,112)=16.10$, $p < .001$). When there is vocalization to the S+, the negative response is significantly better than the positive response, provided that there is no vocal accompaniment to S- ($F(7,248)=22.54$). Other post-hoc comparisons do not yield any meaningful significant results. Notwithstanding this, it is of interest to note that when there are no self-instructions at all (R-NoR), the trend is for the negative response accuracy to be lower than the positive response accuracy, but once there is vocalization on either or both stimulus, there is higher accuracy on the negative mode.

<u>Error analysis</u>

ANOVA of the motor errors (commissions and omissions combined) on S+ (Table 51) indicated that the main effect due to Age was a significant one ($F(3,112)=19.30$, $p < .001$), with a highly significant linear trend ($F(1,112)=152.08$, $p < .001$). The Condition main effect is also significant ($F(3,112)=3.97$, $p < .05$). Two of the conditions, SpR-NoR and R-SpNoR differ significantly from conditions R-NoR and SpR-SpNoR ($F(3,124)=30.49$).

As for the analysis of motor errors to S- (Table 52), the main effect due to Age ($F(3,112)=6.74$) and that due to Conditions ($F(3,112)=6.33$) are both significant at the .001 level. As there is an interaction effect ($F(9,112)=3.35$, $p < .005$), further analysis shows that in the SpR-SpNoR condition, the 3-year olds and the 6-year olds make more errors than the 4-year olds and the 5-year olds ($F(15,112)=52.44$).

Regarding the verbal errors in conditions SpR-NoR and SpR-SpNoR (Tables 53 and 54), there is a significant Age main effects of $F(3,56)=27.19$ ($p < .001$) and $F(3,56)=11.32$ ($p < .001$) to S+ and S- respectively. This suggests that verbal errors tend to decrease with age. Comparison of verbal commission errors in conditions SpR-NoR and R-SpNoR by Friedman two-way analysis of variance does not show any significant differences.

Apart from the quantitative difference, there is possibly a qualitative difference. The errors are recategorised under two groups, namely, the errors that were affected by a previous response and those that were affected by a previous stimulus. The first category includes, say, a commission error if the previous response made by the child (irrespective of accuracy) is a press on the lever. The second category includes a commission error if the previous stimulus is S+, or an omission error if the previous stimulus is S-. 75% of the total motor responses can be grouped in this

Table 51 ANOVA of motor errors to S+

Sources	Ss	df	MS	F	df	Sig
Age (A)	50.22	3	16.74	19.30	3,112	$<.001$
Condition (O)	10.34	3	3.45	3.97	3,112	$<.050$
A x C	11.39	9	1.27	1.45	9,112	N.S.
Within cells	96.67	112	0.86			
Total	168.13	127				

Table 52 ANOVA of motor errors to S-

Source	Ss	df	MS	F	df	Sig
Age (A)	12.54	3	4.18	6.74	3,112	$<.001$
Condition (C)	11.80	3	3.93	6.33	3,112	$<.001$
A x C	18.74	9	2.08	3.35	9,112	$<.005$
Within cells	69.64	112	0.62			
Total	112.72	127				

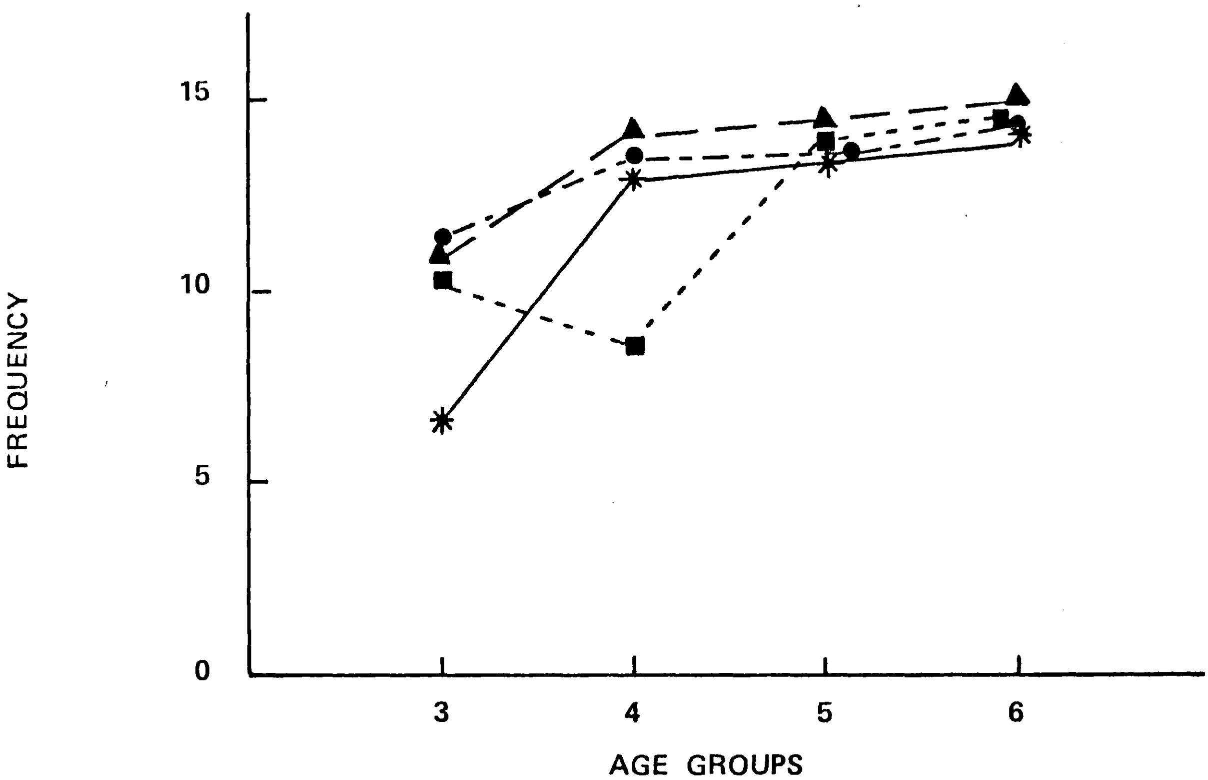
Table 53 ANOVA of verbal errors of S+

Source	SS	df	MS	F	df	Sig
Age (A)	70.74	3	23.58	27.19	3,56	<.001
Linear	54.96	1	54.96	63.17	1,56	<.001
Cubic	12.19	1	12.19	14.02	1,56	<.001
Quadratic	3.59	1	3.59	4.12	1,56	<.05
Condition (C)	0.71	1	0.71	0.82	1,56	N.S.
A x C	1.81	3	0.61	0.70	3,56	N.S.
Within cells	48.36	56	0.87			
Total	121.60	63				

Table 54 ANOVA of verbal errors of S-

Source	SS	df	MS	F	df	Sig
Age (A)	32.59	3	10.87	11.32	3,56	< .001
Linear	24.74	1	24.74	25.77	1,56	< .001
Cubic	6.69	1	6.69	6.69	1,56	< .05
Quadratic	1.16	1	1.16	1.21	1,56	N.S.
Condition (C)	0.70	1	0.70	0.73	1,56	N.S.
A x C	1.70	3	0.63	0.62	3,56	N.S.
Within cells	53.48	56	0.96			
Total	88.47	63				

FIGURE 11 MEAN CORRECT MOTOR RESPONSES TO POSITIVE STIMULUS



KEY

●	R – NoR	⊙
✳	SpR – NoR	×
▲	SpR – SpNoR	△
■	R – SpNoR	□

FIGURE 12 MEAN CORRECT MOTOR RESPONSES TO NEGATIVE STIMULUS

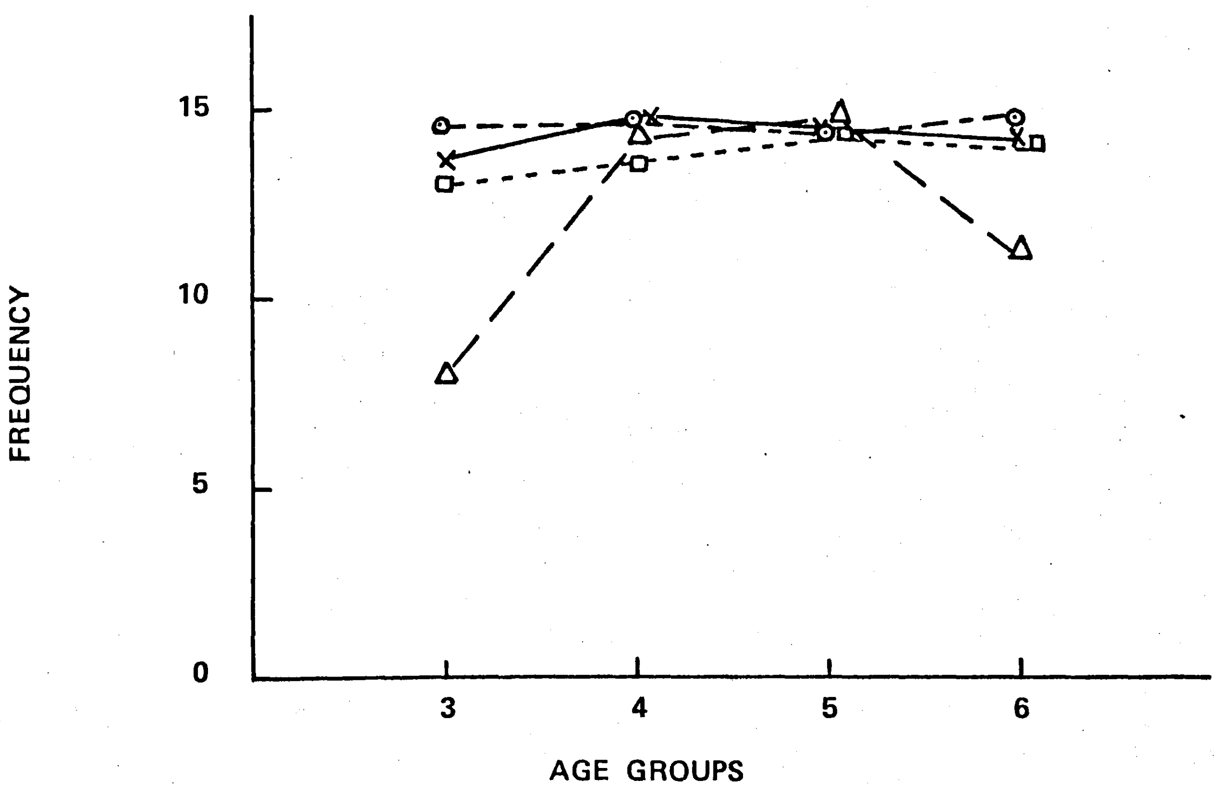


FIGURE 13 TOTAL MOTOR ERRORS TO POSITIVE STIMULUS

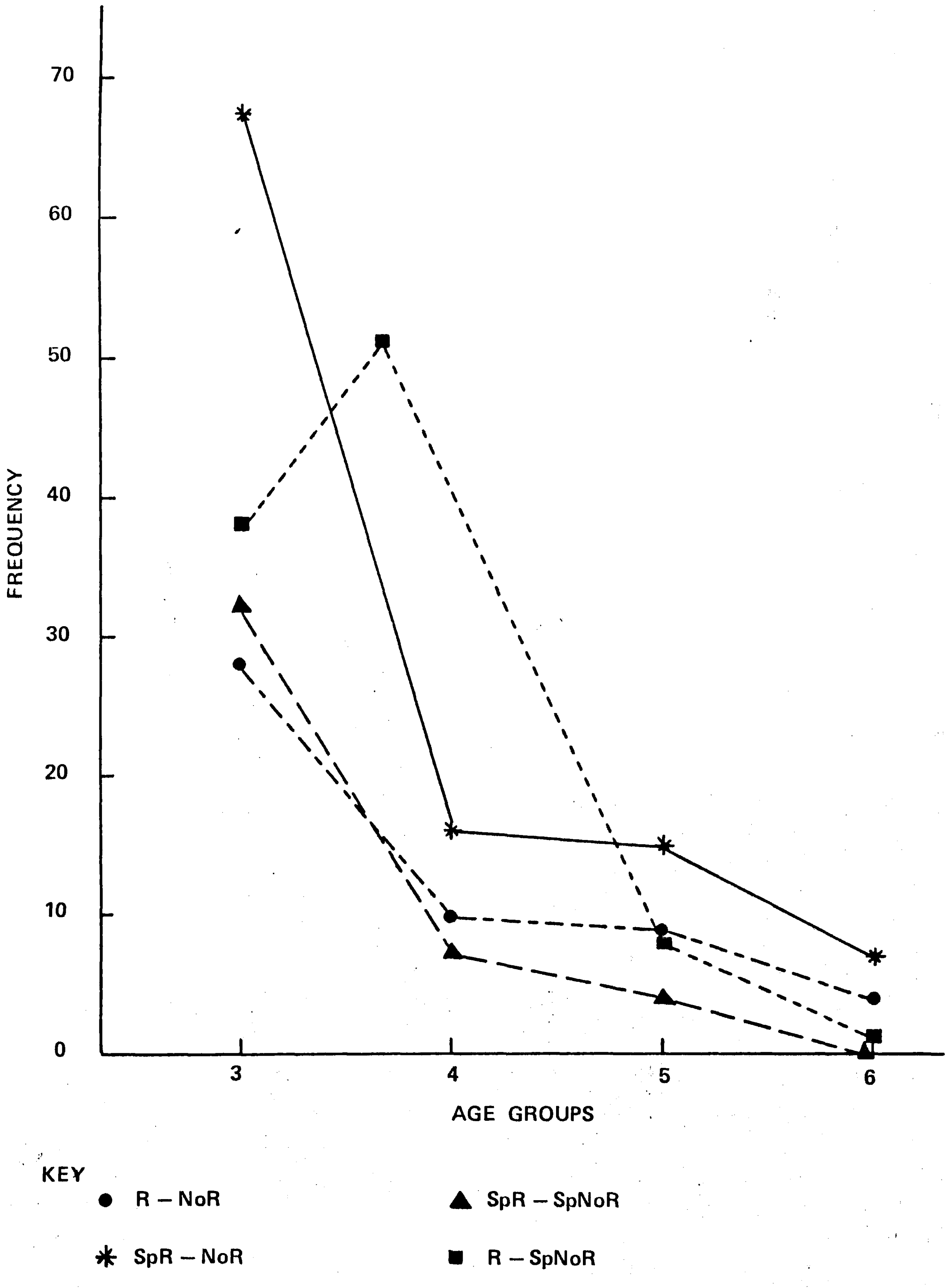
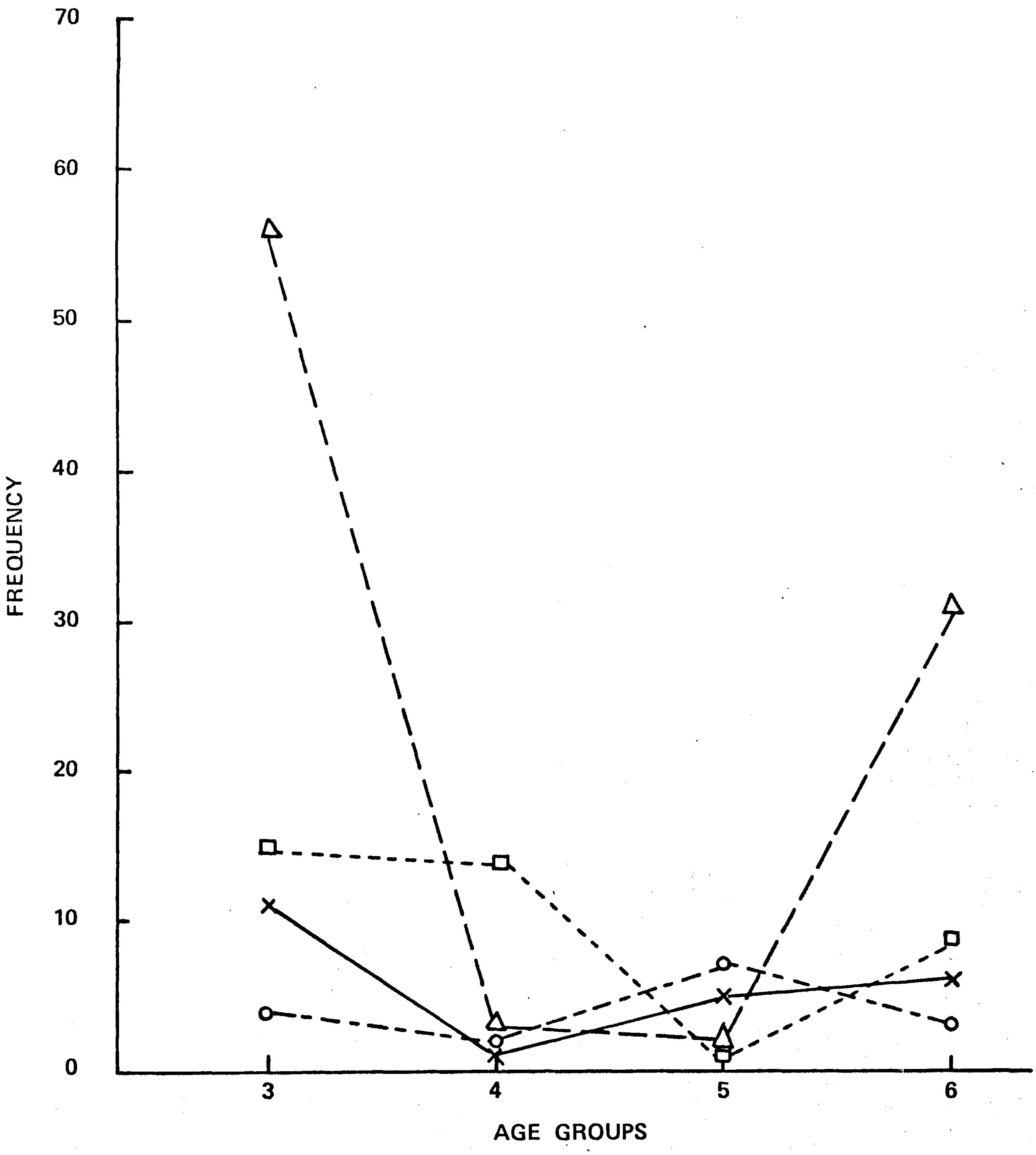


FIGURE 14 TOTAL MOTOR ERRORS TO NEGATIVE STIMULUS



KEY

o R – NoR

Δ SpR – SpNoR

× SpR – NoR

□ R – SpNoR

FIGURE 15 TOTAL VERBAL ERRORS TO POSITIVE STIMULUS

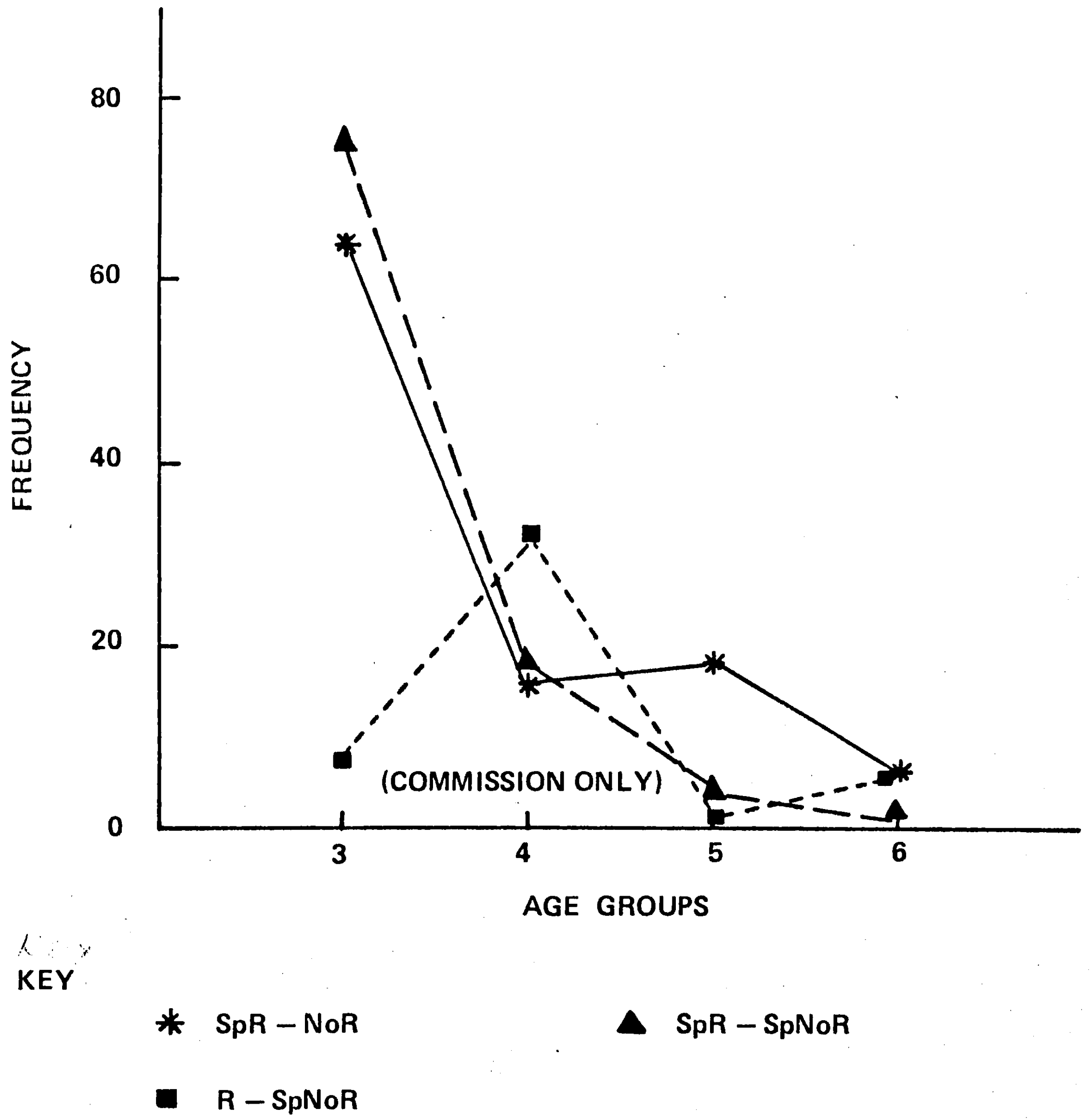
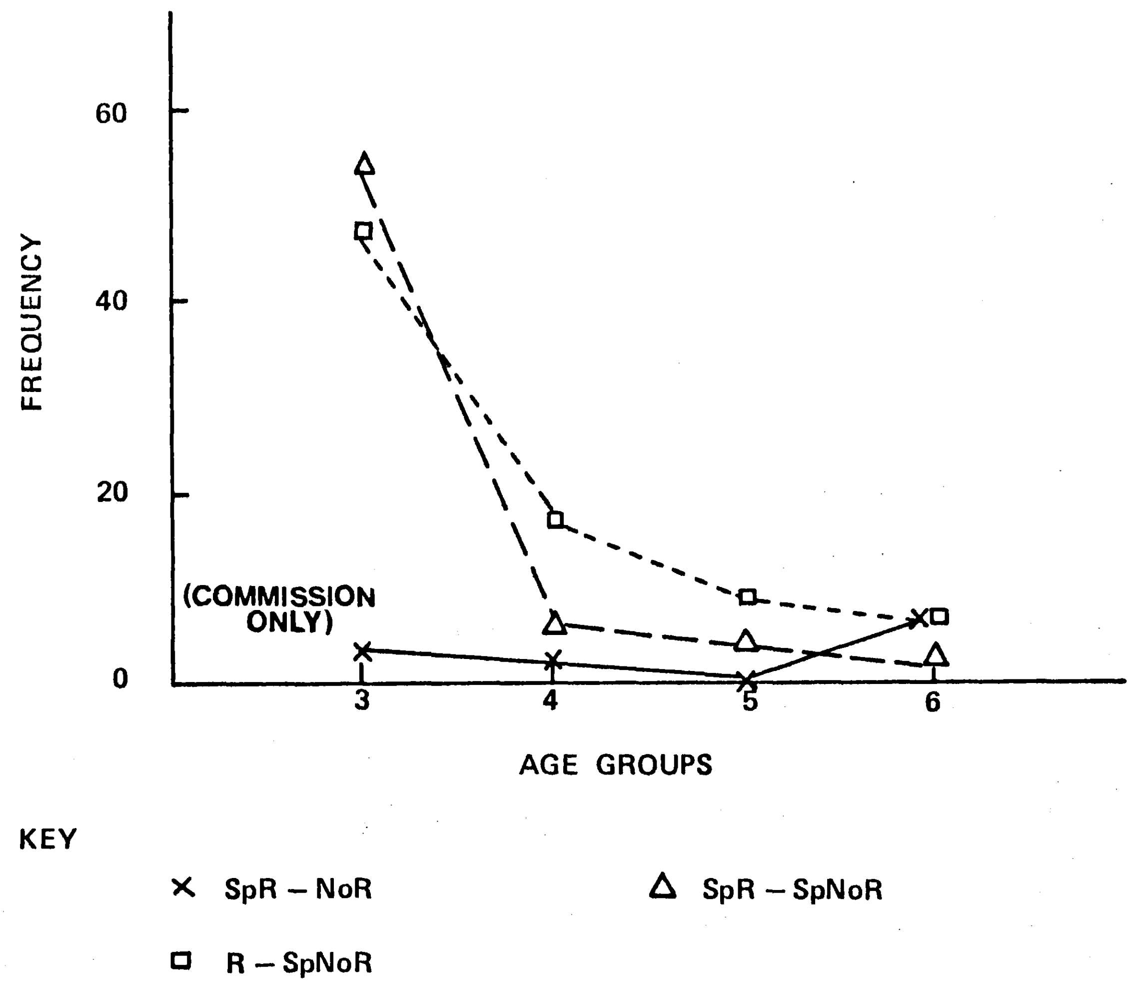


FIGURE 16 TOTAL VERBAL ERRORS TO NEGATIVE STIMULUS



manner. The percentage of errors contributed by those errors affected by the previous response is impressive (Table 55).

Table 55 Percentage of motor errors affected by preceding response

	AGE GROUPS			
CONDITIONS	3	4	5	6
R-NoR	71.94	54.64	87.72	50.00
SpR-NoR	63.69	50.00	47.39	69.44
SpR-SpNoR	66.22	91.74	33.33	93.46
R-SpNoR	69.44	72.46	22.22	28.57

The 5-year old children were most affected when no verbalization was involved (R-NoR). 87% of their errors were related to their preceding motor response, the highest of all the age groups. But when self-instruction was included, the 5-year olds had the smallest proportion of errors affected by previous response in each of the conditions. These children, moreover, produced the smallest number of total errors to both stimuli. This may suggest that the 5-year old groups are more responsive to self-instruction, which, although does not regulate behaviour as the experiments have so far illustrated, may have some attentional effects on the 5-year old children, somehow breaking them off from the influence of the previous response. However, this finding is a serendipity and requires further investigation.

Correlation of behavioural measures with teacher's ratings

The tables of Pearson's Product Moment Correlations are presented in Tables 56 to 59, and the means and standard deviations of the variables can be found in Appendix 10.

When no verbalization accompanied performance in discrimination, only Psychoticism measured by NTRS-P significantly correlated with commission responses to S+ (r=.42, p=.14) (two-tailed). This confirms previous findings that Psychoticism is connected with impulsive responding. It is also positively correlated with commission responses to S-(S-MCOM), albeit insignificantly. NTRS-N is positively correlated with accuracy (i.e., a converted inaccurate score), motor commission and motor omission to both S+ and S-, but the coefficients are small and insignificant.

As before, the introduction of verbalization altered the pattern of correlation. According to Table 57, in the SpR-NoR condition, NTRS-E has the most significant correlations with behavioural measures. It is negatively and significantly related to the performance to S+, including accuracy (S+MACC) (r=-.44, p=.014), motor omission (S+MOMI) (r=-.44, p=.012), verbal omission (S+VOMI) (r=-.36, p=.049). Since the accuracy scores are in fact "nonaccuracy" indices after transformation, the correlations are consistent in suggesting that an active child will tend to do well in situations requiring a response, that is, to the S+, because he is unlikely to omit a response. He will do less well in responding to S- for the same reason - but the correlation here, though positive, does not reach the required level of significance. This interpretation is suggested by the strong tendency for the high E children in the experiment to produce responses that are biased towards responding (r=.53, p=.002). The negative relation between NTRS-G with the S+ and S- behavioural measures is consistent throughout. A cautious, reflective child tends to do well, particularly in not forgetting to produce a required verbal utterance. NTRS-G is correlated with S+VOMI, (r=-.36, p=.022).

When self-instruciton is paired with responding to both S+ and S-, Table 58, the pattern of correlation again alters slightly. The significantly correlations are now with the S- responses. The reflective child again has the tendency to perform well, particularly in controlling himself to score high on the accuracy of responses to S-. NTRS-G is negatively correlated with S-MACC (r=-.51, p=.002) and positively related to the Correctness Index (r=.51, p=.003). But it is also clear that children scoring high on NTRS-G are biased towards nonresponding, which is favourable to negative response performance (r=-.40, p=.023). Results that may be difficult to interpret arethe negative correlation between NTRS-E and the accuracy measure to S-(S-MACC) (r=-.34, p=.054) and the tendency of children scoring high on NTRS-E toward nonresponding, as the correlation between Bias and NTRS-E is r=-.44 (p=.011). However, if one assumes that the children are so much affected by the demand of verbalization to both stimuli that they have opted not to respond (suggested by the positive correlation between NTRS-E and S+MOMI), then the relationship between these variables becomes psychologically meaningful. NTRS-P again related to S+ performance in the expected direction.

Although the magnitude of the correlations between NTRS-G and the discrimination measures is small to moderate, the direction of the relationship is so consistent that the characteristic measured on the TRS subscale can be considered essential to discrimination performance with or within self-instruction. In the fourth condition, R-SpNoR, NTRS-G is significantly correlated with S+MACC (r=-.35, p=.027)

Table 56 Correlation of discrimination measures in R-NoR Condition with teacher's ratings (N = 32)

NEW TRS

	G	E	N	P
S+MACC	-.12	-.11	.23	.19
S+MCOM	-.13	.04	.28	.42* (.014)
S+MOMI	-.11	-.11	.23	.18
S-MACC	-.18	-.10	.10	.21
S-MCOM	-.18	-.10	.10	.21
CORR	.13	.07	-.23	-.23
BIAS	.03	.04	-.20	-.11

(*two-tailed test)

Table 57 Correlation of discrimination measures in SpR-NoR Condition with teacher's rating (N = 31)

NEW TRS

	G	E	N	P
S+MACC	-.13	-.44* (.014)	-.03	-.10
S+MCOM	-.16	-.27	.09	-.04
S+MOMI	-.13	-.44* (.012)	-.04	-.10
S+VCOM	-.10	-.16	.21	-.17
S+VOMI	-.36 (.022)	-.36* (.049)	.11	.06
S-MACC	-.14	.26	.13	.13
S-MCOM	-.14	.26	.13	.13
S-VCOM	-.12	-.02	.26	-.09
CORR	.26	.30	-.06	.02
BIAS	.21	.53* (.002)	-.01	.09

(*two-tailed test)

Table 58 Correlation of discrimination measures in SpR-SoNoR Condition with teacher's ratings (N = 32)

NEW TRS

	G	E	N	P
S+MACC	-.24	.06	-.11	.34* (.054)
S+MCOM	-.29	-.27	.001	-.01
S+MOMI	-.13	.19	-.11	.37* (.040)
S+VCOM+	-	-	-	-
S+VOMI	-.20	-.10	-.04	.08
S-MACC	-.51 (.002)	-.34* (.054)	.24	.04
S-MCOM	-.51 (.001)	-.34* (.054)	.24	.04
S-VCOM	.03	.16	-.19	.08
S-VOMI	-.20	.02	-.11	.13
CORR	.51 (.003)	.19	-.10	-.20
BIAS	-.40* (.023)	-.44* (.011)	.26	-.18

(+S+VCOM nor correlated because frequency equals zero)
(*two-tailed test)

Table 59 Correlation of discrimination measures in R-SpNoR Conditions with teacher's ratings (N = 31)

NEW TRS

	G	E	N	P
S+MACC	-.35 (.027)	-.38* (.036)	-.04	-.06
S+MCOM	-.16	-.32	.03	-.21
S+MOMI	-.34 (.029)	-.36* (.048)	-.06	-.05
S+VCOM	-.42 (.009)	-.43* (.015)	.18	-.09
S-MACC	-.09	-.12	.15	.001
S-MCOM	-.09	-.12	.15	.001
S-VCOM	-.17	-.29	-.09	-.19
S-VOMI	-.31 (.044)	-.33	.13	-.04
CORR	.31	.41* (.022)	-.04	.12
BIAS	.28	.41* (.022)	.09	.17

(*two-tailed test)

and with S+VCOM (r=-.42, p=.009). It is also worth noting that in R-SpNoR, NTRS-E correlations have a similar pattern to those in SpR-NoR with the motor response measure to S+. Significant correlations are found with S+MACC (r=-.38, p=.036), S+MOMI (r=-.36, p=.048) and with S+VCOM (r=-.43, p=.015). Again, this tendency to respond when the negative response is free from vocalization has helped with the correctness (r=.41, p=.022), and notice also the positive correlation with the Bias Index (r=.41, p=.022). The difference between R-SpNoR and SpR-NoR with respect to NTRS-E is that in the former condition, children scoring high on NTRS-E are still prone to not responding to S-, hence the negative relationship with S-MCOM (r=-.12, N.S.), whereas in the latter condition, when no verbalization accompanies response to S-, the children are very prone to respond, as can be seen by the positive relation between S-MCOM and NTRS-E (r=.26, N.S.). The active child is still prone to responding whether or not self-instruction is used to accompany responses towards S+. This can explain why extraversion and correctness has the highest correlation in R-SpNoR of all the four conditions, for it is assumed that the response tendency in this condition is most favourable to a child high on NTRS-E.

Discussion

Luria has predicted an age and performance interaction in discrimination learning. It is true that in this experiment children in the 3-year old age group found conditions involving self-instruction extremely difficult to cope with. The four-year olds too, found verbalization to both S+ and S- difficult. This supports one aspects of Luria's general theory, but we have no convincing evidence for his claim that verbal self-instruction aids the older age groups in discrimination performance.

It has been useful to separate positive from the negative responses in the analysis, because it has revealed that the effect of verbalization can be an intriguing one.

First of all, the negative response seems to be the easier response because its accuracy score is higher than the positive response. However, one must take account of the Bias Index. This is where the scoring of a discrimination response differs from that of a delayed response. Whereas delayed responding requires a definite response after inhibition, discrimination only requires the absence of a response to S-. The Bias Index suggests strongly that the subjects, especially the younger ones, have a tendency towards not responding. Consequently, this would favour the negative response mode. The Age x Condition interaction can then also be explained.

According to the analysis of motor accuracy, pairing speech with either or both stimuli is detrimental to performance. It interferes with both the positive and the negative responses. But it may be important that in the absence of vocalization to S-, the negative mode scores much higher on accuracy than the positive response. When there is vocalization to S+, the negative response remains superior as long as there is not any vocalization to S- (that is, in the SpR-NoR condition), and there is no age interaction to complicate this result. Interpreted in the light of "load" theory, verbalization to S+ has resulted in a lot of omission of the required motor response. This is why the three-year old children have the strongest tendency towards not responding in SpR-NoR, of all the conditions. In fact, verbalization to S- exerts its deleterious effect by encouraging the occurrence of commission errors, as can be seen from the swing towards less non-responding in R-SpNoR in the three-year old (Figure 10).

This does not mean that the different effects of verbalization to both stimuli will cancel each other out. In the present results, the three-year olds and the six-year olds responded to the SpR-SpNoR condition by displaying a very high tendency to respond, which certainly resulted in the worst performance among all the conditions for these two groups of children (see Table 40).

In general, this experiment offers more support for the "load" or limited capacity hypothesis than for Luria's conception of verbal regulation, and for experiments that found performance on discrimination with verbalization worse than that without (e.g., Miller et al., 1970; Higa et al., 1978).

As for the correlation between the behavioural measures and teachers' rated measures of personality, the link between Psychoticism and impulsive responding seems an established empirical observation. Extraversion measured by NTRS-E is also correlated in a meaningful pattern with the behavioural measures in those conditions requiring verbal self-regulation. This implies that there may be individual differences in the use of, and responsiveness to, verbal self-instruction. Meichenbaum & Goodman (1969b) have mentioned some qualitative differences between impulsive and reflective children in their use of self-instruction. But in the present investigation, the children with high or low NTRS-E measures were not selected beforehand. All that can be deduced from the results is that some children respond to the demands of the task by adopting a strategy of responding or not responding verbally or manually. These children can possibly be identified by their NTRS-E scores. For example, children being rated high on NTRS-E tended to do well in a situation requiring a response, such as in response to S+ in the SpR-NoR condition. However, this tendency not to omit responses was reversed in a different condition, SpR-SpNoR, and the children scoring high on NTRS-E tended towards nonresponding. This behavioural pattern is seen as a strategy adopted by these children when they were asked to perform on a more demanding condition by having to vocalize to both S+ and S-. Hence they systematically produced different influence on their performance on the positive and the negative stimuli. This issue will be explored again in Part III.

General Discussion and Conclusion to Part I

The empirical work in this section has achieved two main goals. First of all, it has demonstrated that there is little support for Luria's interpretation of the regulatory function of speech on elementary motor tasks, such as in delayed responding, reaction time and discrimination responding. Secondly, one of the experiments (Experiment 2) has illustrated that there is no support for the assumption that speech is a superior mode of responding to the motor mode in terms of stability and latency; therefore, there is no justification to speak of a motor response being controlled by a verbal one, at least with regard to simple elementary responses that the present experiments are investigating.

There is, however, evidence that verbal and motor responses are interdependent. It might be preferable to ask how such co-ordination can take place, rather than whether or not the child can "control" his own behaviour by uttering self-instructions such as those Luria has employed, which were used in the three experiments here. The mechanism to appeal to is one that helps the child to regulate both verbal and motor responses, that is, his ability to say "BANG" and press the lever each time. The work of Meichenbaum (Meichenbaum, 1975; 1977) and of Mischel (Mischel & Patterson, 1976) mentioned in the literature review has suggested the usefulness of detailed and specific instructions. But terse instructions like "BANG" or "NO" have turned out to be a hindrance to the self-regulation process.

There is no doubt that Luria has highlighted an extremely important area in child development - the process of self-control. But as Flavell (1977) and Cromer (1974) have implied, he may be at fault in interpreting the source and vehicle of human self control as exclusively or even primarily verbal. An alternative interpretation in terms of "load" has explained the results obtained here fairly adequately, so it is clearly possible to examine the interrelationship between speech and motor behaviour, and to investigate how some kind of control can be achieved outside Luria's framework.

The correlation between teachers' ratings and the behavioural measures have produced some interesting results. The discussion has so far been brief, mainly because we have yet to discuss the theoretical basis of the personality measures used (see Chapter Seven). One of the most consistent findings is the relationship between scoring high on Psychoticism and the tendency to emit impulsive responses. The correlations between individual differences in personality and behavioural measures obtained from conditions involving self-instruction tends to be very different from those without verbalization. But it suggests that the use of self-instruction may also be related to individual differences.

However, before reporting empirical work which explored the two issues just raised, it is necessary to describe in the next Part of the thesis the development of the New Teacher's Rating Scale used in the present research.

Part II

CHAPTER FIVE

BACKGROUND TO THE NEW TEACHER'S RATING SCALE

Earlier teachers' rating scales

The second handbook on tests and measurements in child development (Johnson, 1976) has on record over 40 rating scales that teachers can use to assess the behaviour of school children, and there is a striking resemblance between many of them in terms of the categories of behaviour selected to be measured.

Spivack & Swift (1973), who imposed very strict criteria on the selection of teacher's rating scales to be reviewed, still came up with no less than nineteen. They looked at rating scales that specified and measured the overt classroom behaviour of children between the ages of six and eleven years, but excluded those scales that are related to developing personality theories on the grounds that these scales seldom focussed on the problems involved in clinical or remedial application. Although this may be true of some teachers' rating scales on personality, it does not mean that personality studies are unrelated to clinical problems. The personality theories of Eysenck (Eysenck, 1967; 1970) and Cattell (1965) are closely related to the description and explanation of clinical problems. Whereas Eysenck is fairly sceptical about teachers' rating scales, Cattell has widely adopted teachers' ratings of his factors (Cattell & Coan, 1957).

The scales reviewed by Spivack & Swift (1973) overlap considerably in their concern with areas such as aggressiveness or acting-out behaviour, anxiety and social adjustment, and behaviour related to coping with learning in the classroom. However, there is considerable diversity in the choice of methods of rating (e.g., the number of points of the scale) and the specific behaviour to be rated, which is supposed to reflect the broad behaviour category in question. These scales also differ in their implicit assumptions and in the theoretical bases which determine the specific items to be included. Apparently different workers have become dissatisfied with the existing tools and have resorted to developing instruments of their own. Hence, there is a plethora of rating scales, which creates immense problems for any scale user who has to make a choice among them. Spivack & Swift are critical of the present situation; they point out that less than half of the scales they have reviewed provide test-retest or tester reliability, and that they are deficient in terms of providing standardization norms and a validation index. The paucity of data is a great drawback for most of these scales, and the reviewers have warned potential scale users to exercise caution.

The same tone has been echoed by other reviewers (e.g., Bower, 1969; Harris, Drummond & Schultz, 1977; Lambert & Hartsough, 1973; Schultz, Manton, & Salvia, 1972). Eysenck (1970) and Cronbach (1970) have also put the method of assessment by rating scale under attack. It is not intended here to argue about the pros and cons of rating scales, but it is necessary to be aware of the issues involved in the construction and assessment of a teacher's rating scale. These problems are in fact shared by teachers' rating scales on learning disabilities (Bryan & McGrady, 1972), personality (Cattell & Coan, 1957) and specific behavioural maladjustment (Spring, Blunden, Greenberg, & Yellin, 1977; Werry & Quay, 1969).

When information is obtained by means of a teacher's rating scale, one is assuming that the teacher is an accurate informant on the child's behaviour. However, conflicting results have been reported on the consistency and accuracy of teachers' ratings. On the one hand, there are suggestions that teachers are neither consistent nor accurate in their overall ratings of pupils' behaviour (Barnard, Zimbardo, & Sarason, 1968; Elmore & Beggs, 1975; Feshbach, 1969). On the other hand, a low test-retest reliability seems the exception rather than the rule, because when reported, the test-retest coefficients often exceed .60. Miller (1972) found that even teachers untrained in behaviour ratings produced an average of test-retest reliability around .80. Rutter (1967) reported two-month test-retest reliability scores on the Rutter's Children Behaviour Questionnaire to be .89, while Spivack & Swift (1967, quoted in Spivack & Swift, 1973) noted that the test-retest coefficients for the Devereux Elementary School Behaviour Rating Scale ranged between .85 and .91. Given careful planning and specific instructions to the teachers, test-retest reliability can be achieved. Inter-rater reliability is usually lower than retest reliability, but still ranges between .50 and the mid.70s for those studies cited above. Among the methods put forward to improve reliability of an instrument, Jones & Cobbs (1973), quoted by Elmore & Beggs, 1975) have suggested specific and detailed behavioural categories, Block (1957) has prescribed the use of extreme points of the scale, while Lambert & Hartsough (1973) have put forward a modified rank procedure instead of the conventional point rating scale.

There is also concern about the validity of teachers' rating scales. Tolor, Scarpetti, & Lane (1967) reported a difference of up to 22% between teachers' ratings and clinicians' rating of the behaviour of school-children. The discrepancy was found to be largest in areas related to aggressive behaviour, emotional expression and behavioural withdrawal. The authors suggested that the results demonstrated a difference between the roles of teachers and clinicians and in the attitude towards children between the two professions.

Response style (Cronbach, 1970) and bias interest in human judgment may interfere with ratings. Teachers' judgments can differ from those of other professionals (Tolor et al., 1967; Walsh & O'Conner, 1968), and teachers' judgments can differ among themselves (Camp & Zimet, 1974). Bower & Lambert (1961, quoted by Lambert & Hartsough, 1973) reported that words like "never", "frequently" and "all the time" used in rating scales were interpreted differently by primary school teachers and secondary school teachers, because the former regarded a wide range of behaviour as acceptable while the latter perceived acceptable behaviour much more narrowly. The sources of variation lie not only in the teacher's judgment, but also in the sample of children on whom the judgment is made. The teacher of a class of children in which the incidence of misbehaviour is high may judge a relatively obedient child as displaying misbehaviour infrequently, but the same child in a well-disciplined class may be regarded as frequently misbehaving, unless the teachers base the rating on some larger sample than a particular group of children. It has been suggested that teachers apply different norms in rating behaviour, for instance, they may see boys in a less favourable light than girls (Datta, Schaefer & Davis, 1968; McKinney, 1975) and there could be ethnic biases as well (Datta et al., 1968). Cookson (1973) and Hallworth (1966) commented that teachers tend to rate along a "good/bad" dimension when they rate on adjectives.

Bias in teachers' ratings may be a function of their concern about certain behaviour. Glass (1967) showed that teachers were more aware of disciplinary problems in the classroom and less so with behaviour outside the school. Thompson (1975) attempted to find out teachers' attitude on various types of behaviour in two nursery schools by means of the Kelly Repertory Grid. The constructs were grouped into four categories: those linked with personal qualities such as extraversion-introversion, confidence, humour, etc.; those concerned with social behaviour; constructs concerned with competence and ability, and a miscellaneous category related to physical activity and the background of the child. The results indicated that of all the 90 constructs selected, no single teacher produced constructs in all the categories, while the overall proportion of constructs used differed markedly between the teachers of the two schools, who seemed to have a different conception of what were the characteristics of a "good" pupil.

Generally, the validity of a rating scale is obtained by correlating it with other measures of the child's behaviour (assuming that the measures chosen for the purpose are reliable and valid). Some correlations are with clinical diagnosis (Rutter, 1967; Quay, Morse, & Cutler, 1966; Swift & Spivack, 1969), and others with school grades (Touliatos & Lindholm, 1975; Camp & Zimet, 1974).

Correlations with behavioural measures, however, have led to equivocal results. McKinney (1975) obtained teachers' ratings on the Schaeffer & Aaronson Classroom Behaviour Inventory on impulsive and reflective children selected on Kagan's Matching Familiar Figures Test (MFFT). Conceptual styles were not related to measures of hostility, extraversion-introversion, although they were with task-orientation -- the reflectives being rated as more task-oriented. However, the results were confounded because the teachers were biased towards rating boys as more reflective, irrespective of their conceptual styles. Another study (Bjorklund & Butter, 1973) found no support for the relationship between a teacher's rating scale of classroom behaviour and the Sutton-Smith Impulsivity Scale (Sutton-Smith & Rosenberg, 1959). The only significant correlation between the MFFT latency and teacher's rating was on the item "tendency to respond". This is self-explanatory, by virtue of the task-similarity of the two items. All this suggest that the choice of the variables considerably affects the correlation with teachers' ratings. The more specific they are on both measures, the higher is the correlation with teachers' ratings. Studies relating teachers' ratings to broad categories of classroom behaviour based on observation rather than responses on questionnaires tend to be those with the low or non-significant correlation (Blunden, Spring, & Greenberg, 1974).

As for ratings on personality traits, the Junior Eysenck Personality Inventory (JEPI) scores yielded discrepant results when compared with teachers' rated traits (Eysenck & Cookson, 1969; Eysenck, S.B.G. & Pickup, 1968; Cookson, 1973). On the other hand, in a more extensive study, Walker (1967) suggested that the child's self-rating, peer rating and teachers' ratings produced more or less similar structures.

Harris et al. (1977) discovered that the correlations varied with the scales being used. There were satisfactory correlations between a problem behaviour checklist used by teachers and the Cattell Children's Personality Questionnaire (CPQ), but only a moderate relationship with the High School Personality Questionnaire (HSPQ) and none at all with the Elementary School Personality Questionnaire (ESPQ). Overt behaviour, rated by teacher on a checklist is related to the source traits measured by personality questionnaires, but the categories of overt behaviour involved varied from one age group to another. The explanation of this is open to conjecture. Possibly the rapid psychological change during adolescence is more difficult for teachers to rate both in terms of understanding the behaviour and how young people would see themselves or report about themselves in self-rated questionnaires. But for the younger age groups, irrespective of whether teachers' ratings agree with self-reports, there has been doubt as to how accurate young children are in giving self-reports on questions reflecting their personality. Nicholson & Gray (1972) compared the ratings of a teacher's rating scale (TRS) containing adjectives that described the Eysenckian dimensions Extraversion-Introversion (E) and Neuroticism (N) with the scores of the JEPI. They noted a strong negative correlation between JEPI-N and their TRS-N, a strong negative correlation between JEPI-N and JEPI-L (the Lie Scale) and above all, a positive relation between TRS-N and JEPI-L. Their results implied that JEPI-N was an inverse measure of Neuroticism. The accuracy of self-report questionnaires was called into question. And with scales like the CPQ and ESPQ which do not have a lie scale to check whether children are "lying" or simply presenting themselves in a positive light as a result of not understanding the purpose of the questionnaire exercise, the evaluation of the score and the test itself is difficult. It seems, therefore, that for pragmatic purposes, teachers' rating scales still remain a useful instrument for assessment.

In defense of the teachers' rating scales, Werry & Spraque have this to say: "To abandon the questionnaire rating scale method has the double disadvantage of losing an assessment technique that has the virtues of simplicity and inexpensiveness and of failing to use information coming from persons who are continuously sampling the child's behaviour in many differing situations in a way which is difficult and expensive to reproduce by other means" (Werry & Spraque, 1970, p.402). And a more confident note is sounded by Digman (1963)) that "it would be safe to conclude that the use of teacher's judgments represents a valid starting point for the exploration of child personlaity structure". Teachers' ratings are employed in the present investigation as one source of information.

Factor analysis and rating scales

One issue not mentioned above is the use, methods and results obtained by factor analytic studies of rating scales. Factor analysis is one method of testing construct validity of a rating scale. The assumption is that the unitary nature of various groups of items can be teased out by mathematical procedures which check the concommitant variations in the response of the subjects to the items of the questionnaire. Certain items tend to cluster together, and where they do so in an identifiable and meaningful way, they are usually labelled and called factors. In their review, Spivack & Swift (1973) suggested that factor analysis is essential in specifying the dimensions measured in a rating scale (e.g., Behar, 1977; Kohn & Rosman, 1972). However, there are examples of different analysis of the same scale from the results of different samples producing markedly diverse results (Spivack & Spott, 1965; Spivack & Levine, 1964; Schaefer, Baker, & Zawel , 1975). It appears that the conclusions derived from factor analysis depend as much on the variables and items selected to be factorized as on the methods and assumptions made about the procedure.

Basically the aim of factor analysis is to summarize a large number of variables and group them into a smaller number of constructs or factors. For the technical aspects of the computational procedure, readers can refer to texts by Child (1970) and Comrey (1973).

To carry out factor analysis on a rating scale, say, the correlation coefficients between the scores on the various items or variables are calculated and a matrix of the correlations presented. Factors are extracted from the matrix. This involves grouping the coefficients in the correlation matrix to produce a column of coefficients relating to the variables in the factor analysis to a hypothetical construct variable. Methods of extraction vary and with the advance of computer analysis, more data can be handled and researchers can choose the method which meets the theoretical assumptions best.

There is debate about how to decide the exact number of factors to be extracted. A popular technique is the Kaiser's criterion suggest by Guttman (Guttman, 1954) and adapted by Kaiser. The rule is to extract factors having a latent root (or loading) greater than 1 and it is a method suitable for the principle component design, which favours extracting as many factors as possible from the matrix. The drawback with this method is that while it can provide a reasonable number of factors with perhaps twenty variables, it will yield too many factors when more variables are involved. The other method is Cattell's "scree" method (Cattell, 1966). A graph is plotted of the latent root against each factor in the order of extraction and the shape resembles a series of points of a slope. The shape of the curve is employed as the cutoff point. "Stones" are awarded factorial status and the rest, "factorial litter or scree", are discarded as error terms. In practice, it has been demonstrated that the two methods provide similar results (Pawlik, 1973; Child, 1970) and it is not uncommon to find factor analysts bending the rules, to make a comparison with previous studies (Digman, 1965).

The product of factor extraction is always a column of loadings, one for each variable, that represents the extent to which the variable is related to the row of factors. There is also an indication of communalities, which represent the extent of overlap between the variable on all the factors, i.e., the degree of variance in a particular variable which can be accounted for by scores of individuals representing their position on the factors. The interpretation of an unrotated factor matrix is often difficult, because there are overlaps among the factors. The two major methods of rotating the matrix to a more interpretable form are the orthogonal method and the oblique method, but the choice between them has caused some disagreement among workers.

This disagreement is generally over the number and the nature of the factors being conceptualized. There are proponents of a two-factor model (Peterson,1961), which is based on factor analytic studies on personality ratings and questionnaires on children. They have produced major orthogonal components, namely, Good vs Poor Adjustment and Extraversion vs Introversion in personality structure, and Conduct Problems and Personality Problems in deviant behavioural symptoms. The results do not present too many problems if the rating scale is designed only for empirical screening purposes and where no theoretical framework underlies the relationship between the factors. Factor analysis on teachers rating scales have yielded between two and six second order factors. However, when the factors in teachers' ratings are related to existing personality theory, the issue becomes more complicated.

Eysenck has chosen to work on the highest order factors which are further factorized from first order factors. These second order factors, called dimensions by Eysenck, are uncorrelated with one another. Until recently, most of Eysenck's work on personality has been concentrated on two orthogonal dimensions "Extraversion-Introversion" and "Neuroticism" (Eysenck & Eysenck, 1976). However, there is more to Eysenck's theory than factor analysis. Although he considers factor analysis a useful method to establish a taxonomy of personality and to conceptualize a hierarchical structure of personality, he is aware that mathematical methods on their own produce equivocal results because there are many ways in which behaviour can be classified. Eysenck supports the use of factor analysis by applying the technique of criterion analysis, by which widely recognized group differences are seen to differ on a certain factor (Eysenck, 1970). He points out that the factor Extraversion-Introversion separates "hysteria" from "anxiety" (Eysenck, 1957). He also solves the problem as to whether psychotics and neurotics are categorically separate groups or differ only along a dimension, by demonstrating that psychotics differ from the normal population on one factor while neurotics differ on another. Eysenck is concerned not just with the classification of personality, but with its explanation. The content of his theory will be discussed in Part III. His factor analytic method is mentioned here as a contrast to the different approach of R.B. Cattell.

While Eysenck has made use of factor analysis in his personality theory to organize data and test his results with external criteria based on clinical observations, Cattell has employed factor analysis both as a means and as end to formulate a description of individual differences. He has chosen to work on the first order factor level (he calls them source traits), and the validity of the work is based entirely on the consistent clustering of the traits. Cattell initially began with a list of trait names adapted from Allport & Odbert (1936). Combining these with data from life-record material, he factorized twelve factors. Cattell (1965) has reported that these factors can be reproduced using data from other sources, such as by questionnaires (Q data) and by performance tests (T data). He has come to rely increasingly on Q data as the main source of information and claims that they can be factorized into about 16 factors. He assumes that the factors overlap and adopts the oblique method of rotation. The intercorrelations of his factors may be refactorized to form six higher order factors, the first two of which, Exvia-Invia and Adjustment-Anxiety, closely resemble the Eysenckian dimensions of Extraversion-Introversion and Neuroticism. Cattell is adamant that "the primary factors give one most information, and we would advocate higher strata contributors only as supplementary concepts . . . It is a mistake, generally, to work at the secondary level only, for one certainly loses a lot of valuable information present initially at the primary level" (Cattell, Eber, & Tatsuoka, 1970, pp.111-112). This argument has been repeated time and again in his debate with Eysenck, who maintains that second order factors are more meaningful psychologically (Eysenck, 1967) and that very little information is lost by dispensing with the primaries (Eysenck, 1972b).

In terms of scope and intention, Cattell's work is impressive. Teachers' ratings have also been developed based on Cattell's theories and have been factorized to produce twelve or more primary factors (Cattell & Coan, 1957; Digman, 1963; Dielman, Cattell & Lepper, 1971). At the same time, evidence is mounting that Cattell has made some doubtful methodological assumptions, and that he almost certainly has overextracted the number of primary factors (Howarth, 1976).

As a matter of fact, the debate over which factor level should be explored in the study of personality comes down to a question of taste and of practicality (Schaefer, 1971; Royce, 1973). It is obvious that for the sake of parsimony, there is much in favour of the higher-order factors because they are more likely to have a biological basis. On the other hand, a profile of secondary factors would be too broad in comparison with a profile based on first order factors for making predictions about specific behaviour, e.g., in personnel selection. But insofar as the aim of the factor analysis is to explore and explain the individual differences measured by rating scales (or questionnaires), higher order factors are more stable and hence more suitable for the purpose.

Finally, one must be aware of some limitations of factor analysis before embarking on such an exercise, as some users have admitted (Blurton-Jones, 1974) to using the method merely because it is convenient and becoming popular. But Eysenck (1977) and Guildford (1977) both hold that theoretical psychological thinking must go along with factor analyzed constructs. Pawlik (1973) has reminded us that a factor is no more than an "empirical construct", which should not be confused with "theoretical constructs" which explain behavioural observation. Moreover, factor analysis in personality studies - and other psychological research - is "limited to the extent that the instruments of behaviour measurement, which are 'fed' into the analysis, are of limited generality themselves" (Pawlik, 1973, p.24). For instance, rating scales and questionnaires may reveal stereotypes of behaviour description categories in a culture or in common language usage rather than "genuine" trait organization (Hallworth, 1966; Herbert, 1974).

Although the situation is far from being perfect, Comrey (1978) has specified some useful rules to be followed in factor analysis and he is correct in thinking that it is only through dissatisfaction with our present position that we explore ways of improving it.

Summary

This chapter has attempted to examine the difficulty confronted by psychometricians in the construction of a teacher's rating scale of children's personality. The usefulness of a teacher's rating scale was evaluated and it was suggested that despite the difficulty involved in the design and validation of such a scale, teachers' observations are one of the most convenient and inexpensive methods of assessment of the behaviour of school children. One of the methods involved in the construction of a teacher's rating scale, factor analysis, was discussed. This sets the scene for the development of a teacher's rating scale, which will be reported in the next chapter.

CHAPTER SIX

DEVELOPMENT OF THE NEW TEACHER'S RATING SCALE

Under certain circumstances, a teacher's rating of a child's behaviour is useful information about the child unobtainable by other means. One obvious example is that with very young children whose ability to perceive themselves is highly doubtful, teachers' judgments of their behaviour are the only way to assess their personality. And although human judgment can be idiosyncratic, a teacher's rating is nevertheless likely to be more reliable than that of a parent when some norm of behaviour is sought. The teacher will have known many more children, and should be capable of greater objectivity than, say, a parent. There is, therefore, justification for designing a rating scale for teachers to assess children's personality for the purpose of supplying additional information on the behaviour of school children.

The Nicholson & Gray Teacher's Rating Scale (TRS)

The immediate predecessor of the rating scale developed in the present study is that used by Nicholson & Gray (1972). The original TRS contained twelve adjectives chosen from those used by Eysenck & Rachman (1965) to describe Neuroticism. The adjectives were: aggressive, unstable, restless, rigid, anxious, impulsive, touchy, moody, unsociable, pessimistic, excitable and unself-confident (see Nicholson & Gray, unpublished). The adjectives were presented separately on twelve sheets of paper, each with the name of the adjectives written on top and the names of the children to be rated down one side. The teacher was asked to rate the child along a horizontal rating scale, divided into five points, the extent to which the adjective best described the child. The five points were "not at all", "not very", "about average", "rather" and "very". The score was then transformed so that it was comparable to the JEPI-N scores. The test-retest reliability reported, obtained from 70 pairs of judgments of six teachers on 34 children was .81, and inter-rater agreement from the same source was .83.

The TRS has been modified and extended to measure Extraversion-Introversion. The adjectives in the final Neuroticism list are: moody, anxious, rigid, touchy, restless, aggressive, calm, even-tempered, reliable, lively, carefree and stable; and those on extraversion-introversion (TRS-E) are: passive, thoughtful, careful, reserved, quiet, unsociable, impulsive, optimistic, excitable, talkative, responsive and outgoing. The scale was given to the teachers of three different samples of children aged between 7 to 13 years. The test-retest reliability on TRS-E (.53, $p=.002$) and on TRS-N (.56, $p=.002$) was reported to compare favourably with results on self-rating scales. On the other hand, the degree of inter-rater accord on TRS-E was said to be disturbingly low, with only one pair of teachers ranging in the 7-9 years old group reaching significant level (.70, $p=.001$). The inter-rater agreement on TRS-N ranged between .58 and .81 (Nicholson & Shapland, unpublished).

Several points have been raised regarding the need to investigate the process by which teachers rate the children through the use of the TRS. First of all, the ranges of mean scores for the extraversion adjectives and the neuroticism adjectives varied among the teachers and it was suspected that the teachers might be using different scaling criteria for the different adjectives. Secondly, the positive correlation between TRS-E and TRS-N raised a problem regarding the way teachers interpret the extraversion-introversion and neuroticism dimensions. Do they consider them as independent, or do they consider them as one dimension? A factorial investigation into the scale items is one way of answering the question (Nicholson & Shapland, unpublished). Alternatively, it is possible that teachers may employ more than two dimensions to rate their pupils in the school context. It was therefore decided that a more comprehensive teacher's rating scale should be developed, and hereafter it is referred to as the New Teacher's Rating Scale (NTRS).

THE FIRST STUDY (New TRS A)

Selection of adjectives

At the onset, the NTRS consisted of 70 adjectives describing the behavioural characteristic of children. The aim of the first study was to find out the factor structure of these adjectives, so that those with high loadings on particular dimensions could be selected to form the composite subscales of the New Teacher's Rating Scale.

In addition to the 24 adjectives representing the E and N dimensions (Nicholson & Gray, 1972) already mentioned, other adjectives were selected with two other hypothetical dimensions in mind. There has been increasing interest in the Psychoticism dimension (Eysenck & Eysenck, 1976), so the inclusion of this dimension into a teacher's rating scale already adopting the Eysenckian E-I and N dimensions seems appropriate. The adjectives used by Eysenck & Eysenck (1976) to describe Psychoticism were chosen. The second hypothetical dimension was reflection-impulsivity. There is some doubt regarding the generality of the concept of impulsivity or impulsiveness, a question which this research is trying to explore. The adjectives on this dimension consequently came from a variety of sources. For example, Eysenck & Wilson (1976) described the characteristics of the impulsive personality as follows: acting on the spur of the moment; making hurried, often premature decision; usually carefree; changeable; unpredictable. They describe individuals low on impulsiveness as: systematic; orderly; cautious; plan life out in advance; think before they speak and look before they leap. Kagan,et al. (1964) also talked about the reflective child being thoughtful and systematic. Some of the adjectives were included after discussion with teachers as to what adjectives they might readily use to describe the personality of the children. It must be emphasized that these hypothetical dimensions only served as a guideline in the selection of adjectives, and it was anticipated that some of the adjectives might contribute to more than one dimension. The original list of adjectives and the proposed subscales are presented in Table 60.

Table 60 Original list of adjectives for the New Teacher's Rating Scale

Extraversion-Introversion

action-loving
bubbling
blow off steam
careful
careless
daring
eventempered
excitable
impatient
impulsive
reserved
optimistic
outgoing
passive
quiet
talkative
thoughtful
responsive
unsociable
vigorous

Neuroticism

aggressive
anxious
calm
careful
lively
changeable
emotional
easygoing
moody
stable
rigid
touchy
restless
reliable

Psychoticism

boastful
bully
cheeky
disobedient
hostile
hyperactive
insensitive
irresponsible
naughty
solitary
spiteful
troublesome

Reflection-Impulsivity

absent-minded
analytical
attentive
contemplative
controlled
day-dreamy
disorganized
distractible
exact
foolhardy
look before he/she leaps
think before he/she speaks
orderly
quick
rash
reflective
systematic
unpredicatable
cautions
methodical*
impetuous*

Others

bright+
motivated
self-sufficient+
untidy
persistent

(*later addition in Second Study)
(+omitted in Second Study)

Methods

Subjects

The sample being rated included 240 children from three nursery and infant schools. The mean age was 66.8 months (S.D.=23.7). There were 120 boys (mean age = 69.2 months, S.D.=30.6) and 120 girls (mean age = 64.5 months, S.D.=13.47). There were nine teachers providing the ratings on the children and there was one set of ratings for each child.

Procedure

The teachers were given a list of the 70 adjectives typed out in alphabetical order so that the adjectives did not appear in their pre-classified order. The teachers were asked to make the ratings on separate rating forms and an instruction sheet was attached describing the format of the rating scale (Appendix 11a).

Each adjective was written at the top of the rating sheet and the names of the children to be rated were given on the left hand side. The order of the names were randomized on each sheet so as to avoid a "halo" effect. The teacher was asked to mark with an "X" on a five-point horizontal scale the point which best described the degree to which the adjective described the child. The points were labelled: 1. not at all, 2. not very, 3. about average, 4. rather, and 5. very. (Appendix 11b). The teachers were instructed to rate the child according to what he or she was like in school, and not what the parents told the teachers about the child, or what the teachers considered the child should be like. They were also reminded not to consider each adjective for too long, as it was their general impression that mattered.

The results were analyzed by the Statistical Package of Social Sciences (SPSS) computer programme on factor analysis. A principal component analysis with Kaiser normalization was performed. The factors with latent root greater than I were rotated orthogonally by Varimax solution to produce the final factor matrix (Nie, Hull, Jenkins, Steinbrenner & Bent, 1975).

Results

Table 61 presents the means and standard deviations of the 70 adjectives. Table 62 shows the first five factors that have emerged and the loadings of each of the variables under the factors. For convenience, the highest loadings obtained by an adjective under the factors are underlined. The correlation matrix from which the factors were extracted is pressented in full in Appendix 12.

The first factor accounted for 42.8% of the variance after the rotation of the matrix with the ten factors that had latent root greater than 1. The variables with loadings ranging between .50 and .86 included: lively, bubbling, talkative, impulsive, etc. Those with high negative loadings included: passive, quiet and reserved. Seven out of the twelve adjectives from the Nicholson & Gray TRS appeared on the list. This factor can be called an Extraversion factor.

Table 61 Means and standard deviations of TRS variables (Sample A) (N=240)

Variables	$\bar{X}$	S.D.	Variables	$\bar{X}$	S.D.
absent-minded	2.69	1.10	insensitive	2.41	.95
action-loving	3.24	1.08	irresponsible	2.39	.94
aggressive	2.28	1.01	lively	3.05	1.03
analytical	2.90	.98	"look before he (she) leaps"	3.09	.84
anxious	3.15	.95			
attentive	3.17	1.05	methodical	-	-
blow-off-steam	2.44	1.04	moody	2.75	.95
boastful	2.35	1.08	motivated	3.10	.88
bright (intelligence)	3.29	.96	naughty	2.54	.95
bubbling	2.84	.98	optimistic	3.02	.62
bully	2.03	1.02	orderly	3.03	.84
calm	2.99	.95	outgoing	2.98	.99
carefree	2.87	.73	passive	2.71	.97
careful	2.99	.82	persistent	3.11	.85
careless	2.85	.83	quick	2.97	.83
cautious	3.06	.86	quiet	3.01	1.02
changeable	2.69	.93	rash	2.72	.90
cheeky	2.24	1.01	reflective	2.99	.71
contemplative	3.03	.84	reliable	3.13	.82
controlled	3.06	.78	reserved	2.93	.85
daring	2.79	.97	responsive	3.15	.82
day-dreaming	2.94	1.03	restless	3.03	.84
disobedient	2.59	1.04	rigid	2.70	.85
disorganized	2.83	.90	self-sufficient	3.15	.86
distractible	3.09	1.03	solitary	2.58	1.08
easy-going	2.88	.77	spiteful	2.04	.98
emotional	2.98	.70	stable	2.91	.74
even-tempered	3.02	.75	systematic	3.00	.76
exact	2.98	.75	talkative	3.31	.96
excitable	3.03	.95	"think before he (she) jumps"	3.10	.72
foolhandy	2.35	1.03			
hostile	1.84	.96	thoughtful	3.23	.82
hyperactive	2.52	1.01	touchy	2.80	.94
impatient	2.70	.99	troublesome	2.44	1.08
impetuous	-	-	unpredictable	2.82	.79
impulsive	2.84	.96	unsociable	2.36	1.06
			untidy	2.93	.91
			vigorous	2.87	.93

Table 62 Factor loadings on TRS A (decimals omitted)

	Factors				
	I	II	III	IV	V
absent-minded	-22	-42	16	11	22
action-loving	73	-01	17	-05	07
aggressive	31	-27	61	04	-04
analytical	34	62	05	10	03
anxious	-41	-03	-15	46	20
attentive	04	64	-35	01	06
blow-off-steam	35	-21	63	15	-13
boastful	24	09	72	-09	14
bright	49	53	-06	-05	-07
bubbling	80	12	07	14	00
bully	24	-07	65	-05	-19
calm	-37	52	-34	-37	-11
carefree	55	-19	14	-32	-02
careful	-19	56	-31	02	-05
careless	14	-55	29	-02	03
cautious	-67	17	-23	06	02
changeable	16	-15	36	44	-16
cheeky	43	-14	58	10	21
contemplative	-08	76	-06	-05	-02
controlled	-31	59	-28	-28	-07
daring	67	-02	30	-09	-09
day-dreaming	-56	-28	-01	03	26
disobedient	27	-37	68	00	08
disorganized	06	-57	39	04	06
distractible	20	-50	51	13	-03
easy-going	44	05	-08	-15	-11
emotional	04	-08	-01	69	12
even-tempered	-35	33	-28	-26	-11
exact	-11	66	-24	07	04
excitable	75	-12	17	23	06
foolhandy	35	-34	51	11	-32
hostile	00	-08	70	00	19
hyperactive	41	-07	66	11	-05
impatient	35	-06	46	12	53
impetuous	-	-	-	-	-
impulsive	62	-04	46	15	10

Table 62 (Con't)

	Factors				
	I	II	III	IV	V
insensitive	09	-15	74	-26	18
irresponsible	00	-46	64	-13	-01
lively	86	-01	20	21	03
"look before leap"	-45	50	-26	05	-02
methodical	-	-	-	-	-
moody	-15	-08	35	19	68
motivated	32	71	-20	02	11
naughty	42	-43	52	08	14
optimistic	51	33	02	-11	-13
orderly	-15	69	-10	-07	-11
outgoing	85	06	14	-08	05
passive	-75	-15	03	-11	18
persistent	33	54	-02	12	19
quick	59	50	06	09	05
quiet	-85	10	-22	07	-07
rash	68	-23	43	08	-07
reflective	-04	80	-03	08	-01
reliable	04	70	-30	-05	00
reserved	-75	08	-15	17	-08
responsive	39	58	06	-07	-06
restless	49	-39	35	23	07
rigid	-65	-02	35	10	-24
self-sufficient	31	56	03	-27	10
solitary	-62	-05	19	01	46
spiteful	06	-14	75	04	25
stable	06	60	-17	-45	-23
systematic	06	83	-06	-09	-15
talkative	78	03	15	07	01
"think before jump"	-26	60	-12	-07	-08
thoughtful	09	76	-18	-09	04
touchy	-19	-10	56	46	-17
troublesome	17	-36	68	12	21
unpredictable	21	-30	38	32	30
unsociable	-53	-05	54	01	31
untidy	15	-57	12	11	16
vigorous	71	10	27	02	-04

The second factor explained about 27.7% of the variance after the rotation of the ten factors. Variables with high positive loadings were systematic, reflective, contemplative, orderly and thoughtful. The loadings were in the mid-.50 to the .80 region. The adjectives with high negative loadings were "untidy" and "disorganized". These adjectives described the characteristics of a "good" pupil, a paragon child perhaps. This is labelled the "Good" factor.

Factor III is clearly a Psychoticism factor. It accounted for nearly 10% of the variance. Nearly all the adjectives selected in the original list loaded high on this factor, e.g., spiteful, insensitive, boastful, hostile and so on.

Factor IV is the neuroticism factor. It was unexpected that it contributed only 5.6% to the variance of the final ten factors. Only the adjectives "anxious", "changeable" and "emotional" had a higher loading on this factor than on the other factors.

Variables with high loadings on the other factors were scattered. For example, Factor V was loaded on impatient, solitary and unsociable. Absent-minded and calm loaded on Factor VI, while careless and untidy were loaded on Factor VII. These factors were less defined and did not contain sufficient variables to warrant further discussion.

The factors extracted were revealing in terms of how and in what context teachers rated the adjectives. With the present sample of nursery and infant school children, a lot of emphasis was placed on "activity", followed by a task-oriented "good child" dimension. The neuroticism dimension appeared after Psychoticism in importance; it suggested that the teachers rating on those adjectives (e.g., anxious, moody, stable, etc.) might have found the exercise difficult because they are less sensitive to these qualities in children than to other unfavourable qualities such as naughty, hostile, and cheeky, which are loaded on Psychoticism. Adjectives such as "stable" and "reliable" were considered within the context of a "good child" and not as related to the anxiety category.

This is important in considering the nature of the Nicholson & Gray TRS-N measure, because most of the original list of adjectives were chosen from their scale. A separate factor analysis was performed on those 24 adjectives in the Nicholson & Gray TRS. The table of factors and the loadings is presented in Table 63.

The First Factor explained 52.8% of the variance, and it contained a mixture of adjectives from the Extraversion-Introversion and the Neuroticism Scales of the original TRS. The Second Factor accounted for 28.7% of the variance and contained adjectives such as reliable, responsive and thoughful. The other three factors individually explained less than 10% of the variance. It can be seen that the adjectives making up the TRS-N do not group together in a unitary dimension in the factor structure. Moreover, the adjectives from TRS-E and TRS-N were intermixed in Factor I and II, which casts doubt on the validity of the original TRS.

Table 63 Factor loadings of the 24 Nicholson & Gray's TRS adjectives (decimals omitted)

	Factors				
	I	II	III	IV	V
aggressive (N)	50	-34	20	34	16
anxious (N)	-22	-03	74	10	14
calm	56	36	18	-14	-21
carefree	44	-13	52	-17	-04
careful	-29	61	-16	-03	-12
eventempered (N)	-53	35	08	-10	-16
excitable (EI)	82	-10	01	-08	00
impulsive (EI)	77	-04	10	18	20
lively (N)	86	01	11	-07	-06
moody (N)	09	-18	-20	03	70
optimistic (EI)	38	37	30	-10	-18
outgoing (EI)	79	12	31	-15	-08
passive (EI)	-69	-17	-09	05	40
quiet (EI)	-85	04	-25	11	03
reliable (N)	-06	77	-07	-16	-09
reserved (EI)	-67	04	-32	18	08
responsive (EI)	32	63	15	02	-09
restless (N)	59	-47	04	05	-01
rigid (N)	-47	-12	-14	61	10
stable (N)	-15	67	36	-12	-17
talkative (EI)	77	08	15	-07	-16
thoughtful (EI)	02	72	-07	-13	00
touchy (N)	09	-21	-17	68	10
unsociable (EI)	-29	-14	03	43	63

N = Neuroticism adjectives

EI = Extraversion - Introversion adjectives

Table 64 Means and standard diviations of variables in Factor analysis of Nicholson and Gray's TRS

Variables	X Means	S.D.
aggressive	2.53	1.14
anxious	3.17	.96
calm	3.11	1.14
carefree	3.08	1.15
careful	3.06	1.12
eventempered	3.27	1.15
excitable	2.90	1.21
impulsive	2.90	1.24
lively	2.91	1.13
moody	2.55	.99
optimistic	3.13	.73
outgoing	2.89	.99
passive	3.03	.97
quiet	3.07	1.16
reliable	3.14	1.01
reserved	3.20	1.15
responsive	3.13	.97
restless	2.98	1.16
rigid	2.37	1.10
stable	3.08	.99
talkative	3.24	1.05
thoughtful	3.19	.99
touchy	2.91	.97
unsociable	2.37	1.11

Discussion with the teachers after the ratings had been done revealed that the teachers found some of the adjectives more difficult to rate than others. Some of them, such as optimistic, did not seem to apply to the behaviour of young children. Although the teachers perceived "optimistic" along the Extraversion dimension, it may not be an appropriate adjective to include in a scale for rating young children.

So far, the subscales that were initially designed (see p.205) have appeared in the factor structure. The proposed reflection-impulsivity subscale is worth noting because most of the adjectives representing the reflective dimension appeared in Factor II, while those signifying impulsiveness, such as "rash", and "impulsive" were loaded more highly on Factor I. Further inspection of the first two factors suggests that whereas the Extraversion factor is concerned with overt activity, the second factor may represent an attitude or approach towards school work. Consequently, reflectivity and impulsiveness may be seen by the teachers as relating to different domains of activities in the children's personality or behavioural repertoire, rather than the opposite poles of a single dimension.

The first study was carried out with children aged 3 to 6 years. It was decided to test the generality of its findings by carrying out a similar study on a sample of older children.

THE SECOND STUDY (New TRS B)

Selection of adjectives

A list of 70 adjectives was used. With the exception of "methodical" and "impetuous" which were replaced by "bright" and "self-sufficient", the adjectives were the same as those used in the First Study.

Methods

Subjects

There were 238 children in this sample, coming from two junior schools. The mean age of the sample was 103.24 months (S.D.=14.98). There were 116 girls with a mean age of 103.78 months (S.D.=16.1) and 122 boys (mean age = 102.79 months, S.D.=14.11). They were pooled from nine classes, ranging from the first to the fourth year of the Junior School, and were rated individually by their class teachers.

Procedure

The procedure and instructions were the same as in Study One.

Results

Although it was suggested to the teachers that they should rate the children on all the adjectives, the teachers in one of the school did not do so. This explains the variety of N values in the table of means and standard deviations of the variables (Table 66).

As regards the factor analysis, the unrated adjectives posed a problem by reducing the number of subjects with complete data, which affected the factor analysis procedures. There are several ways of dealing with the problem, but each method has its inherent limitations. It is possible to factor analyse the data collected from those subjects who were rated on all 70 adjectives. However, this would reduce the original sample from 238 children to 112, and strictly speaking, the proportion of the number of variables to that of subjects then becomes too small for a factor analytical study. The alternative method is to adopt a "pairwise deletion method", which omits data only when either or both of the variables being considered in the correlation are missing. In the procedure, only certain subjects on some variables are left out, and not for all the variables. The computation of other correlation coefficients is retained. This method has the advantage of using the maximum amount of data available, but the disadvantage is that for factor analysis, it cannot ensure that all the coefficients are derived from the same subject, which introduces a possible source of distortion.

Both methods were attempted and they produced slightly different results.

<u>TRS B (N=112)</u>

With a sample of 112 subjects, the factor analysis yielded eleven factors with latent root greater than 1. These factors were rotated orthogonally and the first seven factors are presented in Table 65. The means and standard deviations of the variables are in Table 66.

Table 65 Factor loadings in TRS B (N = 112) (decimals omitted)

	Factors						
	I	II	III	IV	V	VI	VII
absent-minded	-60	20	-20	-10	32	17	-05
action-loving	05	19	50	-05	34	-25	06
aggressive	-19	81	16	-04	08	07	01
analytical	60	22	34	-04	04	10	02
anxious	07	-05	-46	62	-03	09	05
attentive	73	-33	-06	23	-25	-03	-02
blow-off-steam	-15	76	22	03	06	18	08
boastful	-09	62	25	-03	07	13	13
bright	-	-	-	-	-	-	-
bubbling	-12	48	65	06	12	11	13
bully	-13	86	08	03	-03	-04	-01
calm	41	-38	-20	-51	-02	-24	13
carefree	-15	33	64	-33	28	-04	10
careful	78	-20	-24	-01	-10	-14	09
careless	-77	23	16	-01	07	04	08
cautious	57	-43	-28	18	-11	-19	05
changeable	-23	63	16	28	21	31	03
cheeky	-38	77	22	07	08	-12	06
contemplative	75	-16	-11	-03	-09	-02	19
controlled	67	-48	-13	-15	10	-09	-09
daring	-11	45	48	-20	00	-02	01
day-dreaming	05	41	-36	04	60	05	00
disobedient	-49	72	19	05	06	08	08
disorganized	-82	35	01	08	16	-01	09
distractible	-68	49	18	05	17	-07	12
easy-going	-31	32	29	-12	50	-04	21
emotional	-05	24	-05	69	-01	20	05
even-tempered	38	-63	-04	-20	-03	-46	01
exact	85	-29	-14	-09	00	-02	01
excitable	-35	65	45	17	14	-02	05
foolhandy	-37	72	14	00	16	-07	04
hostile	-13	79	-08	16	06	22	-17
hyperactive	-29	54	57	02	-03	06	-02
impatient	-30	69	35	17	-03	18	01
impetuous	-33	66	49	04	07	05	-06
impulsive	-28	73	47	13	10	08	-07

Table 65 (Con't)

	I	II	III	IV	V	VI	VII
insensitive	-32	69	07	-23	-06	11	-10
irresponsible	-54	67	15	-03	21	-01	05
lively	-14	44	74	04	01	01	11
"look before leap"	44	-21	-11	-20	12	05	46
methodical	85	-12	-15	-06	04	-06	19
moody	-05	33	-11	22	01	68	00
motivated	59	-05	-20	29	-01	-13	28
naughty	-42	70	25	-01	14	09	-07
optimistic	16	02	57	-08	03	-33	03
orderly	80	-26	-08	-17	09	-03	06
outgoing	-13	13	84	-03	-17	09	10
passive	09	-32	-49	-03	32	-33	-14
persistent	20	04	19	07	03	04	78
quick	47	16	41	-08	-20	-11	-07
quiet	37	-41	-57	02	08	-11	-17
rash	-54	69	30	09	-04	-02	-01
reflective	84	-22	-08	11	15	-03	-01
reliable	74	-27	15	08	-06	-27	-07
reserved	43	-35	-53	-13	16	-01	-22
responsive	60	-05	34	08	-31	-21	23
restless	-72	37	24	07	-01	03	-03
rigid	13	-32	-36	03	01	-02	04
self-sufficient	-	-	-	-	-	-	-
solitary	15	-07	-64	-03	-10	13	06
spiteful	-43	59	-11	-09	-31	12	00
stable	67	-36	18	-23	14	-35	-04
systematic	84	-18	00	-13	-14	-03	02
talkative	-48	48	43	11	-08	-01	00
"think before speak"	68	-43	-25	-09	20	-05	07
thoughtful	73	-26	-10	04	22	-15	11
touchy	-23	38	-18	30	-04	52	10
troublesome	-44	69	14	19	-13	15	-01
unpredictable	-51	61	00	23	-06	28	-02
unsociable	-06	10	-75	08	08	04	05
untidy	-74	34	16	-02	-16	-26	-07
vigorous	-20	47	68	-01	-11	-08	-10

Table 66 Means and standard deviations of adjectives in TRS B (N = 112)

Variables	$\bar{X}$	S.D.	Variables	$\bar{X}$	S.D.
absent-minded	2.91	1.25	insensitive	2.36	1.13
action-living	3.35	1.01	irresponsible	2.66	1.25
aggressive	2.56	1.17	lively	2.84	1.23
analytical	2.69	1.11	"look before he (she) leaps"	2.91	1.22
anxious	3.14	.96			
attentive	3.06	1.12	methodical	2.77	1.17
blow-off-steam	2.52	1.15	moody	2.51	1.08
boastful	2.32	.99	motivated	3.25	1.04
bubbles	2.71	1.26	naughty	2.62	1.19
bully	2.43	1.21	optimistic	3.13	.76
calm	3.11	1.26	orderly	2.86	1.13
carefree	2.82	1.21	outgoing	2.96	1.02
careful	3.09	1.22	passive	3.04	1.06
careless	3.00	1.12	persistent	3.06	1.11
cautious	3.01	1.20	quick	3.06	1.03
changeable	2.57	1.10	quiet	3.08	1.27
cheeky	2.26	1.25	rash	2.65	1.30
contemplative	2.88	1.04	reflective	3.05	1.17
controlled	3.15	1.16	reliable	3.22	1.12
daring	2.94	1.11	reserved	3.17	1.27
day-dreaming	2.67	1.26	responsive	3.21	1.07
disobedient	2.56	1.22	restless	3.02	1.27
disorganized	2.91	1.21	rigid	2.29	1.16
distractible	3.31	1.29	solitary	2.73	1.19
easy-going	3.07	1.26	spiteful	2.63	1.16
emotional	3.02	1.13	stable	3.23	1.10
even-tempered	3.41	1.24	systematic	2.96	1.14
exact	2.71	1.19	talkative	3.37	1.11
excitable	2.89	1.30	"think before he (she) speaks"	2.95	1.19
foolhandy	2.59	1.35			
hostile	2.42	1.24	thoughtful	3.27	1.07
hyperactive	2.69	1.25	touchy	2.81	1.10
impatient	3.03	1.24	troublesome	2.66	1.36
impetuous	2.83	1.29	unpredictable	2.70	1.21
impulsive	3.03	1.40	unsociable	2.40	1.12
			untidy	2.77	1.24
			vigorous	3.11	1.18

The first factor accounted for 56.5% of the variance after rotation and the variables with the highest loadings are similar to those in TRS A. Exact, systematic, careful, etc. are the adjectives with positive loadings, and disorganized, careless and untidy were the ones with negative loadings. It is a "reflectivity" or "Good Pupil" factor.

The second factor contains most of the adjectives on the hypothesized "Psychoticism" dimension, and it accounts for over 15% of the variance. However, it also includes adjectives such as excitable, impulsive, rash, and talkative. It seems that the teachers in this sample consider impulsiveness to be related to psychoticism.

The "Activity" or "Extraversion" factor in TRS A was replicated in Factor III in the present analysis and it explained only 9% of the variance. There were about twelve variables with high loadings on this factor. And finally, the fourth Factor, explaining 5% of the variance, which can also be called the Neuroticism factor, contains adjectives like emotional, calm and anxious. Some of the hypothesized adjectives such as touchy and moody can be considered to be loaded moderately on this factor.

TRS B (pairwise-deletion) (Table 67)

The factor structure revealed by this procedure is slightly different from TRS B (N=112), but the variables that have high loadings on the factors resembles those on TRS A. The four main factors are replicated, but their respective contribution to

Table 67 Factor loadings in TRS B (with pairwise omission in matrix)

	Factors						
	I	II	III	VI	V	VI	VII
absent-minded	-68	-17	21	15	04	29	11
action-loving	03	62	-09	09	-08	19	10
aggressive	-24	49	32	59	05	-01	06
analytical	56	24	09	05	53	07	-23
anxious	-04	-29	29	09	-13	22	11
attentive	77	-10	-15	-21	-02	-21	-05
blow-off-steam	-20	51	34	53	-18	09	-06
boastful	-15	59	34	23	-01	04	07
bright	-	-	-	-	-	-	-
bubbling	-03	83	16	06	06	02	06
bully	-13	37	10	79	-11	-15	14
calm	45	-32	-37	-23	00	-02	-09
carefree	-14	63	-05	-03	-14	-02	18
careful	81	-20	-14	-06	-04	06	-03
careless	-81	21	12	11	00	-06	03
cautious	35	-47	-20	-14	-13	22	03
changeable	-34	32	57	25	-01	11	-02
cheeky	-30	43	12	61	17	00	11
contemplative	75	-09	-12	01	18	10	-10
controlled	60	-40	-28	-18	-01	19	16
daring	-05	62	10	10	17	-13	-07
day-dreaming	-25	-11	19	33	01	33	52
disobedient	-51	42	43	33	17	12	-07
disorganized	-82	09	15	24	13	17	-06
distractible	-74	30	17	26	06	20	07
easy-going	-16	41	-03	08	-07	01	25
emotional	-10	16	49	05	05	07	00
even-tempered	31	-29	-60	-17	-16	11	-11
exact	84	-23	-11	-11	-04	-01	08
excitable	-34	70	29	24	07	11	03
foolhandy	-29	49	21	30	25	-01	13
hostile	-14	11	34	69	21	-03	-13
hyperactive	-18	57	07	37	23	25	-39
impatient	-28	54	41	24	13	-10	-03
impetuous	-35	67	28	26	20	09	00
impulsive	-32	67	23	28	21	-07	06

Table 67 (Con't)

	I	II	III	IV	V	VI	VII
insensitive	-41	17	19	13	77	-01	02
irresponsible	-69	30	28	16	18	06	23
lively	-20	80	17	13	02	17	-05
"look before leap"	43	-10	-05	-09	-05	17	09
methodical	49	-09	-02	-09	-04	03	86
moody	-16	03	75	10	08	03	-02
motivated	72	03	-01	-01	-06	-14	13
naughty	-48	49	35	40	06	12	-01
optimistic	19	57	-26	-05	-04	16	-01
orderly	83	-11	-13	-23	-04	-02	11
outgoing	05	79	00	-11	04	-15	-15
passive	01	-60	-26	-04	-02	17	07
persistent	52	18	-02	00	-10	-07	-07
quick	53	45	-15	02	18	-19	-04
quiet	35	-70	-21	-15	05	-04	04
rash	-57	49	20	24	35	-06	09
reflective	80	-17	-07	02	19	38	07
reliable	73	-01	-34	-10	-07	-04	-22
reserved	32	-69	-16	-17	-01	00	04
responsive	63	33	-22	-04	-14	-04	-25
restless	-63	42	21	26	05	03	00
rigid	14	-44	-02	-05	14	01	05
self-sufficient	-	-	-	-	-	-	-
solitary	00	-46	09	28	20	32	12
spiteful	-24	09	10	76	-07	05	-06
stable	60	-06	-45	-25	07	-06	-17
systematic	73	-11	-10	07	07	05	37
talkative	-33	68	16	24	-11	02	-01
"think before speak"	74	-31	-09	-15	-03	-04	-02
thoughtful	79	-09	-14	-06	-01	07	07
touchy	-23	06	74	15	01	05	02
troublesome	-45	39	42	44	06	02	-02
unpredictable	-55	23	44	23	29	12	-12
unsociable	-09	-44	15	45	01	21	29
untidy	-76	21	02	15	20	06	07
vigorous	-12	77	06	19	22	-03	02

Table 68 Means and standard deviations of TRS variables (Sample B)

Variables	N	Mean	S.D.
absent-minded	213	2.89	1.23
action-loving	238	3.26	.91
aggressive	208	2.41	1.15
analytical	195	2.65	1.20
anxious	238	3.05	.99
attentive	238	3.07	1.12
blow-off-steam	238	2.76	1.83
boastful	238	2.32	1.02
bright	-	-	-
bubbling	208	2.80	1.14
bully	238	2.00	1.18
calm	238	3.24	1.17
carefree	238	3.04	1.03
careful	238	3.09	1.13
careless	238	2.99	1.07
cautious	238	3.03	..99
changeable	238	2.58	1.01
cheeky	238	1.92	1.19
contemplative	208	2.83	1.22
controlled	207	3.09	.94
daring	238	2.94	.94
day-dreaming	238	2.63	1.31
disobedient	238	2.51	1.11
disorganized	238	2.87	1.19
distractible	238	3.34	1.21
easy-going	238	3.13	1.04
emotional	238	2.89	1.04
even-tempered	238	3.21	1.05
exact	226	2.78	1.15
excitable	238	2.83	1.16
foolhandy	226	2.66	1.11
hostile	238	1.96	1.13
hyperactive	238	2.34	1.22
impatient	238	2.90	1.07
impetuous	238	2.78	1.15
impulsive	238	2.89	1.15

Variables	N	Mean	S.D.
insensitive	198	2.35	1.19
irresponsible	226	2.76	1.17
lively	238	2.84	1.11
"look before he (she) leaps"	195	2.86	1.02
methodical	238	2.96	1.81
moody	238	2.61	0.99
motivated	238	3.24	1.08
naughty	238	2.47	1.11
optimistic	208	3.11	.71
orderly	208	2.93	1.17
outgoing	238	2.98	.97
passive	238	3.00	.97
persistent	238	3.01	1.11
quick	238	2.91	1.01
quiet	238	3.12	1.13
rash	226	2.67	1.17
reflective	165	2.90	1.12
reliable	238	3.13	1.06
reserved	208	3.23	1.18
responsible	238	3.12	.98
restless	208	2.89	1.20
rigid	177	2.37	1.10
self-sufficient	-	-	-
solitary	208	2.49	1.23
spiteful	238	2.10	1.16
stable	238	3.20	1.04
systematic	226	2.77	1.17
talkative	238	3.16	1.04
"Think before he (she) jumps"	238	3.00	1.16
thoughtful	208	3.19	1.08
touchy	238	2.87	.98
troublesome	238	2.48	1.21
unpredicable	238	2.75	1.14
unsociable	208	2.19	1.15
untidy	238	2.83	1.14
vigorous	208	2.98	1.03

the variance varies from the previous analysis. The first factor is the "Good pupil" factor, and variables such as orderly, reflective, exact, and systematic are among the ones that load consistently highly on this factor. It accounts for more than half of the variance. The second factor is the "Extraversion" factor, explaining 17% of the variance. One reason why the first sample had the order of these two factors reversed may be that the teachers of the older children placed more emphasis on task-oriented behaviours than on physical activity.

The order of the third and fourth factor is also different from TRS A and TRS B (N=112). Neuroticism was the third factor, whereas Psychoticism ranked fourth, and they accounted for 8.2% and 3.9% of the variance respectively.

At this stage of the analysis, it was decided that a third factor analysis would be carried out. Although the order of the factors varied with the two samples of children, the replicability of the dominant factors and the consistency of some of the adjectives with high loadings on these factors suggested that the two samples could be combined. This would increase the size of the sample, and the factor analysis of the results would provide a firmer basis for deciding which adjectives and dimensions should make up the New Teacher's Rating Scale.

TRS A and TRS B combined analysis

The combined sample contained 352 children (181 male and 171 female). The mean age was 78.42 months (S.D.=27.24). The number of adjectives was 68. The method of factor analysis was similar to the previous analysis. The initial factor structure produced ten factors with latent root greater than 1 and they were rotated orthogonally. The loadings and the factor structure are presented in Table 69 and the means and standard deviations of the adjectives are in Table 70.

The four factors already mentioned were clearly identifiable among the first four factor, which together contributed 88% of the variance.

Factor I was the "Good pupil" factor, Factor II was the "Extraversion" factor, and Factors III and IV were labelled "Psychoticism" and "Neuroticism" respectively. The percentage of variance explained by these factors ranged accordingly from 52% for the first factor, then 22%, 9.1% and to 5.2% for Factor IV. Some degree of "factor invariance" (Peterson, 1961) had been demonstrated, since the factors were similar in samples of different size and age.

<u>The New Teacher's Rating Scale</u> (New TRS or NTRS)

The four main factors from the subscales which make up the New TRS. The adjectives which comprise the subscales are selected on the basis that they have high loadings on the combined factor analysis of Samples A and B, and also have high loadings on one of the two samples in isolation. An adjective was chosen for a subscale only when it had the highest loading on that particular factor, and this was based on the factor structure of the combined TRS-A and TRS-B factor analysis.

Table 69 Factor loadings TRS A and B (decimals omitted)

	Factors						
	I	II	III	IV	V	VI	VII
absent-minded	-50	-18	20	09	48	10	19
action-loving	05	63	18	-06	06	-02	03
aggressive	-25	26	72	05	04	09	08
analytical	59	36	09	03	-12	11	-10
anxious	03	-41	-13	58	03	07	-02
attentive	67	-03	-33	10	-35	07	09
blow-off-steam	-18	32	67	13	-03	-05	-09
boastful	03	26	66	-07	02	21	-11
bright	-	-	-	-	-	-	-
bubbling	02	78	19	13	05	09	-07
bully	-11	21	77	00	-01	-20	10
calm	35	-29	-32	-47	-05	-12	08
carefree	-18	59	19	-34	16	04	-04
careful	68	-24	-24	01	-15	-08	03
careless	-66	16	28	-03	08	01	10
cautious	36	-56	-32	07	-04	-04	-02
changeable	-19	21	55	57	11	-06	-25
cheeky	-25	40	65	10	07	12	13
contemplative	77	-08	-11	-04	03	02	-02
controlled	62	-28	-34	-29	-04	-05	-03
daring	-06	59	37	-09	-08	-05	02
day-dreaming	-14	-41	13	11	53	14	-01
disobedient	-42	29	68	04	08	09	-06
disorganized	-68	08	37	08	18	02	07
distractible	-57	23	48	11	22	-09	-05
easy-going	-12	44	10	-15	27	-16	05
emotional	-05	03	10	69	02	02	08
even-tempered	36	-28	-31	-39	-04	-18	05
exact	75	-15	-27	-03	-03	04	-09
excitable	-23	69	34	25	12	01	04
foolhandy	-36	31	58	06	06	-22	00
hostile	-12	00	74	14	17	10	11
hyperactive	-17	49	58	04	01	00	-09
impatient	-17	37	56	21	07	36	19
impetuous	-	-	-	-	-	-	-
impulsive	-17	59	56	18	02	09	03

	I	II	III	IV	V	VI	VII
insensitive	-25	11	68	-21	02	24	-14
irresponsible	-50	11	62	-07	19	-04	-12
lively	-05	84	25	12	-02	07	-05
"look before leap"	51	-27	-26	-04	11	04	-20
methodical	-	-	-	-	-	-	-
moody	-07	-13	34	35	12	54	02
motivated	67	14	-09	14	-07	-05	25
naughty	-42	38	59	10	11	09	03
optimistic	27	53	02	-23	-08	-12	06
orderly	75	-13	-17	-13	-02	-04	-16
outgoing	-01	83	12	-09	-14	12	04
passive	-05	-69	-08	-13	17	06	03
persistent	41	31	01	10	-04	08	03
quick	49	50	10	-03	-28	03	03
quiet	20	-78	-28	00	01	-10	-07
rash	-38	59	51	12	-02	-04	-01
reflective	81	-10	-08	01	10	-05	10
reliable	71	04	-28	-08	-16	-04	13
reserved	24	-71	-19	01	05	-08	-05
responsive	61	33	02	-07	-28	-03	12
restless	-55	44	33	16	-01	01	-03
rigid	05	-55	01	01	-08	-04	-50
self-sufficient	-	-	-	-	-	-	-
solitary	01	-66	11	04	08	38	08
spiteful	-28	-01	72	02	-18	13	12
stable	62	04	-20	-45	00	-22	15
systematic	82	00	-11	-14	-12	-03	-07
talkative	-19	72	25	11	-06	-01	05
"think before jump"	66	-29	-25	-13	13	-01	-07
thoughtful	77	-01	-18	-04	11	-01	08
touchy	-15	-16	37	44	-09	-04	-31
troublesome	-40	19	65	18	-05	16	-04
unpredictable	-42	18	47	39	08	18	06
unsociable	-05	-60	38	04	08	28	-07
untidy	-67	18	18	03	-15	05	09
vigorous	-04	70	35	-02	-14	-08	08

Table 70 Means and standard deviations of variables in TRS A TRS B combined analysis (N = 352)

Variables	$\bar{X}$	S.D.	Variables	$\bar{X}$	S.D.
absent-minded	2.76	1.15	insensitive	2.39	1.01
action-loving	3.27	1.05	irresponsible	2.47	1.05
aggressive	2.37	1.07	lively	2.98	1.10
analytical	2.83	1.02	"look before he		
anxious	3.15	.96	(she) leaps"	3.03	.98
attentive	3.13	1.07	moody	2.67	.99
blow-off-steam	2.46	1.07	motivated	3.15	.93
boastful	2.34	1.05	naughty	2.57	1.03
bubbling	2.80	1.07	optimistic	3.05	.66
bully	2.15	1.10	orderly	2.98	.95
calm	3.01	1.05	outgoing	2.97	1.00
carefree	2.85	.91	passive	2.82	1.01
careful	3.02	.96	persistent	3.09	.94
careless	2.90	.94	quick	3.00	.89
cautious	3.04	.99	quiet	3.03	1.11
changeable	2.65	.98	rash	2.70	1.04
cheeky	2.25	1.09	reflective	3.01	.88
contemplated	2.97	.91	reliable	3.16	.93
controlled	3.09	.91	reserved	3.00	1.01
daring	2.84	1.02	responsive	3.17	.91
day-dreaming	2.85	1.12	restless	3.03	.99
disobedient	2.58	1.10	rigid	2.57	.97
disorganized	2.85	1.01	solitary	2.63	1.12
distractible	3.16	1.13	spiteful	2.23	1.08
easy-going	2.94	.96	stable	3.01	.88
emotional	2.99	.86	systematic	2.99	.90
even-tempered	3.14	.95	talkative	3.33	1.01
exact	2.99	1.07	"think before he		
foolhandy	2.43	1.09	(she) speaks"	3.05	.90
hostile	2.02	1.09	thoughtful	3.24	.91
hyperactive	2.57	1.09	touchy	2.80	1.00
impatient	2.81	1.09	troublesome	2.51	1.18
impulsive	2.90	1.11	unpredictable	2.78	.96
			unsociable	2.37	1.08
			untidy	2.88	1.03
			vigorous	2.94	1.02

It was intended that the subscales should cover a fair representation of the adjectives while the scales remained manageable to the teacher carrying out the rating. Since the number of adjectives with high loadings on Factors III and IV were less than those on Factors I and II, the number of adjectives under each subscales was different.

The content of the New TRS is listed below:

Good Pupil or Reflectivity Subscale (NTRS-G): attentive, careful, contemplative, disorganized, exact, motivated, orderly, reliable, reflective, responsive, systematic, thoughtful. (12 items)

Extraversion Subscale (NTRS-E): action-loving, bubbling, daring, excitable, impulsive, lively, outgoing, passive, quiet, reserved, talkative, vigorous. (12 items)

Neuroticism Subscale (NTRS-N): anxious, changeable, emotional, eventempered, moody, touchy. (6 items)

Psychoticism Subscale (NTRS-P): aggressive, bully, cheeky, hostile, spiteful, troublesome. (6 items)

The format for administration and the rating forms conform with that already described. However, since some of the adjectives are negatively loaded on the subscales, it is necessary to correct the raw scores for the following adjectives to produce a composite score for each subscale: disorganized, passive, quiet, reserved and eventempered, so that a score of 5 means "not at all" and a score of 1 means "very".

The new TRS was administered to a third sample of children, from which the test-retest reliabilities of the items were calculated.

THIRD STUDY (New TRS- Sample C)

Subjects and raters

The third sample were the children from two classes at St. Dunstan's Junior School. There were altogether 68 children (26 boys and 42 girls) who were rated on both occasions. Their mean age was 115.83 months (S.D.=7.98). The means and standard deviations obtained by the subjects are presented in Table 71.

The test-retest reliability on the individual items (Table 72) ranged from .43 to .87, and all of them were significant at the .001 level. The test-retest reliability coefficients for the four subscales were: Good pupils subscale = .92, Extraversion subscale = .82, Neuroticism subscale = .75 and Psychoticism subscale = .82. All the correlations were significant at .001 level.

Data for all three samples were pooled. These included data obtained from children in sample C being rated on the first occasion of the TRS, and from Samples A and B.

Standardization norms of the New TRS

The new TRS with 36 adjectives forming four subscales was standardized on 550 children. Some of the items were omitted by some teachers, so that 477 children (241 boys and 236 girls) had complete scores on all the adjectives. The mean age of the latter sample was 87.49 months (S.D.=28.25). The mean age of the boys was 88.42 months (S.D.=30.14) and that of the girls was 86.55 months (S.D.=26.21). The ratings were provided by twenty teachers in six schools.

Table 71 Means and standard deviations of variables in Test-retest correlation of New TRS (N = 68)

(* = scoring of variables reversed, see p. 229)

Variables	Test X	Test S.D.	Retest X	Retest S.D.
action-loving	3.29	.90	3.10	.88
aggressive	2.72	.96	2.76	1.02
anxious	2.94	.81	2.81	.81
attentive	3.37	.99	3.09	.87
bubbling	2.89	.88	2.89	.90
bully	2.29	.97	2.63	1.01
careful	3.32	1.00	3.07	.96
chargeable	2.65	.82	2.70	.88
cheeky	2.59	1.09	2.92	.97
contemplative	3.06	.86	3.13	.81
daring	2.98	.84	3.10	.81
disorganized*	3.18	.89	3.15	.96
emotional	3.09	.68	2.97	.77
eventempered*	2.78	.98	2.86	.85
exact	3.27	1.03	3.12	.95
excitable	3.07	.97	3.03	.83
hostile	2.04	.76	2.53	.68
impulsive	2.91	1.05	2.97	.97
lively	3.13	.81	3.02	.83
moody	2.92	.74	2.88	.76
motivated	3.05	.99	3.07	.87
orderly	3.31	1.05	3.10	.93
outgoing	3.21	1.07	3.01	.87
passive*	2.96	.85	2.97	.91
quiet*	3.06	1.02	3.11	.99
reflective	3.19	.90	3.19	.87
reliable	3.48	1.03	3.25	.92
reserved*	2.87	1.02	3.17	1.00
responsive	3.37	.93	3.17	.77
spiteful	2.22	.96	2.73	.72
systematic	3.10	1.08	3.04	1.01
talkative	3.28	1.04	3.22	.98
thoughtful	3.33	.94	3.16	.92
touchy	2.89	.90	2.91	.84
troublesome	2.43	.97	2.79	.94
vigorous	3.07	.87	3.04	.94

Table 72 Test-Retest coefficients of the New TRS adjectives (N = 68)

Good/Reflective Scale	r	Activity Scale	r
attentive	.67	action-loving	.64
careful	.75	bubbling	.55
contemplative	.55	daring	.68
disorganized	.80	excitable	.54
exact	.80	impulsive	.65
motivated	.76	lively	.64
orderly	.79	outgoing	.78
reflective	.43	passive	.69
reliable	.56	quiet	.64
responsive	.57	reserved	.69
systematic	.87	tackative	.67
thoughtful	.71	vigorous	.64

Neurotic Scale	r	Psychoticism Scale	r
anxious	.64	aggressive	.69
changeable	.53	bully	.73
emotional	.48	cheeky	.62
eventempered	.70	hostile	.50
moody	.49	spiteful	.75
touchy	.64	troublesome	.59

(The Pearson correlation coefficient are all significant at .001 level).

The rating of each adjective was on a point five-point scale from not at all (1) to very (5), with five adjectives rated in the reversed directions. The means and standard deviations of the individual items are presented in Tables 73 to 75.

The score for each subscale is the sum of the scores of all the adjectives. But in view of the fact that the means and standard deviations of the adjectives are different, the Z-score of each adjective was calculated for each subject by the formula $\frac{\text{raw score}}{\bar{x}}$ X S.D., using the means and standard deviations of the standardization sample in Table 73. Thus the subscale scores can also be represented as the sum of the Z-scores of the items on the subscales. The means and standard deviations of the subscale scores are shown in Table 76.*Note Unless otherwise specified, the subscale scores reported from now on are the standard scores (Z-scores). The Z-scores for both male and female subjects were derived from the same set of means and standard deviations. But referring to Tables 76b and 76c, some difference in sex may be worth noting. T-tests on the means of the Z-scores indicated that boys were being rated significantly lower than girls on TRS-G (t=-5.76, p=.001), and higher than girls on TRS-E (t=4.78, p=.001) and TRS-P (t=4.29, p=.001). The means of the Z-scores on Neuroticism do not differ statisfically between boys and girls.

---

*Note: Other methods to convert the scores to form the subscales were considered. Apart from using raw scores and Z-scores, factor scores could also be used.

Table 73 Means and Standard Deviations of the New TRS variables in entire standardization sample

Items	N	$\overline{X}$	S.D.
Good Subscale			
attentive	550	3.15	1.08
careful	550	3.07	1.00
contemplative	520	2.95	1.02
*disorganized	550	3.16	1.04
exact	538	2.94	.99
motivation	550	3.16	.99
orderly	520	3.03	1.02
reflective	477	2.99	.91
reliable	550	3.18	.97
responsive	550	3.17	.91
systematic	538	2.92	1.00
thoughtful	520	3.23	.96
Activity Subscale			
action-loving	550	3.26	.99
bubbling	520	2.83	1.03
daring	550	2.89	0.95
excitable	550	2.95	1.06
impulsive	550	2.87	1.06
lively	550	2.97	1.05
outgoing	550	3.01	1.00
*passive	550	3.12	.97
*quiet	550	2.95	1.07
*reserved	520	2.93	1.03
talkative	550	3.23	1.01
vigorous	520	2.94	.96
Neurotic Subscale			
anxious	550	3.07	.96
changeable	550	2.64	.96
emotional	550	2.95	.87
*eventempered	550	2.87	.93
moody	550	2.71	.95
touchy	550	2.84	.96
Psychoticism Subscale			
aggressive	520	2.39	1.07
bully	550	2.05	1.09
cheeky	550	2.15	1.13
hostile	550	1.91	1.02
spiteful	550	2.09	1.07
troublesome	550	2.46	1.13

(*variables scored in reversed direction)

Table 74 Standardization Norms of the New TRS (Male)

Items	N	Mean	S.D.
Good/Reflection Subscale			
attentive	272	2.87	1.05
careful	272	2.77	.92
contemplative	257	2.76	1.01
*disorganized	272	2.87	1.04
exact	272	2.63	.95
motivated	272	3.01	1.01
orderly	257	2.75	.97
reflective	241	2.84	.95
reliable	272	2.92	1.00
responsive	272	3.07	.94
systematic	272	2.71	1.00
thoughtful	257	3.13	1.02
Activity Subscale			
action-loving	272	3.47	1.02
bubbling	257	2.95	1.06
daring	272	3.07	.97
excitable	272	3.17	1.10
impulsive	272	3.05	1.09
lively	272	3.14	1.11
outgoing	272	3.08	1.03
*passive	272	3.22	1.02
*quiet	272	3.15	1.10
*reserved	257	3.11	1.07
talkative	272	3.36	1.03
vigorous	257	3.12	1.02
Neurotic Subscale			
anxious	272	3.00	1.01
changeable	272	2.79	1.00
emotional	272	2.99	.90
*eventempered	272	3.01	.92
moody	272	2.71	1.00
touchy	272	2.88	.97
Psychoticism Subscale			
aggressive	257	2.63	1.07
bully	272	2.24	1.15
cheeky	272	2.32	1.21
hostile	272	2.03	1.07
spiteful	272	2.14	1.08
troublesome	272	2.67	1.20

(* items scored in reversed direction)

Table 75 Standardization norms of the New TRS (Female)

Items	N	$\bar{X}$	S.D.
Good/Deflective Scale			
attention	278	3.43	1.03
careful	278	3.37	.97
contemplative	263	3.13	.99
*disorganized	278	3.44	.96
exact	266	3.24	.92
motivated	278	3.30	.95
orderly	263	3.30	1.00
reflective	236	3.14	.85
reliable	278	3.42	.88
responsive	278	3.27	.87
systematic	266	3.14	.97
thoughtful	263	3.33	.88
Activity Scale			
action-loving	278	3.05	.91
bubbling	263	2.71	.99
daring	278	2.71	.89
excitable	278	2.75	.97
impulsive	278	2.69	1.00
lively	278	2.81	.96
outgoing	278	2.95	.96
*passive	278	3.03	.90
*quiet	278	2.76	1.02
*reserved	263	2.70	.96
talkative	278	3.12	.98
vigorous	263	2.77	.87
Neurotic Subscale			
anxious	278	3.14	.91
changeable	278	2.48	.91
emotional	278	2.91	.84
*eventempered	278	2.75	.92
moody	278	2.71	.91
touchy	278	2.79	.95
Psychoticism Scale			
aggressive	263	2.17	1.02
bully	278	1.87	1.00
cheeky	278	1.98	1.03
hostile	278	1.81	.95
spiteful	278	2.04	1.05
troublesome	278	2.75	1.02

(*items scored in reversed direction)

Table 76a Mean scores of the New TRS - entire sample (N = 477)

Subscales	Raw score		Z-score	
	X	S.D.	X	S.D.
NTRS-G	36.59	9.00	-0.041	9.11
NTRS-E	36.79	9.69	0.133	9.59
NTRS-N	17.33	3.57	0.065	3.88
NTRS-P	14.10	5.28	0.517	4.85

Table 76b Mean scores of the New TRS - Male (N = 241)

Subscales	Raw score		Z-score	
	X	S.D.	X	S.D.
NTRS-G	34.44	8.93	-2.344	9.10
NTRS-E	38.71	9.82	2.146	9.84
NTRS-N	17.64	3.75	0.374	4.13
NTRS-P	14.93	5.49	1.387	5.08

Table 76c Mean scores of the New TRS - Female (N = 236)

Subscales	Raw score		Z-score	
	X	S.D.	X	S.D.
NTRS-G	38.92	8.50	2.310	8.52
NTRS-E	34.69	9.11	-1.921	8.90
NRTS-N	16.99	3.33	-0.251	3.59
NTRS-P	13.19	4.90	-0.372	4.43

Inter-scale correlation

The inter-scale correlation coefficients ranged from .13 to .57 (Table 77). NTRS-G was negatively correlated with the three other subscales, which were positively related to one another. This may support Eysenck and Cookson's (1969) claim that teachers' rating cannot produce results that are factorially independent.

Table 77 Inter-scale correlations (N=477)

NTRS		G	E	N	P
	G	-	-.24	-.36	-.45
	E		-	.23	.57
	N			-	.52
	P				-

(correlation coefficients all significant at .001 level)

Test-retest reliability

Test-reliability on the raw scores of the New TRS was reported in the Third Study. The reliability can be considered satisfactory.

Inter-rater reliability

The organization of the schools did not provide an opportunity for inter-rater reliability to be assessed. Each class was taught by one form teacher who was responsible for teaching most of the school subjects, so there was no other teacher who knew the child as well as the class teacher at the time of the rating to provide ratings for inter-rater comparison.

Factor structure of the New TRS

The scores of 36 adjectives from 477 subjects were factorized by principal component method, with Kaiser normalization, and the factors were rotated orthogonally by the varimax method as in all the factor analyses so far reported.

Four factors with latent roots more than 1 were rotated. The first factor accounted for 57.7% of the variance after rotation, the others accounted for 26.3%, 10.7% and 5.3% respectively (Tables 78 and 79).

Factor I was the Extraversion factor. All twelve adjectives of the Extraversion subscale had the highest loadings on this factor. Factor II was the "Good Pupil" factor, and again the twelve adjectives of the subscale loaded highly on this. Psychoticism was the third factor. The six Psychoticism adjectives loaded on this, but so does "changeable", which was an item of the Neuroticism subscale. In fact, "changeable" has a higher loading on the Psychoticism factor than on the Neuroticism factor. This is unexpected, as is the finding that the adjective "eventempered" has the same loading on the Psychoticism and the Neuroticism subscales. These findings were not anticipated when the adjectives were originally selected, and it is unlikely that they result from the teachers' perception of the adjectives

Table 78 Factor loadings of entire sample of the New TRS
(N = 477) (decimals omitted)

	Factors I	II	III	IV
action-loving	61	07	09	-15
aggressive	41	-21	68	01
anxious	-36	07	-08	54
attentive	-07	74	-29	06
bubbling	80	05	08	09
bully	36	-14	71	-03
careful	-27	72	-18	-03
chargeable	32	-31	42	32
cheeky	48	-18	58	07
contemplative	-10	72	-06	01
daring	64	-05	29	-19
disorganized	20	-69	30	15
emotional	14	-04	12	65
eventempered	-36	32	-39	-39
exact	-22	77	-17	-02
excitable	74	-24	23	20
hostile	11	-15	74	14
impulsive	69	-23	41	15
lively	86	-07	14	05
moody	-02	-16	38	44
motivated	12	69	-10	02
orderly	-21	76	-14	-15
outgoing	86	-01	03	-06
passive	-72	-03	-04	-09
quiet	-81	24	-17	02
reflective	-10	82	-03	00
reliable	-05	73	-27	-12
reserved	-74	21	-12	00
responseive	36	62	-08	-05
spiteful	15	-22	69	06
systematic	-08	83	-03	-15
talkative	74	-21	18	11
thoughtful	-04	77	-12	-05
touchy	-06	-16	46	47
troublesome	33	-41	57	22
vigorous	74	-03	26	-09

Table 79 Means and standard deviations of variables in Factor of the New TRS (entire sample) (N = 477)

Variables	X	S.D.
action-loving	3.28	1.03
aggressive	2.45	1.07
anxious	3.11	.95
attentive	3.15	1.06
bubbling	2.81	1.05
bully	2.21	1.08
careful	3.06	.97
changeable	2.67	.95
cheeky	2.25	1.12
contemplative	2.92	.98
daring	2.87	.97
disorganized	2.85	1.02
emotional	2.95	.86
eventempered	3.14	.96
exact	2.94	.96
excitable	2.99	1.05
hostile	1.98	1.05
impulsive	2.87	1.08
lively	3.01	1.05
moody	2.71	.95
motivated	3.13	.96
orderly	3.00	.98
outgoing	2.99	1.02
passive	2.87	.97
quiet	3.02	1.08
reflective	2.99	.91
reliable	3.18	.95
reserved	3.05	1.02
responsive	3.17	.90
spiteful	2.28	1.05
systematic	2.95	.95
talkative	3.28	1.01
thoughtful	3.23	.91
touchy	2.84	.96
troublesome	2.51	.98
vigorous	2.94	.98

n the last sample (Sample C), given that there were only 72 subjects in that sample. However, there is evidence that teachers may have more difficulty in using adjectives describing Neuroticism, and the ratings may vary from sample to sample.

The factor structure yielded by the present analysis agrees with that obtained by Hallworth (1966). he first three factors are somewhat reminiscent of the three factors of meanings, namely, evaluation, activity and potency (Osgood, 1953). Hallworth (1966) also found a fourth factor of emotionality. One might suggest that the teacher's ratings and Osgood's meanings could belong to part of the same universe.

Relationship of the New TRS to other measures of personality

The results to be reported in this section are the correlations between the standard scores of the New TRS and some self-rated measures of personality. These measures include the Cattell's Children Personality Questionnaire (CPQ), the Junior Eysenck Personality Inventory (JEPI) and the Eysenck Personality Questionnaire-Junior (EPQ).

The New TRS and the CPQ

The CPQ (1963 edition) was given to 221 children (in samples B and C) who had been rated on the New TRS. The CPQ provides a quantitative assessment of fourteen personality factors (Porter & Cattell, 1959; Porter & Cattell, 1968). The form is divided into a Form A and a Form B, which can be used separately or jointly. Each form contains two parts, to be administered on separate occasions, and the scores are combined to provide the score for each factor. Each form has eight items for each scale and the subject is asked to make a choice between two statements, marking the one which describes his/her behaviour best. The fourteen factors and their brief description are shown in Figure 17. Although it has been suggested that Cattell has extracted too many factors (Howarth, 1976), the CPQ has the advantage of providing a measure of factors useful for the understanding of specific traits and there is a formula for calculating two higher order factors: Anxiety (ANX) and Exvia (EXT), which is related to the Neuroticism and Extraversion-Introversion dimensions in the Eysenckian paradigm.*Note

Although the test has widely been used, there are no standardization data on this test for the British population (Nicholson & Shapland, unpublished). The raw scores are converted into sten scores, and so far British workers have had to use the norms provided for by an American sample (Porter & Cattell, 1968). The same problem applies to the calculation of the two higher order factors because there are no equations derived from factor analysis of the sten scores of British children for the calculation of Exvia and Anxiety. There have

---

*Note: The formula for the calculation of Anxiety and Exvia factors using Cattell's primary factors are:
Anxiety = .2 (D+O+Q4-Q3)-.1(C+H)+4.4,
Exvia = .33 (A+F+H)+.06,
where D, O, Q4, etc. refer to the Factor names in Cattell's Personality Questionnaire.
(See Porter & Cattell, 1968).

been reports from studies dealing with other Cattellian scales that British and American children differ on some of the measures (Butcher, Ainsworth & Nisbett, 1963), but the same has not been confirmed for the CPQ. There are some data on the performance of British children on the CPQ (Reddy, unpublished; Nicholson & Shapland, unpublished), but due to the varied sizes of the samples and the difference in the method of administering the test, e.g., attempts to change the wordings, etc., it would appear that more work is required to acquire standardization norms for the British children. Given the present situation, there is no choice but to use the American norms for scoring, while exercising caution in interpreting the results.

Nicholson & Shapland (unpublished) suggested that some of the CPQ items should be paraphrased for the benefit of the British children. The present study adopted the same strategy. Moreover, apart from linguistic alterations, some of the situations described in the CPQ were unfamiliar to the British children, so it was decided to redefine the questions for the subjects. The corrections and elaboration of the CPQ are shown in Appendix 17.

The CPQ can be administered individually or in groups. In the present study, the CPQ was given to the children in groups and each question was read aloud. This helped to control the pace at which the children answered the questions. Moreover, although the children were eight years old or above, it was suggested that their reading ability might not enable them to understand all the questions. Consequently, it was decided to read the questions aloud.

Figure 17 The Cattell's Personality Questionnaire
(Form A: adapted from 1963 and 1968 edition)

Scores range between 0 and 10

FACTORS	LOW SCORE Vs	HIGH SCORE
A	SCHIZOTHYMIA RESERVED, detached, cool	CYCLOTHYMIA OUTGOING, participating, easygoing
B	LOW LESS INTELLIGENT, concrete thinking, lower scholastic mental capacity	HIGH MENTAL CAPACITY MORE INTELLIGENT, abstract thinking, higher scholastic mental capacity
C	EGO WEAKNESS EMOTIONALLY UNSTABLE, easily upset, changeable	EGO STRENGTH EMOTIONALLY STABLE, faces reality, calm
D	PLACIDITY OF TEMPERAMENT PHLEGMATIC, inactive, stodgy	EXCITABILITY EXCITABLE, impatient, demanding, overactive
E	SUBMISSIVENESS OBEDIENT, conforming, submissive	DOMINANCE ASSERTIVE, independent, aggressive, stubborn, dominant
F	DESURGENCY SOBER, prudent, serious, taciturn	SURGENCY HAPPY-GO-LUCKY, lively, gay, enthusiastic, heedless
G	SUPER EGO WEAKNESS EXPEDIENT, disregards rules, bypasses obligations	SUPER EGO STRENGTH CONSCIENTIOUS, persevering, rule-bound
H	THRECTIA SHY, restrained, diffident, timid	PARMIA VENTURESOME, socially bold, uninhibited, spontaneous
I	HARRIA TOUGH-MINDED, self-reliant, "no-nonsense"	PREMSIA TENDER-MINDED, dependent, overprotected, sensitive
J	ZEPPIA VIGOROUS, goes readily with group, zestful	COASTHENIA CIRCUMSPECT, individualistic, unwilling to act with group
N	NAIVETÉ FORTHRIGHT, natural, artless, sometimes naive	SHREWDNESS SHREWD, astute, calculating

Figure 17 (Con't)

O	UNPERTURBED ADEQUACY SELF-ASSURED, secure, serene	GUILT PRONENESS APPREHENSIVE, worrying, insecure
Q_3	WEAK SELF-SENTIMENT CASUAL, careless of social rules, untidy, follows own urges	STRONG SELF-SENTIMENT CONTROLLED, socially precise, self-disciplined, high social awareness
Q_4	LOW ERGIC TENSION RELAXED, unfrustrated, tranquil	HIGH ERGIC TENSION TENSE, fretful, overwrought

Product moment correlations were performed by the SPSS programme (Nie, et al., 1975). The means and standard deviations of the variables are shown in Table 80 and the correlations in Table 81.

The mean age of the present sample was 108.4 months, similar to that of the children in Nicholson & Shapland's study (unpublished). The scores obtained by their sample 1 and sample 3 were fairly similar to the CPQ scores of the present sample. The Anxiety and Exvia scores calculated here were also similar to those obtained by samples 1 and 3.

The correlations between the CPQ and New TRS variables were low to moderate, but there were several significant correlations (two tailed). The "Good pupil" subscale (NTRS-G) had the highest correlation with Factor B (Intelligence) (r=.46, p=.001). NTRS-G was also positively correlated with Factors A (Schizothymia vs. Cyclothymia), H (Threctia vs Parmia) I (Harria vs Premsia) and Q3 (Weak self-sentiment vs Strong self-sentiment). This indicates that a high score on NTRS-G is related to being outgoing and participating, socially spontaneous, while at the same time being controlled and disciplined. The positive relation with Factor I suggests that the "good" child is also sensitive, possibly due to an overprotected upbringing, according to Cattell's definition (Porter & Cattell, 1968). NTRS-G was negatively correlated with Factors D (Placidity of temperament vs Excitability), E (Submissiveness vs Dominance), F (Desurgency vs Surgency), J (Zeppia vs Coasthenia), N (Naivete vs Shrewdness), O (Unperturbed adequacy vs Guilt proneness) and

Q4 (Low ergic tension vs High ergic tension). This means that scoring highly on NTRS-G tends to be associated with qualities such as being prudent and obedient, patient and self-assured, as well as being socially forthright and willing to go along with the group. It is understandable that these qualities are appreciated by the school teachers. NTRS-G also correlates negatively with ANX and EXT, but only the correlation with ANX is significant (r=-.32, p=.002).

The positive correlation between NTRS-E and Factor D (r=.26, p=.002), E (r=.17, p=.012) and F (r=.24, p=.002) confirms that NTRS-E represents a measure of activity or extraversion. It is also related to Factor I (r=-.19, p=.006) which suggests that a high NTRS-E scores is connected with the tough-minded end of the dimension. NTRS-E has a positive and significant correlation with EXT (r=.17, p=.010).

Most of the significant correlations between the Psychoticism subscale (NTRS-P) and the CPQ involved the same CPQ measures that correlated significantly with NTRS-E (Factors D, E, F and I). NTRS-P is also related to Factor N (r=.16, p=.020), indicating that a high Psychoticism score is accompanied by shrewdness. The main difference between NTRS-E and NTRS-P lies in their correlations with ANX and EXT. Whereas NTRS-E is significantly correlated with EXT and hardly with ANX (r=.06, p=.376), NTRS-P is correlated to more or less the same degree with ANX and EXT, .15 and .13 respectively and the former at p=.030.

Table 80 Means and standard deviations of New TRS and CPQ variables (N = 221)

		X	S.D.
TRS	NTRS - G	.10	10.20
	NTRS - E	-.09	9.86
	NTRS - N	-.12	4.36
	NTRS - P	1.25	5.19
CPQ	A	5.10	1.87
	B	5.52	1.94
	C	5.33	1.49
	D	6.21	1.79
	E	6.31	2.75
	F	6.52	2.67
	G	4.15	1.67
	H	5.14	1.93
	I	4.66	2.56
	J	6.64	1.86
	N	6.57	2.16
	O	5.33	1.98
	Q3	4.20	1.65
	Q4	6.54	1.77
	ANX	6.13	1.17
	EXT	5.59	1.41

Table 81 Correlation between the New TRS and CPQ
(significant level - two tailed - in parenthesis)

CPQ	NTRS G		NTRS E		NTRS N		NTRS P	
A	.17	(.012)	-.002	(.982)	-.09	(.164)	-.04	(.604)
B	.46	(.001)	-.01	(.860)	-.11	(.119)	-.03	(.694)
C	.10	(.146)	.06	(.398)	-.05	(.423)	-.08	(.224)
D	-.34	(.002)	.26	(.002)	.22	(.002)	.30	(.002)
E	-.18	(.006)	.17	(.012)	.08	(.250)	.15	(.030)
F	-.29	(.002)	.24	(.002)	.11	(.081)	.25	(.002)
G	.13	(.054)	-.01	(.880)	0	(1.00)	.05	(.418)
H	.19	(.006)	.05	(.044)	-.07	(.280)	-.03	(.654)
I	.31	(.002)	-.19	(.006)	-.12	(.076)	-.23	(.002)
J	-.26	(.002)	.05	(.437)	.12	(.048)	.11	(.102)
N	-.34	(.002)	.05	(.431)	.08	(.224)	.16	(.020)
O	-.15	(.030)	-.02	(.792)	.05	(.458)	-.01	(.827)
Q3	.24	(.002)	-.05	(.464)	-.18	(.008)	-.10	(.155)
Q4	-.17	(.010)	-.04	(.564)	.04	(.570)	.05	(.470)
ANX	-.32	(.002)	.06	(.298)	.16	(.014)	.15	(.030)
EXT	-.03	(.706)	.17	(.010)	-.001	(.988)	.13	(.056)

NTRS-N is significantly correlated with Factor D (r=.22, p=.002), which is a factor loaded on emotionality. The positive relation with Factor J suggests that high NTRS-N is connected with an unwillingness to act with the groups. NTRS-N is negatively correlated with Q3 (r=-.18, p=.008), indicating that children with high scores on NTRS-N tend to score low on the CPQ measure of self-control. Finally, NTRS-N is significantly correlated with ANX (r=.16, p=.014), and unrelated to EXT.

Overall, the TRS measures seem to correlate meaningfully with the Cattell factors.

The New TRS and the EPQ and JEPI

The Junior Eysenck Personality Inventory (JEPI) (Eysenck, S.B.G., 1965) is one of the most widely-used tests of children's personality. It has been used to predict academic achievement (Entwistle, 1968; Eysenck & Cookson, 1969), but its relation to teacher's ratings has been reported to be low (Eysenck & Cookson, 1969; Eysenck, S.B.G. & Pickup, 1968). It must be realised, however, that the teacher's ratings in these studies were based on general school behaviour of the children, whereas the children in answering the JEPI rated themselves on specific situations. We might therefore expect low correlations between the various measures, but this would not mean that either type of assessment could be dismissed as invalid.

There has been criticism of the JEPI. Several writers have questioned the nature of the lie scale and its relationship to the other dimensions. First of all, if according to S.B.G. Eysenck (1965), a score of 4-5 on the lie scale means that the data are invalidated, the scale would not be adequate for children under 13, judged by the norms of the lie scale in the manual (Eysenck, S.B.G., 1965). Secondly, despite the report of a positive relationship between the lie scale (L) and Neuroticism (N) by S.B.G. Eysenck (1965), some studies have found a moderate negative relationship between these scales (Gibson, 1967; Eysenck & Cookson, 1969; Bennett, 1973; Nicholson & Gray, 1972). Probably what underlies the tendency to lie varies (Gibson, 1964; Michaelis & Eysenck, 1971). It depends on individual as well as situational factors, so that a child scoring high on a lie scale may be deliberately faking, or he may be misunderstanding the instruction, or presenting a different account of himself because of lack of insight.

But pushing the argument further, Bennett (1973) and Bennett & Youngman (1973) used the results of a cluster analysis to criticise the JEPI. In terms of content, they found that some of the lie scale items loaded on the E dimension. In terms of the scoring method, they proposed an alternative method which scored the JEPI as five factors instead of the scoring by the conventional three-factor solution.

Notwithstanding these doubts, the JEPI is among the most frequently used tests in Britain and it is chosen for this research to supplement the results from the EPQ, which is a comparatively new scale (Eysenck & Eysenck, 1975). The EPQ provides measures of Extraversion-Introversion, Neuroticism, Lying and Psychoticism (P).

While the nature and causes of Psychoticism remain a matter of dispute (Eysenck & Eysenck, 1976), the validity of P as a dimension has been indicated by the testing of criterion groups and the finding that P scores correlate with other criterion variables in a manner consistent with predictions derived from existing personality theory (Eysenck & Eysenck, 1975; Eysenck & Eysenck, 1976).

65 children from sample C had complete data on the JEPI, EPQ and the New TRS. Their scores were correlated by the SPSS computer programme, and the correlations and the means of the variables are shown in Tables 82 to 85.

NTRS-G was positively correlated with JEPI-E, and negatively correlated with JEPI-N and JEPI-L, but none of the coefficients reached the required level of significance. The TRS-E was significantly related to JEPI-E ($r=.32$, $p=.008$), and this was evidence that the TRS-E resembled to some extent the extraversion measure in the Eysenckian sense. The negative relation with JEPI-N, though not significant, might have been predicted in view of the negative correlation between JEPI-E and JEPI-N. There was no relation between NTRS-E and the lie scale.

The positive relation between NTRS-N and the lie scale supports Nicholson & Gray's (1972) findings, but whereas Nicholson & Gray (1972) reported a strong negative relation ($r=-.63$) between TRS-N and JEPI-N, there is no evidence here that the NTRS-N and JEPI-N are related at all. Finally, NTRS-P is positively correlated with JEPI-E and JEPI-L and negatively with JEPI-N, but the correlation does not reach statistical significance.

With regard to the correlation between the New TRS and EPQ, the NTRS-G significantly correlated with EPQ-E (r=.29, p=.024) and EPQ-P (r=-.28, p=.030). This implies that a child rated favourably by the teacher on the TRS-G is likely to have high extraversion scores and low psychoticism scores by self-rating. The negative correlation between NTRS-G and EPQ-N agrees with the direction in the JEPI-N and NTRS-G correlation but the result was insignificant statistically.

NTRS-E is unrelated to EPQ-E, but is correlated with EPQ-P (r=.33, p=.010). The explanation for this is a matter of conjecture, but it may reflect the nature of the items in the NTRS-E and the EPQ-E. The adjectives in NTRS-E tend to describe the active or impulsive aspect of extraversion, rather than the sociability aspect. From the theoretical point of view, impulsiveness and sociability are both components of Extraversion (Eysenck & Eysenck, 1969). If the EPQ-E items are balanced better on impulsiveness and sociability, or possibly loaded more on sociability, the lack of a relationship between NTRS-E and EPQ-E can be explained. At any rate, the negative relation between NTRS-E and EPQ-N echoes that between NTRS-E and JEPI-N.

Once again, NTRS-N bore no relationship with the self-rated personality measures of Neuroticism, although NTRS-N and EPQ-E were significantly correlated in the negative direction (r=-.30, p=.018). NTRS-N was also positively related to EPQ-L.

NTRS-P was significantly correlated with EPQ-P (r=.24, p=.046), which indicates that there was some correspondence between teacher-rated and self-rated measures of Psychoticism.

Table 82 Means and standard deviations of New TRS and JEPI variables (N = 65)

		Mean	S.D.
TRS	TRS-G	2. 75	9.57
	TRS-E	.367	8.82
	TRS-N	.187	3.27
	TRS-P	1.069	4.32
JEPI	E	18.920	3.58
	N	13.780	5.51
	L	3.030	2.14

Table 83 Pearson's correlations between the New TRS and JEPI

	TRS-G		TRS-E		TRS-N		TRS-P	
E	.11	(.298)	.32	(.008)	-.05	(.708)	.11	(.264)
N	-.20	(.109)	-.21	(.086)	.09	(.468)	-.08	(.540)
L	-.01	(.902)	-.003	(.984)	.24	(.058)	.10	(.425)

Table 84 Means and standard deviations of New TRS and EPQ (Junior) variables (N = 65)

		X	S.D.
N TRS -	G	2.407	9.66
	E	.714	8.58
	N	.338	3.26
	P	1.168	4.26
EPQ	P	4.540	4.77
	E	19.660	3.57
	N	9.500	5.60
	L	7.980	4.49

Table 85 Correlation between the New TRS and EPQ (Junior) (levels of significance - two tailed - in parenthesis)

	NTRS							
	G		E		N		P	
JEPI								
P	-.28	(.030)	.33	(.010)	.11	(.400)	.24	(.046)
E	.29	(.024)	.08	(.524)	-.30	(.018)	-.16	(.206)
N	-.13	(.300)	-.15	(.244)	.03	(.796)	-.01	(.950)
L	.05	(.700)	-.15	(.237)	.10	(.442)	-.01	(.912)

NTRS-P correlated negatively and insignificantly with the other EPQ variables.

Overall, the relationship between NTRS-G and the Eysenckian measures was in line with prediction, and NTRS-P seems to be a valid measure of Psychoticism, which was related to self-rated Psychoticism. The relationship between NTRS-E and self-rated Extraversion was inconclusive, probably due to the nature of the items included in the JEPI and the EPQ. One of the most important findings was that NTRS-N was positively related to the lie scale on both EPQ and JEPI. This was in support of the findings of Nicholson & Gray (1972). However, the evidence regarding the relationship between self-rated and teacher-rated Neuroticism differed from Nicholson & Gray's results. Whereas they found a strong negative relationship, the present correlation was a very small and insigificantly positive one. Interpretation of the Anxiety measure of the CPQ is more difficult, because there is no lie score on the CPQ to check the results. However, the correlation between CPQ-ANX and NTRS-N was a significant and positive one.

Turning to the correlations between the different self-rating measurements, EPQ-N and EPQ-L were negatively correlated ($r=-.02$, n.s.), and so were JEPI-N and JEPI-L ($r=-.26$, $p=.04$). CPQ-ANX was also correlated with EPQ-L and JEPI-L in the negative direction, $r=-.22$ ($p=.014$) and $r=-.16$ (n.s.) respectively. This is in line with the relationship between the lie scale measures and the Neuroticism measures postulated by Eysenck, but contrary to that reported by Nicholson & Gray. There is insufficient evidence to reject the self-rated measures of Neuroticism on the Eysenckian scales, but self-rated Neuroticism on the Eysenckian measures seems to be unrelated to teacher-rated Neuroticism. However, the pattern of correlation coefficients between CPQ-ANX and those CPQ factors loaded on ANX on the one hand, and the scores on NTRS-N on the other, suggests that NTRS-N is a measure of neuroticism. The relationship between these scores of Neuroticism and the lie scale remains uncertain though. The correlations are generally low, although they occasionally reach statistical significance. A second difficulty arises from interpretation of the lie scale; as discussed earlier (p.252), a high lie score can have one of several different causes.

Summary and conclusion

The chapter describes the development of a new teacher's rating scale. The items were obtained by asking teachers to rate a sample of 550 children on a list of adjectives, and then by factor analysing the results to find out what should be the appropriate subscales, and which items should be included in the subscale. Standardization norms and data on the reliability and validation coefficients were presented.

The New TRS contains four subscales which are labelled the "Good pupil" subscale, "Extraversion" subscale, "Neuroticism" subscale and the "Psychoticism" subscale. It was found that the NTRS-G, NTRS-E and NTRS-P correlated meaningfully with CPQ, EPQ and JEPI measures. The NTRS-N correlated positively with some of the self-rated measures of Neuroticism, but its relation with the Eysenckian lie scale was in the opposite direction (albeit insignificantly) to those of the self-rated measures. It was suggested that until more is known about the connection between Neuroticism and lying, it is prudent to retain both self-rated and teacher-rated measures of Neuroticism.

PART III

"In one the need to talk is a primary impulse, and I can't help saying right off what comes to my tongue."

Miquel Cervantas, Don Quixote

CHAPTER SEVEN

IMPULSIVENESS AND BEHAVIOURAL SELF-RESTRAINT

The study has so far dealt with the theoretical analysis of the "verbal regulation of behaviour" put forward by Luria, and has discribed some empirical tests of the concept. The development of a teacher's rating scale has also been reported, this scale has been used to investigate the relationship between individual differences in personality as rated by teachers, and performance in behavioural tests involving verbal self-instruction.

Let us recapitulate some of the findings of the previous chapters. First of all, it has been suggested that the rejection of Luria's interpretation of the verbal regulation of motor behaviour at the elementary level of performance does not rule out the possibility that the verbal and the motor systems are intricately related, and this could be utilized to improve the performance on different tasks under different situations. The observation that when children were instructed to produce a verbal response and a motor response at the same time, they were able to adjust and co-ordinate the two modes of responding temporally suggests that motor and verbal correspondence (Experiment 2) may be employed to regulate the performance of a task involving a temporal parameter. Two experiments bearing on this issue will be reported.

Secondly, the Limited Capacity or "load" interpretation has been demonstrated to be a plausible explanation of the results observed in Part I. Its validity will be further tested in this section.

Finally, individual differences in behavioural self-restraint and in the verbal regulation of behaviour will be examined in greater detail. We have seen that the tendency for children to response impulsively - producing errors of commission - is consistently related to their being rated highly on Psychoticism by their teachers. It has also been found, though less consistently, that the children coped with and performed differently when they accompanied their motor behaviour with verbal self-instructions, and that this tendency was related to the teacher's ratings on Extraversion. The validation studies in Part II indicated that teacher's ratings on Psychoticism and Extraversion correlated with self-reports on these measures. All this suggests more than merely an agreement between individual differences in actual behavioural performance and individual differences as measured by teacher's ratings. The more important implication is a conceptual one. The observable impulsive behaviour and the ability to co-ordinate behaviour that involves both the verbal and motor responses may be connected to stable characteristics of the children's personality, in a way which throws light on the mechanisms that underlie personality differences.

While "behavioural restraint" is a self-explanatory concept which can be defined and operationalized relatively easily, the lack of it, often described as "impulsive behaviour" or "impulsiveness" is harder to define and measure. Psychologists of different persuasions have used the term "impulsiveness" in attempting to explain personality functioning and individual differences (e.g., Barratt, 1959; Block & Block, 1953; Eysenck, 1957;

Gray, 1967, 1972a & b; Kagan, Rosman, Day, Albert & Philips, 1964; Sutton-Smith & Rosenberg, 1959). But they have used "impulsiveness" in slightly different ways and there is a danger that a term used broadly in natural language can cause confusion when used technically.

Thus, the success or failure to exercise behavioural restraint can be interpreted in terms of various usages of "impulsiveness". Also performance in co-ordinating verbal and motor behaviour to promote behavioural restraint can be related to different understanding of "impulsiveness". It is necessary that some of these different usages be reviewed.

Kagan's "reflection-impulsivity" and the Matching Familiar Figures Test

Kagan's use of "impulsiveness" to describe one end of a "reflection-impulsivity" continuum is distinct from the other usages to be mentioned later in that when it was originally introduced, it was meant to conceptualize cognitive styles in information processing in children rather than differences in personality functioning. "Impulsiveness" is not clearly defined by Kagan and his co-workers; it is usually taken to be the opposite to what "reflection" stands for, that is, "the consideration of alternative solution hypotheses (either classifications or problem solving sequences) when many alternatives are available simultaneously" (Kagan, et al., 1964, p.33). This definition has remained by and large unchanged in subsequent articles. The reflection-impulsivity dimension is concerned with "the degree to which the subject reflects on the validity of his solution hypotheses in problems that contain response uncertainty" (Kagan & Kogan, 1970, p.1309).

Although the initial concern for "reflection-impulsivity" of Kagan and his co-workers was no greater than that for other cognitive processes in children, the popularity enjoyed by the "reflection-impulsivity" dimension has in recent years outweighed, that of , say, the "analytical attitude".

Research on the "reflection-impulsivity" construct has appeared with regularity, and Messer (1976) has reviewed most of the literature connected with the "reflection-impulsivity" dimension and the Matching Familiar Figures Test (MFFT), which is the most frequently used measure of the dimension. The literature on the "reflection-impulsivity" dimension in preschool children has also been reviewed by Kogan (1976). Readers are therefore referred to these two reviews for those studies published before 1976, while the present discussion will concentrate on the recent studies and the light they cast on specific issues. The first issue is a psychometric one concerning the MFFT. The second issue is the extent to which the reflection-impulsivity dimension can be linked with motor behavioural restraint and personality attributes. And the third issue is the antecedents of reflection-impulsivity: how does the construct relate to the frameworks described in other personality theories?

The Matching Familiar Figures Test (MFFT): Psychometric problems

The MFFT is a visual matching to sample task consisting of two practice items and twelve test items (Appendix 20). Each test item contains a standard picture and six alternatives, five of which differ from the standard with respect to one unique feature in the design only. The child is asked to select which one of the alternative pictures is identical to the standard. The time taken to make the first choice is recorded. The child is told if a wrong choice is made and is allowed to choose again. The number of choices made (up to six being allowed) is noted as the error score. The usual convention for classifying the subjects is a double-median-split procedure: those subjects who score above the median on total errors and below the median on latency (or response time) are classified as "impulsive", while those who score above the median on response time and below the median on errors are classified as "reflective". Different forms of the test are available, but the test format is basically the same. Form F is the version in current circulation; form S of the MFFT, which has been used as a post-test measure in pre-and-post test designs, is no longer used. Form K, the version for younger children (with only four alternative pictures for each test item) is also no longer distributed. The test-retest reliability and stability of the MFFT have been criticised. Kagan (1965b) administered the test to 100 first grade and 100 third grade children. On a one-year retest, the older group produced a positive correlation of .62 on latency and the younger group, a .52 correlation for the females and .48 for the male subjects. The test-retest correlation on errors was .25 for the male subjects and .51 for the female in the younger age group, but there was no report on retest correlation for the older group. A test-retest study over a 20-month period prompted the conclusion that there is "remarkable stability" on the response time and error measure (Kagan, 1966b).

However, other researchers are less satisfied with the situation. According to those employing the same form of the MFFT, the test-retest coefficients for latency have ranged from .14 (Ward, quoted by Messer, 1976) to .31 (Messer, 1970) for boys and .13 (Ward, quoted by Messer, 1976) to .70 (Yando & Kagan, 1968) for girls. As for errors, the test-retest coefficients have ranged between .21 (Yando & Kagan, 1968) and .47 (Ward, quoted by Messer, 1976) for boys, and between .23 (Yando & Kagan, 1968) and .49 (Ward, quoted by Messer, 1976) for girls. These results have been obtained from children between 3½ and 6 years of age. Slightly higher figures have been reported by Egeland & Weinberg (1976). The latency coefficients for their grade school sample were between .51 and .78, and the error coefficients ranged from .27 to .77. The results from the kindergarten sample remained low and "poor". Test-retest coefficients collected over inter-test intervals between three weeks and 2½ years, even though statistically significant, have been described as low to moderate by most psychometric standard (Ault, Mitchell, & Hartmann, 1976; Egeland & Weinberg, 1976; Cairns, 1978a, and below acceptable levels for test-retest reliabilities (Ault, et al. 1976).

Several reasons have been put forward to explain the low test-retest coefficients. For short-term retest studies, Messer (1976) reviewed four studies (Adams, 1972; Duckworkth, Ragland, Sommerfeld, & Wyne, 1974; Hall & Russell, 1974; Siegelman, 1969) in which children between six and ten were tested on the same version of the MFFT over a one to eight weeks interval. But "because of sampling and procedural irregularities and the use of the same version (vs equivalent versions) of the MFFT, these studies may not represent true MFFT test-retest reliability. Response uncertainty for subjects taking the same version of the MFFT twice in close succession may decrease so much that the test becomes a less valid measure of reflection-impulsivity" (Messer, 1976, p.1029). It is obvious that the lack of an adequate equivalent form of the MFFT has created problems in interpretating the test-retest coefficients, as well as in evaluating any intervention procedures which adopt a retest MFFT measures as a post-treatment index.

Even if the form S was still available, it would not be a satisfactory measure. According to Egeland & Weinberg (1976), "given the increased difficulty of form S versus form F (of the MFFT), despite the comparability of reliability coefficients for the two forms, one might seriously question the appropriateness of using form S as a post-test measure, its traditional role in reflection-impulsivity training studies" (p.490).

Egeland (1974) attempted to devise equivalent forms from the children's and adults' versions of the MFFT. However, his report on the resulting three eight-item forms suffered from incomplete description of his sample characteristics, correlation coefficients of the test forms on errors and latency, and the comparison between this shorter version and the traditional 12-item version. No further reports on the development of his test have appeared.

In a major attempt to design a more reliable version of the MFFT, Cairns (1978a) selected thirty MFFT type items and by means of item analysis, he finally chose twenty items with the best discriminability between reflective and impulsive boys. He reported split-half correlation coefficients of .89 and .91 for errors and latency respectively, and test-retest correlations over five weeks of .85 for latency and .77 for errors. Cairns has prepared two sets of comparable items from the MFFT-20 in the split-half analysis, "sufficiently equivalent for pre-post-test research pusposes" (Cairns, 1978a). But the size of the Cairns' sample was small. Apart from the first study in which there were 98 subjects, only 30-40 subjects of a particular age group (11 years) were used. Cairns' claim that the MFFT-20 can be generalized for usage in the age range of 7-11 years must also be evaluated in the light of the fact that no data on female subjects are available.

While the problems of short-term test-retest remain unsolved, long-term test-retest poses problems of a different nature. Low test-retest reliability over a long interval may be due to the lack of stability of the trait of conceptual tempo rather than to imperfections in the instruments used to measure it (Nadelman, 1975). Nadelman also quoted a study by Parker (1975) which suggested that certain MFFT items appeared to bear the brunt of the developmental changes between 2nd and 6th grade children. There are other complications. Messer (1976) points out that among school age children, response time is moderately stable over time but errors are not. Cairns (1978b) came to the same conclusion in a study covering the ages between 5 and 13 years. By contrast, among preschool children, MFFT errors are moderately stable over time, but latency scores are not (Messer, 1976).

There are at least two problems inherent in these findings. The first concerns the nature of the relationship between response time and error measures of the MFFT, in all age groups. This issue will be pursued in a later section. The second problem concerns the application of MFFT to preschool children and the validity of the reflection-impulsivity dimension in younger children. Although the MFFT has been given to children of preschool age (Harrison & Nadelman, 1972), there is increasing evidence that the Form F is unsuitable for the preschool, or even the young elementary school age groups (Block, Block, & Harrington, 1974; Egeland & Weinberg, 1976; Becker, Bender, & Morrison, 1978). Lewis, Rausch, Goldberg, & Dodd (1968) have attempted to design a new match-to-sample test for young children, but so far the Kansas Reflection-Impulsivity Scale for Preschoolers (KRISP, - Wright, Gaughan, & McClanahan, 1978) has been examined most extensively (e.g., McCluskey & Wright, 1975; and see Kogan, 1976). The KRISP is modelled upon the MFFT. The subject is asked to select a picture from an array of six figures that resembles a standard figure. Also similar to the MFFT, the scoring involves a measure of errors and one of latency. The reported test-retest coefficient was .58 for latency and .75 for errors, based on the results of nearly 500 subjects. It seems that the KRISP is becoming the preferred scale for studying reflection-imuplsivity among preschool children, and equipped with this more adequate instrument, workers can pursue the study of reflection-impulsivity in young children with confidence.

But as far as the MFFT is concerned, Ault,et al. (1976) have criticized various aspects of its construction, including its low reliability and the danger of misclassifying children being tested on it. It is useful to be aware of these suggestions, but wise to heed the opinion of Egeland & Weinberg (1976) that "while one might question the premature acceptance of the MFFT as a psychometric procedure for operationalizing the reflection-impulsivity construct, one might also urge caution and restraint in prematurely rejecting the test as an operational measure of reflection-impulsivity before its psychometric underpinnings have been investigated" (p.490).

The relationship between response time and errors of the MFFT

Ault,et al. (1976) quoted the figure -.56 as the average response time-error correlation coefficient, a correlation they described as moderate, but one which implies that there are problems in the classification of subjects on the basis of performance on the MFFT. The normal convention for classifying subjects as reflective or impulsive by the double-median-split method on response time and errors may lead to a wrong impression that reflectives and impulsives are dichotomous groups rather than being continuous. Ault, et al. (1976) were extremely critical of this: "Using high vs low errors and high vs low latencies as the two factors in an analysis of variances results in confounded main and interaction effects since errors and latencies are not orthogonal" (p.5). Another problem is that some data will be wasted if the fast-accurate and the slow-inaccurate groups are discarded. However, there is no obligation to use all the groups that are categorised according to the ways response time and errors relate with each other. As for analysis of variance designs, it seems that the use of latency and errors as two separate levels is "infrequent" (Nadelman, 1975) - the more commonly used design is to treat impulsive vs reflective as one factor.

Ault, et al. (1976) cited Kerlinger & Pedhauzer (1973) and recommended the use of the multiple regression method of analysis. This method avoids the problems involved in dichotomization, because the multiple regression technique treats latency and errors as continuous variables, and is designed to deal with correlated independent variables.

Haskin & McKinney (1976) conducted a study of this nature by analyzing the relationship between the two MFFT variables with problem solving (matrix solution and pattern matching) and academic achievement by means of univariate, multiple and part correlations. They found that the variance contributed by latency to the dependent variable was slight compared to that contributed by errors. Shipe (1971) also reported using multiple regression analysis, and MFFT scores were one of the predictor variables of academic achievement in retarded youngsters. Unfortunately, MFFT index was a single score derived by dividing the error score by the latency. Although the versatility of the regression method was highlighted by her study, the intricate relationship between MFFT latency and errors was masked by the transformation of the data. The present research will employ multiple correlation and regression methods to examine the nature of "impulsiveness" as operationalized by the MFFT. Response time and errors will be the two criterion variables with which other measures are correlated to discover a way to maximize prediction.

Apart from those issues mentioned by Ault,et al. (1976), the interpretation of the latency-error relationship and how it indexes reflection-impulsivity is also a matter of controversy. This can be seen in the exchange between Block & Kagan (Block, et al., 1974; Block, Block, & Harrington, 1975; Kagan & Messer, 1975). Block,et al. (1974) accused Kagan of conceptualizing reflecting-impulsivity in terms of response time but subsequently operationalizing the construct in terms of response time and errors. They strongly questioned the use of the MFFT variables in classifying subjects:

> Response errors are only a partially correlated consequence of rapid decision; response errors _per se_ are not a defining characteristic of reflection-impulsivity because such errors can arise for many alternative reasons (e.g., low intelligence, anxiety, misunderstanding of the instructions, poor vision, and so on). The negative correlations generally found between response time and response accuracy (averaging about .4) are far from being high enough to justify, conceptually or empirically, co-ordinate status for response errors in determining, together with response latency, whether someone shall be identified as impulsive or reflective. (p.613).

The argument then developed into a criticism of the validity of the MFFT measures by quoting studies on the generality of latency and errors, those that were concerned with visual scanning strategies, intervention to modify MFFT performance, the effects of stress on MFFT performance and the relations between the MFFT measures and other concepts of impulsivity and reflectivity. Some of the studies cited did not show any of the predicted relationships between the MFFT indices and the external variables (Ault, Crawford, & Jeffrey, 1972; Reali & Hall, 1970; Shipman, 1971). For those that demonstrated a relationship (e.g., Katz, 1971; Lewis,et al., 1968; Messer, 1970a). Block,et al. (1974) suggested that they could fit in with his explanation, or that the studies have confused the reflection-impulsivity dimension with the analytic-nonanalytic dimension (Kagan,et al., 1974).

Block,et al. (1974) reported on the personality correlates of reflection-impulsivity. Only two items on the California Q-sort correlated with MFFT response time, over 30 personality variables correlated with accuracy, and nearly twenty with latency X error interaction. Based on these results, Block,et al. (1974) proposed that any contrast between reflective (the slow-accurate in their terminology) and impulsive (the fast-inaccurate) subjects was a function of accuracy and not of response time.

In their rebuttal, Kagan & Messer (1975) insisted that it was not subjective choice but empirical justification that determined the combined use of MFFT latency and errors, and they denied that reflection-impulsivity was conceptualized in terms of latency alone. They indicated that Block,et al. (1974) had relied on data obtained from preschool children to support their claim, and claimed that a low inverse relationship between latency and response was to be expected among preschool children, possibly because behaviour conceptualized by reflection-impulsivity has not emerged, or perhaps, as suggested by Ward (1973a, cited by Messer, 1976), because young children had not yet developed a motive to perform well and hence did not reflect upon their responses. The two sides have agreed to disagree, but it may be that Block,et al. (1974) overstated their case, even to the extent of dismissing studies which appeared to support their own case by showing that response time and errors are unrelated.

Support for Block (Block,et al., 1974, 1975) comes from reports that only error scores predict self-regulatory behaviour (Toner, Holstein, & Hetherington, 1977), problem solving and school achievement (Haskin & McKinney, 1976; Juliano, 1977a), ratings on interpersonal relationships (Glenwick, 1976) and certain personality variables (Bush & Dweck, 1975). On the other hand, there is also evidence to support the importance of response time from Zelniker & Jeffrey (1976), who showed that the length of decision on time is related to the subject's performance on perceptual analysis. Zelniker, Bentler, & Renan (1977) demonstrated in a factor analytical study that latency yielded the most important factor that accounted for 90% of the common variance, and they suggested that the response time measure had greater cross-item consistency than the accuracy measure. Brodzinsky & Dein (1976) reported greater stability of the latency measure among adult subjects, and Rollins & Genser (1977) confirmed that latency was the more important predictor of the performance on a cognitive-style task.

Kogan (1976) has described the situation as "a state of ferment". Indeed, there is some difficulty in the Kagan position because it is possible that the reflection-impulsivity dimension is irrelevant to a proportion of preschool children. Moreover, the classification of subjects by the median-split procedure only accounts for three-quarter of the subjects. However, citing extensively the works of Ward (Ward, 1973a, 1973b), Kogan supported Kagan's conceptualization. He argues that the correlation between latency and errors does <u>not</u> reflect a fairly uniform weak association between these variables, but rather that they are related functionally in some children and not in others. Specifically, it is suggested that the correlation increases with age, indicating that latency and errors among at least some children become more closedly related over time. This may be a significant factor when it comes to explaining the fact that the relation between latency and errors varies from one situation to another. The degree to which latency and errors are related with other variables may be a function of the demand of the task situation, or the variable with which the MFFT measures are correlated. What underlies such a functional relationship has yet to be specified. The point which emerges from the present discussion is that it is unlikely that latency and errors on the MFFT can both predict to the same extent a wide selection of variables, given that the relation between them is subject to changes with age, sex and so on.

Having accepted this explanation, there is still a problem of classification. Rather than discount the contribution made by either response time or errors, it is probably more fruitful to adopt an approach which conceptually and methodologically combines measures of speed and accuracy (Salkind, 1978; Salkind & Wright, 1977; Wright & Vlietstra, 1977). The proposal is that there is a stylistic as well as an ability element in the reflection-impulsivity dimension:

> Reflection-impulsivity is or should be so measured to be as nearly orthogonal to ability or intelligence as possible. This would mean that in power tests where speed and accuracy are positively correlated and the major variance is between the fast-accurate and slow-inaccurate quadrants, reflectives and impulsives should have approximately the same distribution of scores. On style or preference tasks, however, this assumption (or definition) would mean that the major variance between reflectives and impulsives would results from a choice or strategy rather than from differential ability of efficiency. (Wright & Vlietstra, 1977, p.212).

Cultural values are responsible for producing the impression that reflective children are often "superior" to the impulsive children by virtue of the emphasis on accuracy whenever the two are in conflict. This is emphasized in the educational system. To counterbalance this, these researchers have derived two measures from the speed-accuracy correlation, namely, impulsivity and efficiency. Impulsivity is defined as "a dimension of individual differences ranging from fast-inaccurate to slow-accurate performance", and efficiency is defined as "a dimension conceptually orthogonal to impulsivity, along which individual differences range from slow-inaccurate to fast-accurate performance".

A formula has been derived to calculate the impulsivity and the efficiency scores from raw latency and error scores.*Note Norms of these measures have also been published (Salkind, 1978).

The separation of cognitive efficiency from cognitive tempo is useful in clarifying some of the mixed results obtained by relating the MFFT variables to other measures. It may also have serious implications for any attempt to modify performance on the MFFT. This model underlines the fact that the differential contribution to the overall variance made by style or ability will depend on the choice of tasks. The importance of the task variable has been noted by Kagan & Kogan (1970), who warn that "statements about individual differences in categorization strategy must contain a strong statement about the material manipulated" (p.1309). This has often been neglected by researchers working with the reflection-impulsivity construct. Only a few studies incorporate the demands of the task (Haskin & McKinney, 1976; Bush & Dweck, 1975; Bartis & Ford, 1977) and many of the psychologists involved in the latency-error debate have overlooked this issue altogether. Salkind & Wright (1977) have refined the model by pointing out specifically the style vs ability dimensions that the task variables will interact with.

---

*Note: $I \text{ (impulsivity)}_{\underline{i}} = Z_{\underline{ei}} - Z_{\underline{li}}$

$E \text{ (efficiency)}_{\underline{i}} = Z_{\underline{ei}} + Z_{\underline{li}}$,

where $Z_{\underline{ei}}$ is a standard score for the _i_th individual's total error, and $Z_{\underline{li}}$ is a standard score for the _i_th individual's mean latency.

Correlates of reflection-impulsivity

One of the main questions regarding the correlates of reflection-impulsivity concerns the role played by age, intelligence and sex. It has been mentioned in the discussion on the relationship between MFFT errors and response time that meaningfulness of reflection-impulsivity depends on the age group to which it is applied (Ward, 1973a). According to published norms (Salkind, 1978), there is an age trend both in terms of the latency-error correlation and in separates measures of latency and errors. Children become increasingly reflective between five and ten years of age, and after that, latency begin to decrease while errors remain stable. According to Salkind (1978), this can be explained by the efficiency dimension in his model.

The role played by intelligence in reflection-impulsivity seems less clearcut. Kagan & Kogan (1970) have reported a nonsignificant correlation between intelligence and response latency on the MFFT. The correlation between MFFT latency and the verbal section of the WISC was under .20, but is slightly higher for girls than for boys. However, several studies have produced results that suggest otherwise (Achenbach & Weisz, 1975, Block,et al. 1974; Ridberg, Parke, & Hetherington, 1971; Siegelman, 1969). These correlations may be a function of age (Messer, 1976) and the order of presentation of the intelligence test and the conceptual style test (Plomin & Buss, 1973). Moreover, the correlations between error and IQ and latency and IQ depend on the nature of the test used, that is, whether it measures verbal or nonverbal abilities, speed or power. But in view of these findings, intelligence should ideally be taken into account in the interpretation on MFFT results.

Finally, sex differences in cognitive styles have been widely reported (Kagan, 1966c; Maccoby, Dowley, & Hagen, & Degerman, 1965; Nuessle, 1972). Sex differences have been found on MFFT response time (Meichenbaum & Goodman, 1969b), errors (Kagan, 1965a) or both MFFT measures (Harrison & Nadelman, 1972). However, some studies reported no evidence of sex differences (Adams, 1972). Lewis, et al. (1968) suggested that MFFT error-latency correlation is higher for boys than for girls, whereas the opposite was true for the correlation between MFFT errors and IQ. However, this study has been criticised on statistical ground (see Messer, 1976) and the latest normative data show that the differences between the performance by boys and girls on the MFFT are not significant at any age level (Salkind, 1978). On the assumption that certain differences in cognitive style are the predictable outcome of the social milieu, Sigel (1965) suggested that even if boys and girls do not show any difference in performance, they may have arrived at the same status by different routes, since they have been exposed to different social environments.

Having discussed MFFT and age, sex and IQ, we shall turn to some broader correlates.

When dealing with convergent validity, Messer (1976) reviewed several studies which presented subjects with match-to-sample tasks that resembled the MFFT (Kagan, 1965a; Kagan, Pearson, & Welsch, 1966a; Kagan, et al., 1964; Ward, 1968) or tasks which had in them a response uncertainty element (Denny, 1973; Kagan, 1965b, Kagan, 1966a; Mann, 1973; Nussele, 1972). Messer (1976) concluded that "the reflection-impulsivity construct remains moderately robust over changes in the MFFT; it also extends to tests containing different requirements and content" (p.1032). The reports on the relation between reflection-impulsivity and other cognitive styles suggested that there were more subjects scoring high on field-independence among the reflectives than impulsives, whereas reflection-impulsivity and the analytic-nonanalytic conceptual style did not relate consistently, according to the results.

A large group of studies have correlated perceptual variables with reflection-impulsivity, on the assumption that the attention and scanning strategies adopted by reflectives and impulsives might be different. Several studies have provided detailed recordings of the subjects' eye-movements. For example, most of the studies reviewed by Messer (1976) show that reflective subjects spend more time comparing stimulus pairs (the standard and the alternatives and different pairs of alternatives) systematically. By contrast, the impulsives tend to be less systematic in scanning the field and the features of the the stimuli. There has been indirect support for these findings in the reports on selective attention among learning-disabled children (Heins, Hallahan, Tarver & Kauffman, 1976) and normal 6th grade children (Hallahan, Kauffman & Bell, 1976). Studies on visual focus (Grant, 1976), visual recognition memory (Siegel, Babich & Kirasic, 1974; Siegel, Kirasic & Kilberg, 1973) and transfer of learning (Odam, McIntyre & Neale, 1971) provide evidence that reflectives may pay more attention to details in analysing visual stimuli. However, it is possible that the difference in perceptual strategies between reflective and impulsive subjects reflects only the difference in preferred strategies which interact with the nature of the task under different stimulus situations (Zelniker, Bentler, & Renan, 1977; Zelniker & Jeffrey, 1976). The reflectives tend to adopt a detailed or analytical approach, whereas the impulsives adopt a global one. By designing and administering the Differential Familiar Figure Test (DFFT) (Zelniker, Jeffrey, Ault, & Pearson, 1972) to reflective and impulsive children, it has been demonstrated that there is such a strategy difference, which interacts with the type of the task and affects the variance of the accuracy of performance (Zelniker & Jeffrey, 1976). The latency of the response is associated with the preferred strategy and seems to be less responsive to modification (Zelniker & Oppenheimer, 1973).

On a variety of learning and problem-solving tasks, reflectives are found to be superior to impulsives in their performance, for example, in two-choice discrimination learning (Massari & Schack, 1972) and in transfer of learning (Juliano, 1977b). In a serial learning and recall task, reflective children are better at recall than impulsive children, whereas the latter commit more errors of omissions, intrusions, and if digit are used as the stimuli, more reversal of figures (Kagan, 1965a, Kagan & Kogan, 1970). When tested on recognition ability, reflectives are accurate a larger proportion of the time (Siegel, Kirasic, & Kilburg, 1973). This ability is also demonstrated in their recognition of single English words or detection of the stimulus words from a piece of prose (Erikson & Otto, 1973). The results have mostly been in favour of the reflective subjects in other tasks ranging from Piagetian conservation problems (Bartis & Ford, 1977; Schwebel & Schwebel, 1974) to the detection of linguistic ambiguities and the comprehension of cartoon humour (Brodzinsky, 1975; Brodznisky, Feuer, & Owens, 1977).

The difference in actual performance between reflectives and impulsives has sometimes been attributed to the strategies they adopt, and generally the reflective children are described as more "mature" in their response strategy. For example, they make appropriate use of relevant cues (Weiner & Berzonsky, 1975) and generate characteristically different and more effective hypothesis-testing strategies than impulsive children on a matrix solution task (McKinney, 1973). Moreover, they actively seek information in problem solving (Hatano & Inagaki, 1976), and make effective use of the information (Brannigan & Ash, 1977; Haskin & McKinney, 1976) and feedback cues (Nuessle, 1972). There are also numerous reports that reflective children ask information-constraining questions which enable them to do well on the game twenty-questions and convergent problem solving (Adams, 1972; Ault, 1973; Denny, 1973; Finch & Montgomery, 1973; Klein, Blockovich, Buchalter & Huyghe, 1976).

It is important to note that a study using college students as subjects (Wolfe, Egelston & Powers,1972) and a study on disadvantaged children (Juliano, 1977b) failed to find sufficient evidence to support any difference in performance on concept learning, or habituation of the orienting responses between the reflectives and impulsives. But in spite of these findings, the evidence suggests that in most areas of problem solving, reflectives display more effective and mature strategies and attain better performance.

It is when problem solving concerns divergent problem solving and creativity that a difference in performance between reflectives and impulsives is less apparent. Fuqua, Bartsch & Phye (1975) found that reflectives scored higher than impulsives on measures of creativity, but Ward (1968) did not find a difference in this respect. Klein, et al. (1976) also failed to discover any difference between the two groups on a divergent thinking task. Indeed, Kagan (1966b, p.522) has suggested that "maximal productiveness and mastery of principles in aspects of the arts, social studies, and humanities may be hampered by an excessively reflective orientation".

A study by Rollin & Genser (1977), in which children have to process various stimulus dimensions, challenges the view that reflectives are better overall than impulsives. Subjects (3rd and 4th grade children) were asked to choose one of a pair of multidimensional stimuli based upon a single cue. Some conditions included more dimensions; others, fewer. Reflective children solved the problems with fewer dimensions faster than impulsive children, but the latter did better on the multi-dimensional items. The authors argue that even though the impulsives considered fewer characteristics of the stimuli, their performance benefitted from their ability to select items most likely to appear in any situation. In a multidimensional condition, reflective children who adopted the strategy of systematic search were unable to cope. These findings echoed the conclusion of Weiner & Brozonsky (1975).

We cannot make a general statement about the abilities of reflective and impulsive children without specifying the exact nature and condition of the tasks. Klein,et al. (1976) have pointed out that the difference between reflective and impulsive children may be overridden by situation variables, including changes in individual's expectation of success, his experience with the task, and his redefinition of what constitutes an appropriate level of performance.

The consensus which emerges from studies concerned with academic achievement in general and reading abilities in particular is that at least among elementary school children, the results consistently show better performance from reflective children (Barratt, 1977; Becker, 1976; Hayes & Prinz, 1975; Hood & Kerdall, 1975; Margolis, 1976). Less certain, however, are the results obtained from emotionally disturbed and mildly retarded school children. Hayes, Prinz, & Siders (1976) has cast doubt on the association between the MFFT indices and reading when age and IQ are controlled. And as for the application of the MFFT to the clinical population, a series of studies (Finch, Crandell & Deardorff 1976; Finch, Deardorff, & Montgomery, 1974; Finch, Kendall, Deardorff, Anderson, & Sitarz, 1975; Finch & Nelson, 1976) has shown that the utility of the MFFT among special populations is highly dubious.

The question of the greatest relevance to the present investigation is what connection is there between reflection-impulsivity dimension and performance in situations requiring behavioural control and restraint, not so much from the cognitive point of view, but more from the motor.

Maccoby, Dowley, Hagan, & Degerman (1965) devised three simple motor tasks (Draw-a-line-slowly, Walk-slowly and "pushing the truck" test) in the Motor Inhibition Test (MIT) for use with preschool children. After completing the tests at the child's normal pace, the subject is asked to perform these tasks as slowly as they can. Children who can inhibit their motor movements are considered to be performing well. Despite some initial doubt as to whether greater inhibition is associated with the ability to follow instructions among young children, Massari, Hayweiser & Meyer (1969) have confirmed that the comprehension of the instruction is not at issue and that intelligence does not seem to play any part.

When motor inhibition is correlated with general activity level, the variables seem independent of each other (Maccoby, et al., 1965; Loo & Wenar, 1971; Toner, Holstein, & Hetherington, 1977). But is the ability to inhibit motor movements related to reflection-impulsivity, as we might expect if the ability to slow down decision time is one of the parameters defining reflection-impulsivity?

Harrison & Nadelman (1972) gave the MIT and the MFFT to 50 black children aged between four and five years. Significant correlations were obtained and in the expected direction between the MIT and MFFT variables for both male and female subjects. Reflective children were significantly better at inhibiting motor movements. This led the experimenters to conclude that motor inhibition could be an antecedent, or at least an important correlate, of conceptual tempo.

Banta (1970, quoted by Kogan, 1976) reported a correlation of .37 between impulse control on the Draw-a-line test and reflectivity. However, he only used the MFFT error scores in the correlation. It is unclear whether the latency and motor inhibition correlation was not reported because they were not significant, or because MFFT latency was considered not important.

Costantini, Corsini, & Davis (1973) administered the MIT battery, a finger-tapping task and the MFFT to preschool, first grade and third grade children. They reported a significant correlation between MIT measures and a conceptual tempo index, which was particularly marked in the young group. They also explored the relation of MFFT conceptual tempo, motor inhibition and motor acceleration. The evidence indicated that motor inhibition and motor acceleration might be different abilities. The correlation between motor inhibition and conceptual tempo was higher than that between motor inhibition and motor acceleration. Finally, some interesting developmental trends emerged in that the relation between motor and cognitive inhibition was strongest at the youngest age group, and decreased with age, in line with some previous findings (Kagan, 1966b; Costantini & Hoving, 1973a). Costantini (Costantini & Hoving, 1973a) suggested that motor and cognitive inhibition could not be separated easily and proposed a reconceptualization called "response inhibition", meaning "the ability to delay or withhold a previously learnt or preferred response".

On the negative side, Kogan (1976) cites several studies which do not find any relationship between motor and cognitive inhibition (e.g., Block & Block, 1973; Mumbauer & Miller, 1970), and he cautions that the MIT tests are loaded on general intelligence, which makes it necessary to correct the raw data before analysis. He suggests that intelligence accounts for the link between MFFT and slow performance on the MIT before the age of six, but that later speed of response on the MFFT becomes linked with conceptual style performance, and there is a definite positive correlation between MFFT latency and motor inhibition.

Bucky, Banta & Gross (1972) gave the MFFT, Draw-a-line and Walk-a-line to groups of subjects aged 5, 10, 15 and 20. They found that measures of reflection-impulsivity increased from five years to 15 years, and then levelled out at twenty, while motor control ability increased from five to ten and decreased in the 15-20 age groups. They concluded that motor control and reflectivity were separate variables. However, there were noticeable flaws in the experiment, especially in tasks which were too simple for subjects over 15 years old. The lack of motor control among older subjects could be interpreted as a lack of motivation to perform adequately on simple motor tasks.

Toner, Holstein & Hetherington (1977) included various measures of measuring "self-control" in their study, which set up different situations to test delay of gratification, and resistance to temptation in 55 preschool boys and girls. MFFT errors correlated with motor inhibition, but in the light of Kogan's (1976) comments mentioned earlier this might be a function of intelligence confounding MIT performance. Delay of gratification correlated with MFFT errors in the boys, while the relation between MFFT measures and other indices of self-control were neither consistent nor significant.

One constantly recurring theme in this group of studies is the effects of age and IQ on motor and cognitive inhibition. This is an important consideration, for some studies report only the correlation figures between MFFT and other variables without attempting to explain the mechanisms involved. This is true of studies relating MFFT to other measures of impulsivity (Boyden & Gilpin, 1978; O'Keefe, 1973), or to lesser variables such as handwriting (Williams & Berg-Cross, 1977) and interpersonal responses (Glenwick, 1976; Glenwick, & Burka, 1975). Returning to an earlier concern (p.278), more vigorous thinking about intervening variables might throw light on the relationship between MFFT latency and error scores.

The modification of reflection-impulsivity

The modification of conceptual tempo is of interest here because verbal self-instruction has been introduced as one of the methods to modify the performance of reflective and impulsive children (Genshaft & Hirt, 1979; Kendall & Finch, 1978; Meichenbaum & Goodman, 1969b). But before going into the details, it is worth mentioning a few other modification studies to put the issue into perspective.

Several methods for modifying conceptual tempo or changing specific aspects of the behaviour of reflective and impulsive children have been documented. They include forced delay (Brown & Lawson, 1975; Denny, 1973; Gaines, 1971; Heider, 1971), modelling (Cohen & Przybycien, 1974; Denny, 1972a, 1972b; Orbach, 1977), emphasizing to the subjects the importance of either or long response time (Bartis & Ford, 1977; Duckworth, Ragland, Sommerfeld, & Wyne, 1974; Karoly & Briggs, 1978) and the training of specific strategies (Heider, 1971; Orbach, 1977; Wen, 1974; Zelniker & Oppenheimer, 1973, 1976).

The use of verbal self-instruction in modifying reflection-impulsiveity response style differs slightly from the other methods in that as the treatment strategies become more refined, self-instruction is increasingly used as part of a treatment package. A typical treatment procedure usually includes the following:

> "1. An adult model performed a task while talking to himself out loud (cognitive modeling);
>
> 2. The child performed the same task under the direction of the model's instructions (overt, external guidance);
>
> 3. The child performed the task while instructing himself aloud (overt self-guidance);
>
> 4. The child whispered the instructions to himself as he went through the task (faded, overt self-guidance); and finally,
>
> 5. The child performed the task while guiding his performance via private speech (covert self-instruction)." (Meichenbaum, 1977, p.32).

Meichenbaum & Goodman (1971) who devised this treatment programme reported that successful results were obtained in altering the response style of impulsive children in problem solving, as a result of their improved use of verbal self-instruction. Evidence has been collected to show that while experimenter cognitive modelling was a necessary but not sufficient condition for engendering improvement in the impulsive children, the child's own behavioural rehearsal in self-instruction was an indispensable part of the training procedure. Empirical studies have adopted this method and have claimed successful outcomes in teaching impulsive or hyperactive children to think (by speaking out to themselves first) before they act (e.g., Bem, 1967; Palkes, Stewart & Kahana, 1968; Palkes, Stewart & Freedman, 1972; Douglas, 1972).

Finch, Wilkinson, Nelson, & Montgomery (1975) studied the relative effectiveness of verbal self-instruction versus delay training in modifying the cognitive styles of institutionalized emotionally disturbed boys. The training extended to six half-hour sessions over a three-week period. They adopted the Meichenbaum & Goodman (1971) format and found that while both the delay and self-instructed groups lengthened their response time on the MFFT, only the self-instructed group, who had learnt the specific cognitive strategies, made fewer errors.

Kendall & Finch (1978) devised a training programme including conceptual thinking, attention to details, recognition of identical features, etc., and gave it to 10-11 - year old children. A special treatment group was provided with self-instruction training via modelling and response cost contingencies in conjunction with the training procedures. Among the dependent variables, an increase in response time and a decrease in errors on the MFFT were found among those receiving extra treatment, and teacher's rating on attention span and work consistency also lent support to the success of the treatment programme. However, other measures did not reveal significant differences after the treatment. Given the results that supported the treatment programme, there was no indication whether self-instruction alone could have been responsible for the effective change. Caution must be exercised in evaluating studies which claim to have adopted verbal self-instruction in producing desirable changes in behaviour when verbal self-instruction is used merely as part of the treatment.

Some studies have concentrated not so much on the topography of the behaviour to be modified, but on how reflective and impulsive children respond to contingencies which affect any behaviour change. Cole & Hartley (1978) compared the effects of primary and secondary reinforcement in reflective and impulsive children. Costantini & Hoving (1973b) applied reward and punishment contingencies on kindergarten and 2nd grade children who were instructed to perform on a motor inhibition task. The subjects were either told that they could win marbles by performing well or that they should try to lose as few marbles as they could. The dependent variables were the pre- and post-training measures on the MFFT and Draw-a-line test. The results suggested that punishment produced more motor inhibition than rewards, but no definite explanation could be given. On the other hand, there was no evidence that there was any effect of other reinforcement or punishment on cognitive inhibition. Hemry (1973) also found no interaction between cognitive styles and his reinforcement combinations, which included verbal and nonverbal rewards, and his punishment schedules, although there was some suggestion that reward tended to produce the poorest results on the discrimination task.

Unlike the previous workers, Massari & Schack (1972) worked on the assumption that negative consequences would lead to better performance since they created more concern over accuracy. They administered two schedules of reinforcement, one with 70% positive vs 30% negative consequence, and the other with the reversed proportion, to reflective and impulsive subjects working on a discrimination task. The results provided some support for their hypothesis. Subjects on the schedule with a greater proportion of negative contingencies responded correctly more often than those in the schedule with a higher proportion of positive reinforcement. Moreover, although impulsive children performed worse than the reflective ones overall, their performance in the negative contingency condition was similar to the level of performance of the reflective subjects in the positive contingency condition,

Firestone & Douglas (1977) reported that there was an interaction between cognitive styles and contingencies. Reflective and impulsive children performed on a discrimination learning task and were randomly assigned to one of four conditions:

verbal-reward, verbal punishment, material reward and material punishment. The impulsive subjects performed significantly worse than the reflective subjects in the reward conditions. And within the impulsive group, punishment significantly improved performance better than reward, and to a level comparable to that of the reflective children in the punishment condition. The study offered partial support for the work of Massari & Schack (1972), although the results are in contradiction to the theory of Gray (1973), to be discussed later in the chapter (p.303).

So far, the suggestion is that a punishing contingency is more effective at increasing inhibitory behaviour, and there is evidence that impulsives respond to the punishment schedule as much if not more than reflective children. It is not clear whether the choice of material or verbal contingencies is significant, because different types of material rewards have been used in different studies and this does not allow adequate comparison across studies. The implication of these studies not only extends to the planning of effective modification programmes, but also to the relation between reflection-impulsivity and other personality correlates, because the responsiveness and sensitivity of the subjects toward rewarding or punishing conditions plays an important part in the treatment of impulsiveness in Gray's theory of personality (Gray, 1973).

As far as the outcome of the modification studies are concerned, the most consistent results have been obtained through the teaching of scanning strategies or the teaching of response strategies by special training material (Messer, 1976). The use of verbal self-instruction has also produced successful results. But in view of the fact that self-instruction was used in the modification programme as part of the package offering cognitive-behavioural treatment (Kendall & Finch, 1978), the effective outcome is hardly surprising. The success of the treatment or modification strategies is partly due to a careful analysis of the nature of the task, and the deployment of attention by the subjects. As Bush & Dweck emphasized, "the training of impulsive children should be aimed at increasing attention to and utilization of situational cues, rather than encouraging a stereotyped response style" (1975, p.574).

Studies that manipulated either the error or response time elements have yielded results that are less satisfactory than those training response strategies. On the basis of his results, Denny (1973) concluded that conceptual tempo was <u>not</u> the exclusive factor underlying conceptual strategy. Brown & Lawson (1975) also suspected that "'impulsivity' was based upon some accidental or less significant phenomenon" (p.103). These "phenomena", or perhaps mechanisms that underlies impulsiveness have been specified by Kagan, et al. (1964), and it is hoped that these mechanisms could be further explored to help bring about any desired changes in cognitive styles, or to explain the performance of reflective and impulsive subjects.

<u>The mechanisms underlying reflection-impulsivity</u>

Kagan, et al. (1964) suggested three possible mechanisms which might underlie reflection-impulsivity: constitutional factors, involvement in tasks and the expectation of failure.

While the involvement in tasks has not been further investigated, Kagan (1967) has made some speculations regarding the biological basis of reflection-impulsivity. But it is the third factor, expectation of failure, which has so far attracted the greatest attention.

Kagan,et al. (1964) worked on the assumption that impulsive responding on the MFFT may be due partly or wholly to the child's anxiety about his ability in the test situation, his expectation of failure and his inability to tolerate the period of silence in deciding the response. Two specific forces were later proposed. "It is likely that a reflective or impulsive attitude can be in the service of several different forces" (Kagan & Kogan, 1970, p.1317). One of these is anxiety over making an error and this causes a more reflective attitude. The other is anxiety over competence and this causes fast and impulsive responding.

There is evidence that after the experience of failure on an anagram task, both reflective and impulsive children showed an increase in response time on the MFFT. A successful experience, by contrast, led to faster response time for all the subjects, and increased errors for the reflectives. This led to the conclusion that anxiety over errors is one antecedent of a reflective cognitive style (Messer, 1970b). Support for Messer (1970b) has been promised by Weiner & Adams (1974), Reali & Hall (1970) and Ward (1968), who reported an increase in latency on MFFT after failure on MFFT items or other tasks. It has also been suggested that the reflective subjects are more sensitive to feedback of failure or of potential failure. Nuessle (1972) found that reflectives produce longer latency than impulsives on a conceptual formation task after failure, and Kagan (1966a) syggested that the performance of reflectives is disrupted more than that of impulsives in serial memory recall experiments, subsequent to warning of possible failure. All these findings supported the anxiety over error hypothesis, and are in agreement with studies discussed earlier on the effects of rewards and punishment on impulsive responding.

Block,et al. (1974) adopted the second assumption involving anxiety - that impulsive behaviour was due to an anxiety over competence. They cited results (Block & Peterson, 1955; Smock, 1955) which suggest that fast decision time is a result of the subject becoming intolerant of uncertainty, and hence responding quickly in order to escape from the uncertain situation. Altogether Block,et al. (1974) proposed a very different personality description from Kagan,et al. (1964) of the fast-inaccurate and slow-accurate child. The fast-inaccurate child has more anxiety and self-concern than the fast-accurate, slow-accurate or slow-inaccurate child. He is a brittle and ill-adapted person, very affected by unpredictable situations. In one study which lends indirect support to this description, Campbell& Douglas (1972) found that after being exposed to the threats and frustration of uncertain outcome, impulsive children produced more pessimistic responses than the reflectives, which suggests that they had less confidence. However, Block,et al.

(1974) argued their case on the basis of rather dated studies. Furthermore, it has been pointed out by Kagan & Messer (1975) that Block et al. (1974) have drawn their conclusions from studies using only preschool children as subjects, and we have already seen (p.269) that this may not be a suitable population for studying reflection-impulsivity.

The concern for anxiety, nevertheless, leads the study of the construct reflection-impulsivity closer to the study of personality differences. Isolated reports have suggested some negative results: Cairns (1973, 1975) did not find any correlation between the MFFT and JEPI measures. Bjorklund & Butter (1973) reported the absence of correlation between teacher's rated impulsiveness and MFFT measures. But Block et al. have shown empirically that MFFT performance is related to certain aspects of personality. The aim here is not to explain reflection-impulsivity by searching for personality correlates, but rather to test the generality of impulsiveness as conceptualised by the reflection-impulsivity dimension in the domain of personality studies. However, if correlations can be established, this may improve our understanding of impulsive performance (and perhaps reflective performance) on the MFFT, since the mechanisms underlying individual personality differences have been more systematically tested. In the next section, in which personality theories are introduced and their conceptualization of impulsiveness is discussed, we shall find that a plausible account of the workings of reflection-impulsivity can be given in terms of concepts used by personality theorists.

"Impulsiveness" in Eysenck's theory of personality

The concept of "impulsiveness" was introduced by Eysenck in the discussion of the "unitary" and "dual" nature of Extraversion (Eysenck, S.B.G. & Eysenck, 1963; Eysenck & Eysenck, 1969, Chapters 12 and 13), after Carrigan (1960) has cast doubt on the propriety of combining the traits "impulsiveness" and "sociability" into a single dimension of extraversion. A factor analysis was carried out on 66 extraversion-introversion (E) and neuroticism (N) items. The results indicated that Factor I was an E factor and Factor II was an N factor. Factor III (Sociability vs Impulsivity) was where the interest was forcussed on. There was a clearcut distinction among the items; they fell into two groups - impulsiveness and sociability. Impulsiveness was positively correlated with N, while sociability was negatively correlated with N. Impulsiveness and sociability were correlated with one another (r = .5) and they formed the higher order trait E which was independent of N. The independent nature of E and N on the questionnaire items was achieved by a careful counterbalance of the items which were loaded on impulsiveness and N and on E and N. Eysenck maintains that E is a unitary concept, at least at the level of higher order factors, which he favours for explaining personality.

Eysenck's view on lower order traits in personality studies has changed little, but there has been an increased interest in exploring the nature of impulsiveness. Eysenck, S.B.G. & Eysenck (1977) argued that there is a "somewhat arbitrary assignment of the term 'impulsiveness' to a variety of different items" and subsequently reported a factor analytic study on the various facets of Impulsiveness.

They reported that the factor Imp_B (Impulsiveness in the broad sense) could be broken down into four factors, namely, Imp_N (impulsiveness in the narrow sense), risk taking, nonplanning and liveliness. The intercorrelations among the components of impulsiveness are positive, but low, and therefore not all of them can be components of a high order factor. Their relation with the measure of the EPQ (Adult) was revealing and interesting. Imp_N was closely and positively related to Psychoticism (EPQ-P) and positively but to a lesser degree with N and negatively with the lie scale. It appeared, according to Eysenck, a pathological trait that had nothing to do with E. Risk-taking correlated with P and E positively, nonplanning with P positively and with N negatively, and liveliness correlated with E positively and with N negatively. Imp_B is correlated with sociability (.20 - .34) and more so with E (.35 - .48). But above all, Imp_B correlates with P to the extent of r = .55 in men and .59 in women, clearly suggesting that it is related more closely with P than with E. The crucial issue now is that Imp_B and Imp_N appeared to have a high pathological content - by having close connection with P and N, the pathological dimensions. Related to this is the problem of finding appropriate items to measure P and E, assuming that they should be orthogonal to each other in the factor space. Eysenck, S.B.G. & Eysenck (1977) commented that such considerations have forced them to eliminate some of the impulsive items from the P scale, and to devise a separate impulsive scale to be used with the EPQ. Similar work has to be carried out with the Junior EPQ, but the standardised version of the impulsiveness scale for children is not yet available (Eysenck, S.B.G., 1979, personal communication).

It is uncertain whether this alteration of the questionnaire items is a justifiable move. It appears that it is based on the assumed orthogonality of the dimensions, and Eysenck's earlier claim that impulsiveness was a component (together with sociability) of the unitary factor Extraversion. In view of evidence that Imp_B correlates more with P than with E, the decision to eliminate the questionable impulsiveness items from the P scale may in some sense preserve the integrity of the E scale, but the validity of the resultant P scale devoid of some of its impulsiveness components seems to be called into question.

The connection between impulsiveness and Psychoticism is a recent finding, and impulsiveness has traditionally been conceptualised in terms of extraversion. Impulsive behaviour can be identified in the way subjects respond on a task involving speed and accuracy. Himmelweit (1946) showed that extraverts tend to sacrifice accuracy for greater speed. When speed alone was considered in a free-paced task, extraverts performed faster than introverts, and there was no relationship between performance of this nature and Neuroticism (Farley, 1966). One experiment specifically showed that the difference in performance between extraverts and introverts could be explained mainly as a function of impulsiveness. Eysenck & Levy (1972) scored the subjects separately on sociability and impulsiveness on the E scale, and found that tht difference between extraverts and introverts in eye-blink conditioning was related mainly to impulsiveness and not to sociability.

Eysenck's explanation of personality differences deals only with the dimensions of the highest order, and he has not attempted to provide a separate explanation of impulsiveness. It may however be inferred that the mechanisms underlying the three main dimensions may all play some part in the explanation of impulsiveness in view of the correlation between the impulsiveness measures and P, E and E (Eysenck, S.B.G. & Eysenck, 1977).

On the psychological level, Eysenck claims that extraverts and introverts differ in their degree of conditionability, i.e., extraverts condition less readily. He further postulates that conditionability is a function of the spontaneous level of activity in the ascending reticular activity system (ARAS). "Introverts are characterized by a reticular formation the activating part of which has a relatively low threshold of arousal, ... conversely, extraverts are characterized by their possession of a reticular formation whose activating part has a higher threshold of arousal .... Under identical conditions, therefore, cortical arousal will be more marked in introverts, cortical inhibition in extraverts" (Eysenck, 1965). He has also proposed that extraverts have weak excitatory and strong inhibitory potentials, excitation and inhibition in this context meaning the facilitation of cortical events underlying perceptual, learning and motor behaviour and the depression of the cortical events under those phenomena respectively.

Neuroticism is regarded by Eysenck as a dimension of emotionality which is closely related to the autonomic system. It acts as an amplifying device, so that a raised intensity of emotional response will accentuate the autonomic reactions in introverts as well as increasing drive in extraverts. Both effects can result in pathological conditions.

Psychoticism has been reported to be related to criminality and antisocial behaviour (Allsopp & Feldman, 1974; Eysenck & Eysenck, 1976). There is no definite proposal regarding the explanation of this dimension, although Eysenck & Eysenck (1976) state that they tend to favour the hypothesis that psychoticism may be related to serum uric acid (SUA) activities, which controls the display of "maleness" and aggression in behaviour.

Eysenckian theory is only tangential to the present study, but it cannot be ignored since impulsiveness is now known to be related to Eysenck's three dimensions of E, N and P. Moreover, this brief summary of Eysenck's framework sets the scene for the summary which follows of Gray's model of personality, in which the concept of impulsiveness plays a major role.

Gray's modification of Eysenck's theory of personality

Gray (Gray, 1970, 1971, 1972a, 1972b) has extended Eysenck's theory on two levels. First of all, he suggests that although Eysenck's E-I and N are tenable dimensions, Eysenck's treatment of them is incomplete. Data collected have shown that introverts conditioned better only under certain condition -- when the environment is stressful or threatening. Consequently, the physiological explanation of E-I differences in terms of condition ability should be complemented by an additional postulate. Gray proposes that introverts are more susceptible to punishment, whereas extraverts are more susceptible to reward (Figure 18).

In the attempt to put E and N in a more meaningful factor space Gray rotates the E and N dimension by 45°. Predictions on E must be made in conjunction with N. Gray suggests that N is a dimension of increasing sensitivity to both rewards and punishment. Individual differences in personality are explained not separately by E and N, but along the diagonals of the dimensions. The diagonal from stable extravert to neurotic introvert (low sensitivity to reinforcement in general to punishment in particular vs high sensitivity to reinforcement in general and to punishment in particular) corresponds to the trait of susceptibility to Anxiety (Spence & Spence, 1966). The diagonal from stable introvert to neurotic extravert corresponds to the trait of impulsivity (Eysenck & Eysenck, 1969). The classification system seems to agree well with the classification of psychiatric symptoms Eysenck initially set out to explain. Neurotic introverts would be predisposed towards meanifesting dysthymic symptoms, while the neurotic extraverts would be prone to anti-social behaviour.

On the physiological level, Gray's suggests that Eysenck's hypothesis that E-I reflects differences in the spontaneous activity level of the ARAS requires modification. Based on the physiological effects of two treatments — the administration of the barbiturate drug sodium amytal and damage to the frontal cortex — Gray argues that amytal acts not so much on the ARAS but on the septo-hippocampal system, of which the orbital frontal cortex appears to be the neocortical representation. His hypothesis is that it is the orbital frontal cortex, the medial septal area and the hippocampus in conjunction with the ARAS which underpin individual differences in extraversion-introversion.

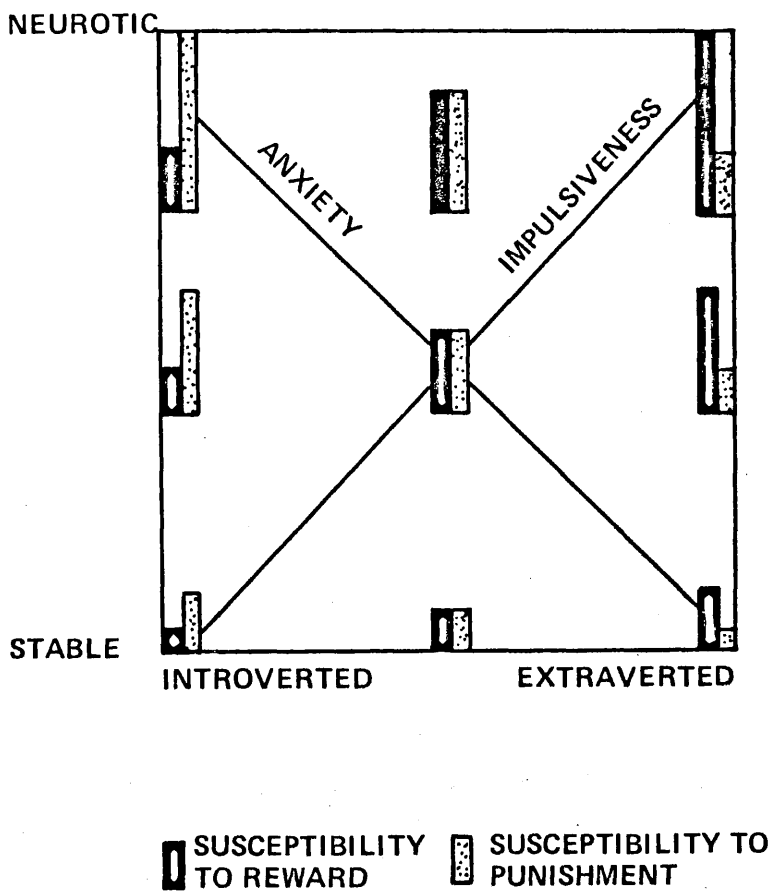
The significance of this alternative interpretation has to be considered in connection with Gray's modification of Eysenck's treatment of N. While agreeing that neuroticism represents the level of emotionality, he suggests that emotionality should be regarded as the degree of sensitivity to <u>both</u> reward <u>and</u> punishment in the autonomic nervous system (ANS) but in the neuro-endocrine system (NES).

These propositions form part of Gray's treatment of the emotions. Gray has developed the theory that individual differences in the modes of emotional reaction to external stimuli underlie the major dimensions of temperaments, and abnormalities of behaviour. He puts forward the "fear-frustration" hypothesis, which states that the effects of punishment and of frustrative nonreward are functionally identical, and proposes that they are processed by the same system in the brain. In response to a signal of impending punishment or frustrative nonreward, the organism will react by inhibitory behaviour or passive avoidance, behaviour which reflects the activity of "stop" system. On the other side of the coin, the response to reward and the non-arrival of anticipated punishment is approach learning or active avoidance, behaviour which reflect the activity of the reward area identified by Old's self-stimulation studies. This is the "approach" system. Finally, the response to unconditioned punishment and frustrative non-reward is classified under the "fight-flight" system, which results in aggressive behaviour and unconditioned escape. The physiological activity of this last system is controlled by the amygdala.

Gray's psychological and physiological conceptual statements on personality are isomorphic. When they are combined, the anxiety dimension in Gray's personality theory corresponds to the "stop" system, and the impulsivity dimension corresponds to the "approach or go" system. Although he is less concerned with the Psychoticism dimension, Gray has suggested that the P dimension in Eysenck's theory may perhaps correspond to the "fight-flight" system.

Support for Gray's theory of the emotions and individual differences comes largely from experiments on animals, though their results may be applicable to man (Gray, 1973). Support for the "fear-frustration" hypothesis has been offered in studies

FIGURE 18 HYPOTHETICAL RELATIONSHIP BETWEEN N AND E–I AND SUSCEPTIBILITY TO REWARD AND TO PUNISHMENT (ADAPTED FROM GRAY, 1970, p. 233)



in which children with high N and low E manifested greater susceptibility to frustrative nonreward (Nicholson, 1975; Nicholson & Gray, 1972).

The question is: to what extent does impulsivity defined by Kagan on cognitive functioning correspond with Gray's and Eysenck's notions of impulsiveness in personality studies?

Kagan,et al. (1964) and Block,et al. (1974) have both appealed to emotional disposition to explain reflective and impulsive behaviour. It would be convenient to think in terms of the figure with the rotated axes of E and N (Figure 18) and examine where the reflection-impulsivity dimension will fall.

Kagan,et al. (1964) and Messer (1970b) both emphasize anxiety over errors, and studies indicating that experience of failure leads to greater tendency towards reflective responding than experience of reward have already been discussed. They may indicate that the relfective disposition perhaps lies at the unstable introvert end of the Anxiety dimension where there is a greater susceptibility to punishment. Given that impulsivity is the opposite to the reflection disposition, impulsivity will be related to low N and high E (Stable extravert). This is clearly different from Gray's conception of impulsiveness.

On the other hand, according to Block,et al.'s description of the personality correlates of the impulsive child, impulsiveness is a result of anxiety over competence, The impulsive child is described as fearful, inhibited, and highly anxious and sensitive to situations of uncertainty and frustration. On this analysis, the impulsive character might be expected to be high on N and low on E (unstable introvert) while the reflective child would be stable and extraverted. Where Block,et al. (1974) and Kagan,et al. (1964) agree is that the mechanism involved is a responsiveness to frustration, which implies that the Anxiety axes of the personality dimensions is more relevant to reflection-impulsivity than the impulsive dimension.

This, however, is contrary to the explanation of impulsive behaviour offered by personality theorists. Whether the extraversion-introversion dimension reflects susceptibility to conditioning or susceptibility to fear, the impulsive trait is seen as related to high E. As far as behavioural restraint is concerned, there is a study showing that children scoring low E and low N were better at restraining themselves than those scoring high on those dimensions (Shapland, Nicholson, Rushton & Gray, unpublished).

There are several ways in which the difference between these interpretations might be explained. First of all, although reflection-impulsivity may be related to E and N, cognitive impulsivity may be unrelated to behavioural impulsiveness. They may lie on different axes of the personality dimensions, implying that they are controlled by different behavioural and presumably physiological mechanisms. Secondly, there is still the possibility for cognitive impulsivity and behavioural impulsiveness to overlap. Finally, Messer (1976) has proposed that impulsivity and reflection might be mediated by different mechanisms; expressed in terms of individual differences in personality, it may be that reflection and impulsivity are not opposite poles of the same dimension, but instead may belong to different dimensions.

These alternative explanations can be tested in different ways. One method is to administer behavioural tests which are known to measure individual differences in personality to reflective and impulsive subjects. Another method is to correlate measures of reflection-impulsivity with personality measures. The following chapters described experiments involving both methods.

Summary

This chapter discussed the concept of impulsiveness as it is used in the dimension of cognitive reflection-impulsivity (Kagan, et al., 1964). The correlates of reflection-impulsivity were examined and the Matching Familiar Figures Test (MFFT), which is used to measure reflection-impulsivity, was also reviewed. The discussion then focussed on the mechanism which might underpin impulsiveness. There is some evidence suggesting that reflective responding is related to experience of failure or punishment. The biological basis of reflection-impulsivity is unclear, but it is suggested that if reflection-impulsivity is related to the measures of personality, there is a possibility that the physiological mechanisms that underlie differences in personality may also explain cognitive impulsiveness. In connection with this, the personality theories of Eysenck and Gray were briefly reviewed. According to Gray's conceptualization, the impulsive personality is characterised by high E and high N. This interpretation is different from the one suggested by Block, et al. (1974) who suggest that impulsivity in the cognitive reflection-impulsivity dimension is characterised by an anxious, ill-adapted personality, i.e., by low E and high N. The different interpretations will be tested in the following chapters.

CHAPTER EIGHT

"SIMON SAYS" AND "DO AND DON'T": A STUDY ON THE RELATIONSHIP BETWEEN IMPULSIVENESS AND BEHAVIOURAL SELF-RESTRAINT

Background

The difference in the use of verbal self-instruction by reflective and impulsive children was reported by Meichenbaum & Goodman (1969b). When these children were asked to say "fast" or "slow" to accompany their motor responses -- tapping on a key --, impulsive children produced the verbal utterances as though they were a metronome, whereas the reflective children would say the word and then tap as though the verbal instruction was a reminder of how to perform. It was therefore suggested that although the impulsive children responded to verbal instructions, and they did not take into account of the meaning of the word.

In view of this observation of the differences in the ways in which reflective and impulsive children made use of verbal self-instruction, Meichenbaum (1971, cited in Meichenbaum, 1977) studied the use of private speech by cognitively reflective and impulsive pre-school children. The results indicated that whereas the verbalisations of impulsive and reflective children did not differ in quantity, they did differ in quality. The private speech of the impulsive children seemed to be comparatively immature and self-stimulatory in content. By contrast, the reflective children manifested significantly more self-regulatory speech.

The inability of impulsive children to respond to self-instruction or to generate spontaneous speech to aid their performance in problem solving situations suggests that impulsive children are less efficient than reflective children when a verbal instruction offers the discriminative cue for responding in a situation when there is a conflict between the response required and the verbal cue.

Strommen (1973) suggested that the game "Simon Says" would be a suitable task to test the ability of children to respond to selective verbal cues in producing or inhibiting a motor response. This game also had the advantage of testing children in a "real-life" setting. "Simon Says" (or sometimes known as "O'Grady Says") is played by having a leader name and perform a series of simple actions, such as "put your hand on your head", "point to your nose", etc. The instruction is sometimes preceded by the utterance "Simon says", and sometimes not. For example, if the leader says "Simon says, hands up", the child is expected to perform the action. But if he just says "Hands up", the child must not perform the action. The phrase "Simon says" is therefore the cue to act. Usually the series of actions are presented in a continuous fashion so that the child must be able to act or inhibit his action in a relatively fast sequence in order to do well. Strommen (1973) played this game with children aged about 5 to 8 years. Two blocks of ten trials each were administered. The impulsive errors made on the inhibition trials were analysed, and the results showed that impulsive errors decreased over age, and that older children committed fewer errors on the second block of trials, suggesting that they were better than the younger children at benefiting from practice in inhibiting their responses. There was also a tendency for girls to produce fewer errors than boys at all ages, though they only reached statistical significance among the younger children.

Strommen's (1973) interest in the "Simon Says" game was by and large a developmental one. The choice of this game in the present investigation was considered appropriate for two reasons. Firstly, it was a test of behavioural restraint which had not been used to examine the generality of reflection-impulsivity. Secondly, the behavioural restraint required in "Simon Says" was specifically related to a differential response to verbal cues, and so tied in with the concern for verbal regulation in behaviour.

There are several features of the "Simon Says" game which seem to be of interest in the context of verbal regulation of behaviour. Briefly, when the prefix "Simon Says" is omitted, the child has to inhibit a response, contrary to the semantic structure of the statement. Strommen (1973) interpreted the failure to inhibit the action as due to a "disinhibition" effect by the presentation of the action. Strictly speaking, the failure to restrain the action cannot be attributed to only the action being presented. Strommen made the point that the activating signal (i.e., the cue whether or not to perform) and the description of the action are presented in the same -- verbal -- modality. This seems more likely to be the major source of difficulty which confronts children when they play "Simon Says". It would seem more appropriate to suggest that the disinhibition effect may be due either to the instruction given or to the action being performed by the experimenter or possibly to both. "Simon Says"can be played without the presentation of the action and the inhibition trials are equally difficult. This suggests that disruption to performance as a result of the motor action being presented is secondary to the effects of the verbal cue, though it can certainly enhance the difficulty of the trial.) Another problem is that although "disinhibition" is a convenient explanatory concept in this instance, it may not be applicable to the broader phenomenon of verbal regulation of behaviour, as proposed in the discussion in Part I (see p.42). The same analysis can be expressed in terms of the "load" hypothesis, in that when the stimulus (instruction) is incompatible with the response required, it is more difficult to perform well.

"Simon Says" is also a task with considerable situational uncertainty. The child does not know whether or not to respond before an individual trial. Until the instruction has been given, he does not know what action he is to perform each time. One would expect an anxious child to be more sensitive to these situations, so this is a task in which impulsive children might be expected to perform less well than the reflective children. This is based on the assumption discussed in the last chapter that the impulsive child tends to be anxious, brittle and unable to tolerate uncertainty (Block,et al. 1974).

It can also be argued that "Simon Says" is a more demanding game to the impulsive children because on top of response uncertainty, subjects are required to respond selectively to the verbal cues, a task at which impulsive children have been found to be at a disadvantage compared with reflectives (Meichenbaum & Goodman, 1969b).

In order to show that impulsive children are worse at inhibiting themselves in uncertain situations, another game, similar to "Simon Says", but with more straight forward verbal instructions was designed. It was called "Do and Don't". In this game, the child is expected to respond when the instruction is "Do this" and to inhibit his action when the instruction is "Don't do this". It is predicted that the reflective children would perform better than the impulsive children at this task, and that impulsive children would find this task easier than the "Simon Says" game. The predictions are based on the assumption that reflective children are better at behavioural restraint and at following instructions than the impulsives, whether the instructions are complicated or straightforward ones. For the impulsives, the game "Do and Don't" is easier than "Simon Says", because the latter requires the selective response to verbal cues, and there is a conflict between the response required from them and the verbal and visual stimuli presented to them, whereas "Do and Don't" does not involve these complications.

So far, "impulsive" and "reflective" children have been mentioned assuming that the classification is in accordance with that suggested by Kagan, et al. (1964) and categorized by means of the MFFT. But in addition to this classification, individual differences in personality appears to be closely linked to the understanding of impulsiveness. Following the conceptualization of Gray (1973), it is predicted that the ability to perform well on "Simon Says" and "Do and Don't" is related to scoring low on extraversion and neuroticism. However, there is no direct measure of Gray's dimension, and although the discussion on impulsiveness has also brought up Eysenck's work, the present experiment will adopt the Cattell's Children's Personality Questionnaire (CPQ), which has the advantage of operating at the level of finer scales for traits. There is therefore the possibility of separating measures of impulsiveness and sociability when personality variables are related to behavioural measures.

Methods

Subjects

The subjects for the experiment were selected from 256 children (134 boys and 122 girls) attending Westbourne Junior School and the Robin Hood Junior School. The mean age of all the subjects was 109.59 months (S.D.=13.73). The mean age of the boys was 109.18 months (S.D.=13.30) and of the girls was 110.03 months (S.D.=14.23). The children were all given the MFFT in order to select reflective and impulsive children from this sample.

Selection of subjects by MFFT

All the subjects were seen individually in a small quiet room in school. The MFFT was administered to them according to the standard procedures (Appendix 20). The booklet containing the MFFT pictures was propped up on a desk, so that the standard picture faced the child, and the page containing all the stimuli lay at right angles to it on the desk. Before displaying the MFFT items, the experimenter (E) sat beside the child and gave the following instructions: "I am going to show you a picture of something you know and then some pictures that look like it. You will have to point to the picture on this bottom page (point) that is just like the one on this top page (point). Let's do some for practice." E then showed the child the two practice items. Most of the children were correct in their first response to the practice trials, and none of them had any difficulty in understanding the instructions. E then continued: "Now we are going to do some that are a little bit harder. You will see a picture on top and six pictures on the bottom. Find the one that is just like the one on top and point to it."

The latency of the first response was recorded. If the child gave a correct answer, E said, "Good, that's right." If the child made an error, E said, "No, that's not the right one. Find the one that is just like this," and pointed to the standard picture. All the responses (including errors) were coded in the order given and if the subject made up to six errors, the correct item was pointed out to him and he was shown the next trial. Although the children could see E using a stopwatch and marking down their answers, nothing was said about trying to get a correct answer or about the speed of response required. All the subjects were told not to mention anything to their friends when they left.

The means and standard deviations of MFFT response time and errors are presented in Table 86.

The children were divided by sex and subdivided into an older age group and a younger age group. Children attending the first two years of the junior school belonged to the Young group,

Table 86 Means and standard deviations of age and MFFT scores in original sample

	Old		Young	
	M	F	M	F
N	68	62	66	60
Age				
$\overline{X}$	120.86	122.35	97.22	97.30
S.D.	6.16	6.44	6.13	6.93
range	109-131	111-132	86-109	86-109
MFFT latency (in seconds)				
$\overline{X}$	130.86	137.37	128.00	133.72
S.D.	67.90	74.92	68.03	95.51
median	124.00	116.00	106.50	117.50
range	35.5-489	48-486.5	46-359	34.5-725
MFFT errors				
$\overline{X}$	9.09	8.74	12.89	11.56
S.D.	4.54	5.00	6.08	6.36
median	8.50	7.70	12.16	10.10
range	2-22	1-30	0.30	3-32
latency x error (correlation)	-0.4**	-0.40**	-0.52**	-0.36*

** $p < .001$ (1-tailed)

* $p < .01$ (1-tailed)

and those from the upper two forms belonged to the Old group. The latency and errors on the MFFT of these four groups were examined (Winer, 1971, p.402). There was no sex difference ($F(1,252)=0.4$) in the latency measure, or in errors ($F(1,252)=0.11$). The two age groups did not differ in latency ($F(1,252)=1.47$), but there was a significance difference between the errors ($F(1,252)=23.61$, $p=.001$).

It would be justifiable to pool together male and female subjects in the selection process. However, in order to balance the number of boys and girls in the design, the impulsive and reflective children in each of the four groups were chosen by the double-median-split method, using the median of errors and the median of latency of each group as the criteria.

Among the Old Males, 24 children were classified as impulsive, 24 as reflective. 20 Young Males were impulsive, and 22 were reflective. As for the girls, 21 Old Females were impulsive and 22 of them were reflective. Among the Young Females, 22 were impulsive and 23 were reflective. Sixteen children were randomly selected from each of these groups to participate in the "Simon Says" and "Do and Don't" experiments.

In view of the fact that the number of errors differed significantly between the age groups, it was decided that the two groups should be separated in the design and analysis. The design was a four-way analysis of variance design with Sex (2) x Conceptual tempo or IR (2) x Order of presentation (2) x Condition (2), with repeated measures on the Condition factor.

The means and standard deviations of the MFFT scores of the subjects in this experiments are shown in Table 87.

Procedures for "Simon Says" and "Do and Don't"

The subjects were seen individually in a small room in the school. Half of the subjects in each group were given the game "Simon Says" first, and then the game "Do and Don't". The other half played the games in reversed order. All the subjects had met E before in the MFFT session, and were willing and co-operative in this experiment.

The instructions were given as follow:
"Do you know a game called 'Simon Says'?" (If answer yes), "Good, and you know that it is played in this way." (If answer no), "It's all right. It's very simple and I'll show you how to play this game."
"When I say 'Simon Says -- do this', you follow what I do (demonstration with action). But when I say 'Do this', you do not do anything at all (demonstration with action). Now we'll try a few times for practice."

Practice trials were presented at a slow pace. When the subject were correct at least twice on each type of instruction performing on their own, E said, "Now, I want to find out how good you are and we shall do it a little bit faster. You must pay attention and try your best."

Two blocks of 10 trials were presented with one minute rest between each block. After the presentation of each gesture, a count of four (about two seconds) was made and if the subject did not

Table 87 Means and standard deviations of MFFT by subjects in "Simon Says" and "Do and Don't" experiment (N = 16 in each group)

			Age (Months)		MFFT error		MFFT latency (seconds)	
			$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
Old	M	impulsive	119.10	6.41	13.50	3.97	76.62	20.57
		reflective	122.40	4.80	4.75	1.69	212.06	81.61
	F	impulsive	123.20	6.39	14.31	4.96	84.50	17.33
		reflective	123.70	6.14	5.00	1.90	225.41	88.75
Young	M	impulsive	96.60	7.51	19.69	4.08	73.41	13.32
		reflective	97.70	5.41	7.25	3.02	210.78	79.17
	F	impulsive	93.90	6.82	18.63	5.60	71.03	17.46
		reflective	98.50	7.52	6.00	1.83	206.70	14.76

respond when he was supposed to, the trial was counted as an omission error. If the subject made a response after the instruction "Do this", it was considered a commission error. To these, E would say "No, try the next one," and proceeded with the next trial. If the appropriate response was made, E said "Good, that's right". As the trials were performed in a continuous sequence with less than three seconds' inter-trial interval, the proceedings were recorded on a cassette tape-recorder and scored after the experiment.

The actions in each block of trials were: hands on head, both arms out, jump once, arms up, swing one arm, touch tummy, bend knees, touch nose, clap once and bend to one side. Half of the items were preceded by "Simon says, do this" and the other half by "Do this". The sequence was presented in random order, with no more than three consecutive trials preceded by the same instruction. In order to remind E of the sequence of presentation, a coded list was written on a card placed on a desk next to where E was standing.

After conducting the "Simon Says" game, a rest of two minutes was given. Then E said, "Now we shall play a different game. This time I want to see how good you are at following instructions. It is a simple game but you must pay attention. When I say 'Do this', you follow what I do (Demonstration of action). But when I say 'Don't do this', you do not do anything at all (demonstration of action). Now we shall try this a few times for practice." The actual trials began after the subject had achieved two correct trials on his own on each type of instruction. There were two blocks of ten trials each. The actions and the format followed exactly that of the "Simon Says" game. In this game, a response to "Don't do this" was an error of commission, and the failure to respond "Do this" was an error of omission. The maximum score a subject could obtain was 20, with the two trial blocks combined.

Personality measures

The subjects were given Form A of the CPQ in a class test, and their class teachers were asked to fill in the New TRS. These children were part of the standardization sample (Sample B) of the New TRS.

It was hoped to obtain measures of children's intelligence or their reading scores from the school records, but this request was turned down by the School authorities.

Results

The means and standard deviations of the scores of the games "Simon Says" and "Do and Don't" are presented in Tables 88 and 89. As the variance of these scores was homogeneous, the scores were analysed by analysis of variance and the ANOVA summary tables are presented in Tables 90 to 95.

Analyses were performed separately on accuracy, errors of commission and errors of omission.

For the old subjects, there were two between subjects main effects that were significant, namely, Sex ($F(1,56)=7.98$, $p=.01$) and Conceptual style (IR) ($F(1,56)=26.75$, $p=.001$) on the accuracy index. Girls obtained higher accuracy than boys and the reflective

Table 88 Means and standard deviations of "Simon Says" Scores (S.D.s in parenthesis)

Order of Presentation		First			Second		
Subject	Groups	Accuracy	Commission	Omission	Accuracy	Commission	Omission
Old Male	impulsives	14.78 (1.85)	4.50 (1.51)	1.13 (0.99)	15.88 (2.42)	3.75 (2.12)	0.38 (0.52)
	reflectives	17.62 (1.41)	2.00 (1.41)	0.38 (0.74)	18.13 (1.25)	1.75 (1.16)	0.13 (0.64)
Female	impulsives	16.38 (2.33)	3.38 (2.39)	0.25 (0.71)	17.25 (1.58)	2.63 (1.69)	0.13 (0.35)
	reflectives	18.38 (0.52)	1.63 (0.52)	0 (0)	18.63 (1.30)	1.38 (1.30)	0 (0)
Young Male	impulsives	14.38 (3.50)	4.38 (2.26)	1.25 (1.75)	14.38 (1.92)	4.75 (1.75)	0.88 (0.64)
	reflectives	17.00 (1.69)	2.50 (1.31)	0.50 (0.76)	16.50 (1.41)	3.38 (1.30)	0.13 (0.35)
Female	impulsives	15.63 (2.39)	4.13 (2.03)	0.25 (0.46)	15.13 (1.89)	4.63 (1.85)	0.25 (0.70)
	reflectives	17.00 (1.31)	2.75 (1.28)	0.25 (0.46)	18.13 (1.25)	1.63 (1.06)	0.25 (0.46)

Table 89 Mean and standard deviations of "Do and Don't" Scores (S.D.s in parenthesis)

Order of Presentation		First			Second		
Subject	Groups	Accuracy	Commission	Omission	Accuracy	Commission	Omission
Old Male	impulsives	16.63 (1.60)	2.63 (1.77)	0.75 (0.89)	17.13 (1.13)	2.25 (1.04)	0.63 (0.92)
	reflectives	18.13 (1.73)	1.13 (0.83)	0.75 (1.04)	18.75 (1.16)	0.63 (0.92)	0.63 (1.19)
Female	impulsives	17.75 (2.25)	1.88 (1.89)	0.38 (0.52)	17.88 (1.81)	1.38 (1.60)	0.75 (1.16)
	reflectives	18.75 (1.28)	0.86 (0.69)	0.50 (1.41)	18.88 (0.64)	1.13 (0.69)	0 (0)
Young Male	impulsives	16.38 (1.60)	2.50 (1.60)	1.13 (0.83)	15.38 (1.85)	3.50 (1.41)	1.13 (1.13)
	reflectives	17.75 (1.49)	1.50 (1.20)	0.75 (1.04)	18.25 (1.28)	1.50 (0.93)	0.75 (0.71)
Female	impulsives	17.63 (1.06)	1.88 (1.13)	0.50 (0.93)	17.13 (0.99)	2.75 (1.04)	0.13 (0.35)
	reflectives	18.25 (1.75)	1.38 (1.50)	0.36 (0.52)	17.88 (1.55)	1.75 (1.39)	0.37 (0.74)

subjects performed better than the impulsive subjects. The condition variable was significant ($F(1,56)=14.15$, $p=.001$), indicating that the game "Do and Don't" was easier than the game "Simon Says", as hypothesized. There were no significant interaction effects.

The same three main effects produced significant results on the errors of commission analysis: Sex ($F(1,56)=4.54$, $p=.05$); IR ($F(1,56)=25.84$, $p=.001$) and Condition ($F(1,56)=25.37$, $p=.001$). They were consistent with the accuracy index in showing that boys and impulsive subjects produced more errors of commission, and more commission errors were scored in the inhibition trials of "Simon Says" than the game "Do and Don't".

The only significant main effect on the analysis of omission errors was a between subject main effect due to sex ($F(1,56)=5.29$, $p=.05$), with girls committing fewer errors of omissions overall.

The results for the younger subjects were fairly similar to those of the older subjects. The analysis of accuracy produced significant main effects due to Sex ($F(1,56)=5.57$, $p=.01$), IR($F(1,56)=26.57$, $p=.01$) and Condition ($F(1,56)=24.50$, $p=.001$). This implied that among the younger age group, girls and reflective children yielded the most accurate performance, and the game "Do and Don't" was the easier game of the two.

Only the main effects due to IR ($F(1,56)=28.44$, $p=.001$) and to Condition ($F(1,56)=36.35$, $p=.001$) were significant in the analysis of errors of commissions. The direction was as expected, i.e., impulsive children produced more commission responses, and

Table 90 Older Subjects: ANOVA of Accuracy Scores

Source of variation	SS	df	MS	F	Sig
Between subjects	326.88	63			
Sex	26.28	1	26.28	7.98	<.01
(IR)	98.00	1	98.00	26.75	<.001
"Simon Says" Order of presentation (SSORD)	10.13	1	10.13	3.07	N.S.
Sex x IR	5.28	1	5.28	1.60	N.S.
Sex x SSORD	1.53	1	1.53	0.47	N.S.
IR x SSORD	1.13	1	1.13	0.34	N.S.
Sex x IR x SSORD	0.03	1	0.03	0.01	N.S.
error (between)	184.50	56	3.29		
Within subjects	143.00	64			
Conditions (C)	26.28	1	26.28	14.15	<.001
C x Sex	2.00	1	2.00	1.08	N.S.
C x IR	7.03	1	7.03	3.79	N.S.
C x SSORD	1.53	1	1.53	0.83	N.S.
C x Sex x IR	0.50	1	0.50	0.27	N.S.
C x Sex x SSORD	0	1	0	0	N.S.
C x IR x SSORD	1.53	1	1.53	0.83	N.S.
X x Sex x IR x SSORD	0.13	1	0.13	0.07	N.S.
error (within)	104.00	56	1.86		

Table 91 Older subjects: ANOVA of errors of commission

Source of variation	SS	df	MS	F	Sig
Between subjects	241.43	63			
Sex	11.88	1	11.88	4.54	$<.05$
Conceptual tempo (IP)	67.57	1	67.57	25.84	$<.001$
"Simon Says" Order of presentation (SSORD)	5.70	1	5.70	2.18	N.S.
Sex x IR	6.57	1	6.57	2.51	N.S.
Sex x SSORD	0.07	1	0.07	0.03	N.S.
IR x SSORD	2.26	1	2.26	0.86	N.S.
Sex x IR x SSORD	0.95	1	0.95	0.36	N.S.
error (between)	146.44	56	2.61	1.68	N.S.
Within subjects	133.50	64			
Conditions (C)	39.38	1	39.38	25.37	$<.001$
C x Sex	1.76	1	1.76	1.13	N.S.
C x IR	3.45	1	3.45	2.22	N.S.
C x SSORD	0.95	1	0.95	0.61	N.S.
C x Sex x IR	0.01	1	0.01	0.01	N.S.
C x Sex x SSORD	0.63	1	0.63	0.41	N.S.
C x IR x SSOR	0.20	1	0.20	0.13	N.S.
C x Sex x IR x SSORD	0.20	1	0.20	0.13	N.S.
error (within)	86.94	56	1.55		

Table 92   Older subjects: ANOVA of errors of omission

Source of variation	SS	df	MS	F	Sig
Between subjects	48.22	63			
Sex	3.78	1	3.78	5.29	< .05
Conceptual tempo (IP)	2.00	1	2.00	2.8	N.S.
"Simon Says" order of presentation (SSORD)	1.25	1	1.25	1.58	N.S.
Sex x IR	0	1	0	0	N.S.
Sex x SSORD	0.50	1	0.50	0.70	N.S.
IR x SSORD	0.03	1	0.03	0.04	N.S.
Sex x IR x SSORD	0.78	1	0.28	1.09	N.S.
error (between)	40.00	56	40.00	1.25	N.S.
Within subjects	37.00	64			
Conditions (C)	2.00	1	2.00	3.50	N.S.
C x Sex	0.13	1	0.13	0.22	N.S.
C x IR	0.28	1	0.28	0.49	N.S.
C x SSORD	0.28	1	0.28	0.49	N.S.
C x Sex x IR	0.78	1	0.78	1.37	N.S.
C x Sex x SSORD	0.28	1	0.28	0.49	N.S.
C x IR x SSORD	0.13	1	1.13	1.97	N.S.
C x Sex x IR x SSORD	0.13	1	0.13	0.22	N.S.
error (within)	32.00	56	32.00		

Table 93 Younger subjects: ANOVA of accuracy scores

Sources of variation	SS	df	MS	F	Sig
Between subjects	371.22	63			
Sex	22.78	1	22.78	5.57	< .01
Conceptual tempo (IR)	108.78	1	108.78	26.57	< .001
"Simon Says" order of presentation (SSORD)	0.78	1	0.78	0.19	N.S.
Sex x IR	5.28	1	5.28	1.29	N.S.
Sex x SSORD	0.28	1	0.28	0.07	N.S.
IR x SSORD	3.78	1	3.78	0.92	N.S.
Sex x IR x SSORD	0.28	1	0.28	0.07	N.S.
error (between)	229.25	56	4.09	1.82	N.S.
Within subjects	199.00	64			
Conditions (C)	55.13	1	55.13	24.50	<.001
C x Sex	0.13	1	0.13	0.60	N.S.
C x IR	6.13	1	6.13	2.72	N.S.
C x SSORD	1.13	1	1.13	0.50	N.S.
C x Sex x IR	3.13	1	3.13	1.39	N.S.
C x Sex x SSORD	1.13	1	1.13	0.50	N.S.
C x IR x SSORD	0.13	1	0.13	0.60	N.S.
C x Sex x IR x SSORD	6.13	1	6.13	2.72	N.S.
error (within)	126.00	56	2.25		

Table 94 Younger subjects: ANOVA of errors of commission

Source of variables	SS	df	MS	F	Sig
Between subjects	228.72	63			
Sex	5.28	1	5.28	2.09	N.S.
Conceptual tempo (IR)	72.00	1	72.00	28.44	<.001
"Simon Says" order of presentation (SSORD)	3.78	1	3.78	1.49	N.S.
Sex x IR	0.13	1	0.13	0.05	N.S.
Sex x SSORD	1.53	1	1.53	0.61	N.S.
IR x SSORD	3.73	1	3.73	1.24	N.S.
Sex x IR x SSORD	1.13	1	1.13	0.44	N.S.
errors (between)	141.75	56	2.53	1.45	N.S.
Within subjects	176.00	64			
Condition (C)	63.28	1	63.28	36.35	<.001
C x Sex	0.28	1	0.28	0.16	N.S.
C x IR	4.50	1	4.50	2.59	N.S.
C x SSORD	1.53	1	1.53	0.88	N.S.
C x Sex x IR	3.13	1	3.13	1.80	N.S.
C x Sex x SSORD	2.53	1	2.53	1.45	N.S.
C x IR x SSORD	0.13	1	0.13	0.07	N.S.
C x Sex x IR x SSORD	3.13	1	3.13	1.80	N.S.
error (within)	97.50	56			

Table 95 Younger subjects: ANOVA of errors of omission

Source of variation	SS	df	MS	F	Sig
Between subjects	63.88	63			
Sex	6.13	1	6.13	7.11	<.01
Conceptual tempo (IR)	3.78	1	3.78	4.39	<.05
"Simon Says" order of presentation (SSORD)	1.13	1	1.13	1.31	N.S.
Sex x IR	3.78	1	3.78	4.39	<.05
Sex x SSORD	0.50	1	0.50	0.58	N.S.
IR x SSORD	0.03	1	0.03	0.04	N.S.
Sex x IR x SSORD	0.28	1	0.28	0.33	N.S.
error (between)	48.25	56	0.86	1.80	N.S.
Within subjects	28.00	64			
Condition (C)	0.28	1	0.28	0.59	N.S.
C x Sex	0.03	1	0.03	0.07	N.S.
C x IR	0.13	1	0.13	0.26	N.S.
C x SSORD	0.03	1	0.03	0.07	N.S.
C x Sex x IR	0	1	0	0	N.S.
C x Sex x SSORD	0.28	1	0.28	0.59	N.S.
C x IR x SSORD	0	1	0	0	N.S.
C x Sex x IR x SSORD	0.50	1	0.50	1.05	N.S.
error (within)	26.75	56	0.48		

the inhibition trials of "Simon Says" were marked by more errors of commission.

The analysis of errors of omission by the Young age group showed that there were significant main effects due to Sex ($F(1,56)=7.11$, $p=.01$) and to IR ($F(1,56)=4.39$, $p=.05$). However, there was also a significant Sex x IR interaction such that the main effects results warrant further qualification ($F(1,56)=4.39$, $p=.05$). Post-hoc analysis of the Scheffé test showed that the male impulsives produced significantly more omissions than the other three subject groups combined ($F(3,60)=7.84$). The within-subjects main effect due to condition did not reach significance, but the trend was that more errors of omissions were produced in the game "Do and Don't". Examination of the syntax of the instruction suggests a reason for this finding. Whereas the instruction of the game "Simon Says" predisposes the subjects to respond, the game "Do and Don't" includes an instruction which specifically requires the subject not to do something. It may be that subjects were affected by this negative instruction in the game "Do and Don't" and were therefore more inclined to omit responses even on trials when they were required to produce a response.

Discussion

The results are that in playing these two games which require responding or not responding to specific verbal instructions, the boys in the older age group did worse than the girls, in that they produced more errors both of commission and omissions. The impulsive children produced more errors of commission, and their overall performance was worse than that of the reflectives. This confirms the hypothesis that impulsive children defined according to the MFFT measures are poorer at inhibiting their responses in a task that requires subjects to follow directly what is suggested in the instruction ("Do and Don't"), as well as a task which requires them to respond to the verbal cues in the instructions ("Simon Says"). However, there is no indication that the impulsive children found the "Simon Says" game harder than did the reflective children, since there was no significant interaction between response style and condition.

As for the younger age group, the accuracy index analysis replicated the results obtained from the older age group, and confirmed the hypothesis. However, it would seem that correct performance in the younger age group was determined more by the responses of omission than by commission. Where there was only a main effect due to sex in the analysis of commission errors, several significant findings were revealed in the analysis of the errors of omission, and the interaction effect indicated that male impulsives omitted more responses than the other groups. The reasons for this was a matter of speculation. Perhaps the presentation of trials was too rapid and imposed too great a demand on the attention of the younger children, but it is not clear why they omitted responses and did not make as many commission responses. In the discussion in the previous chapter, it was suggested that impulsive children are less capable of sustaining their attention, which might explain why they tended to omit responses in the present experiment.

Relation between the games "Simon Says" and "Do and Don't"

Table 96 Product moment correlation of "Simon Says" and "Do and Don't" variables

	Simon Says		
	Accuracy	Commission	Omission
Do and Don't			
Accuracy	.50	-.47	-.26
	(.001)	(.001)	(.002)
Commission	-.41	.44	.12
	(.001)	(.001)	
Omission	-.28	.19	.29
	(.001)	(.017)	(.001)

The correlation between the "Simon Says" (SS) and "Do and Don't" (DD) measures, based on the data of all the subjects are presented in Table 96. The means and standard deviations of the variables are shown in Appendix 22.

SS and DD accuracy were highly correlated (r=.50, p=.001, one-tailed) and so were SS and DD errors of commission (r=.44, p=.001) and errors of omission (r=.29, p=.001). DD commission responses were negatively related to SS accuracy (r=-.41, p=.001) but the correlation with SS omission responses was not significant. As for DD omission response, its negative correlation with SS accuracy was moderate but significant, and so was its positive correlation with SS responses of commission.

Inter-correlation of the measures in each of the games indicated although the correlations were all significant and in the expected direction, errors of commission related significantly better with accuracy then omission. SS commission correlated with SS accuracy (r=-.47, p=.001) and DD commission correlated with DD accuracy (r=-.41, p=.001). By contrast, the correlation between errors of omission and accuracy in the two games reached only the mid- .20s in the negative direction. This indicated that errors of commission made a more important contribution than did errors of omission to overall performance. In line with this, the accuracy and commission measures of the two games correlated to a greater degree with one another than did the omission and commission measures.

Relationship between "Simon Says" and "Do and Don't" measures and personality and age variables

The correlation table is presented in Table 97 and the means of the variables are shown in Appendix 23.

The variables involved were the accuracy, errors of commission and errors of omission of SS and DD, the MFFT variables, the measures of the CPQ, the New TRS and age.

Product moment correlation indicated that MFFT error correlated signifcantly and in the expected direction with all the measures of SS and DD, with the exception of DD errors of omission (DDOMI). While SS errors of omission (SSOMI) correlated significantly with MFFT errors (r=.25, p=.002), the correlation coefficient was smaller than other measures that correlated with MFFT error. This suggests that the ability to withhold a response according to an

Table 97 Correlation of "Simon Says" and "Do and Don't" measures with MFFT and Personality Variables

	MFFT		CPQ									
	* ERROR	* TIME	A	B	C	D	E	F	G	H	I	J
"SIMON SAYS"												
ACCURACY	-.56 (.001)	.15 (.034)	.14	.46 (.002)	.04	-.03	-.04	-.18 (.046)	.13	.11	.17	.02
COMMISSION	.55 (.001)	-.20 (.013)	-.15	-.44 (.002)	-.06	.03	.00	.10	-.16	-.12	-.08	-.01
OMISSION	.25 (.002)	.06	-.01	-.19 (.038)	.04	.07	.15	.32 (.002)	.03	-.02	-.34 (.002)	-.08
"DO AND DON'T"												
ACCURACY	-.51 (.001)	.11	.17	.34 (.002)	-.01	-.06	-.11	-.20 (.025)	.15	.11	.23 (.010)	-.06
COMMISSION	.53 (.001)	-.17 (.028)	-.28 (.002)	-.21 (.018)	-.05	.04	.09	.08	-.18 (.048)	-.13	-.08	.05
OMISSION	.11	.07	.11	-.32 (.002)	.09	.05	.07	.25 (.006)	-.002	-.01	-.31 (.002)	.02

(* one-tailed test)
(The number of subjects in the correlation of SS and DD measures with:
MFFT and age = 128, CPQ = 126, New TRS G = 89, E = 106, N = 117, P = 106)

Table 97 (Con't) Correlation of "Simon Says" and "Do and Don't" measures with MFFT and Personality Variables

	CPQ						NEW TRS				
	N	O	Q3	Q4	ANX*	EXT	G	E	N*	P	AGE
SS											
ACCURACY	-.21	-.07	.20	-.08	-.14	-.005	.25	-.06	-.16	-.12	.21
	(.014)		(.020)				(.016)		(.039)		(.016)
COMMISSION	.18	.12	-.22	.09	.17	-.06	-.19	.03	.12	.05	-.23
	(.046)		(.014)		(.058)						(.010)
OMISSION	.16	-.08	-.04	.02	.01	.22	-.22	.02	.20	.15	.01
						(.014)	(.036)		(.01)		
DD											
ACCURACY	-.20	-.10	.18	.04	-.11	-.001	.15	.01	-.06	-.03	.21
	(.024)		(.044)								(.018)
COMMISSION	.16	.16	-.17	-.03	.14	-.15	-.10	-.06	-.01	-.02	-.23
			(.051)								(.008)
OMISSION	.12	-.07	-.06	-.03	-.01	.23	-.11	.07	.14	.08	.01
						(.008)					

instruction "Don't do this" in DD) and according to a selective cue ("Do this" without "Simon Says" in SS) were related to making an error in MFFT, which was the inability to discriminate the relevant visual cue before making a response.

MFFT latency correlated significantly with SS errors of commission (SSCOM) and DD errors of commission (DDCOM). Hasty responding in MFFT was related to committing impulsive and erroneous responses in SS and DD. However, it seemed that the MFFT response time was a less effective predictor of SS and DD performance than was MFFT error. In terms of the nature of MFFT and the SS and DD games, MFFT was an untimed task while SS and DD was time restricted and the subjects were responding in fast sequences. This might explain the lack of correlation between MFFT response time and the games.

Age correlated significantly with the accuracy score and errors of commission of both SS and DD, but hardly with the errors of omission. As age increased, there was a tendency of errors of commission to decrease and accuracy to improve and this was in accord with Strommen's (1973) results.

The correlation of the SS and DD measures with personality variables showed that several CPQ factors had significant relationships with the behavioural variables. Factor B (Less mental capacity vs More mental capacity) correlated significantly and the coefficients were among some of the highest with all the behavioural measures. Although Factor B could not be considered strictly speaking as a personality measure, this finding shows that intelligence played an important part in the performance of the games. It appears that a more intelligent child can respond to instructions better, and being intellectually more adaptable, can respond more appropriately in a complex situation with conflicting visual and verbal cues.

Factor F (Desurgency vs Surgency) correlated negatively with SSACC (r=-.18, p=.046) and with DDACC (r=-.20, p=.025), and positively with SSOMI (r=.32, p=.002) and DDOMI (r=.25, p=.006). Factor F of the CPQ was one of the factors loading highly on Extraversion. A low score represents seriousness and caution while a high score suggests heedlessness, impulsiveness and liveliness. It was useful in this analysis to separate the errors into responses of commission and omission, because it was obvious that Cattell F, a trait of extraversion, related more with omitting responses that with impulsive responding.

Factor I (Harria vs Premsia) also correlated significantly with the omission responses, r=-.34 (p=.002) with SSOMI and r=-.31 (p=.002) with DDOMI. The negative correlation could be explained by that fact that Premsia represented a tenderminded disposition, being dependent and prone to avoidance of threatening situation, and therefore, a high score on Premsia would suggest that the child took great care not to omit responses. Factor I was also positively correlated with DDACC (r=.23, p=.01) but not with SSACC. This implied that where following exactly what an instruction meant was concerned, Factor I would predict satisfactory performance, but, when the simple link between instruction and action was broken, and when performance depended on paying attention to extra cues, Factor I became a less useful predictor of performance.

Q3 (Weak self-sentiment vs Strong self-sentiment) can be described as an index of self-control. High ratings on Q3 indicate that the child has control over his emotions and behaviour in general. He is motivated to do well and to have foresight. On the other hand, a low Q3 rating suggests laxity, a tendency to follow one's own urges and to break rules through carelessness or neglect. Although Cattell (Porter & Cattell, 1968) provides a broader interpretation of Q3 to encompass "self-regarding sentiment" i.e., the degree to which a child regulates his own behaviour by reference to the concept he has of himself and how he wishes to present himself, one may regard Factor Q3 as indicating adequate self-control for accuracy. This is in accord with the finding here that Q3 correlated with SSACC ($r=.20$, $p=.02$) and with DDACC ($r=.18$, $p=.044$). It was negatively correlated with the errors of commission.

Factor N (Naiveté vs Shrewdness) has significant correlations with SS and DD, but the results are somewhat difficult to explain. A high score on N is described as indicating a calculating, shrewd or aloof personality, as opposed to a low N score, which represents artlessness and a lack of social awareness. The correlations were significant on the two-tailed test, and they seem to indicate that a calculating child tends to perform less well and commit more impulsive errors on both SS and DD.

There are other isolated correlations involving other variables. Factor G (Super ego weakness vs Super ego strength) is significantly correlated with DDCOM ($r=-.18$, $p=.048$); a high G score reflects perseverance and an ability to concentrate and to follow instructions, so this correlation might be expected. Factor A (Schizothymia vs Cyclothymia) was correlated with DDCOM (r=-.28, p=.002).

The high order factor Anxiety (ANX) correlated significantly with SSCOM (r=.17, p=.029). Although ANX also correlated negatively with SS and DD accuracy and positively with the errors of commission, the coefficients were around the mid.-.10s and were not significant statistically. Exvia (EXT) was correlated significantly and positively with the errors of omissions on both games, but not with accuracy and errors of commission. That EXT was related to errors of omission could be explained by the fact that inattentiveness and carelessness may be features found in an extraverted personality. The relation between Anxiety and errors of comission was in accord with the prediction that impulsive behaviour is connected to neuroticism.

The measures of the NEW TRS yielded few significant correlations. The "Good pupil" (TRS-G) measure correlated significantly with SSACC (r=.25, p=.016) and with SSOMI (r=-.22, p=.036). The child scoring high on TRS-G tend to be reflective and systematic, so he might be expected to do well on the "Simon Says" game. The correlations with DD measures were in the same direction as the SS measures, but probably DD was a more straightforward task, and TRS-G ratings became less useful predictors of performance. TRS-N correlated negatively with SSACC, but the coefficient was significant only by a one-tailed test. It was also significantly correlated with SSOMI (r=.20, p=.01).

It seems that performance of SS and DD is significantly related to MFFT measures of reflectivity and impulsivity, and that it is also related to at least some aspects of personality, as measured by the CPQ. There was some evidence in support of the relation between Anxiety and response of commission but not Exvia and response of commission. By contrast, factors loaded on Exvia are significantly and positively correlated with errors of omissions, whereas neuroticism did not seem to be related to this aspect of performance. The results therefore offer some support for Block,et al.'s (1974) position that impulsive behaviour as characterised by a high frequency of errors of commission is related to neuroticism in personality. The prediction from Gray's theory (Gray, 1973) is that impulsive behaviour should be linked with both neuroticism and extraversion. Only the connection with Neuroticism has been supported by the present findings. There is no evidence from the correlation between measures of extraversion and behavioural measures to substantiate Gray's theory.

Among all the correlation coefficients, the best predictors of SS and DD performance are MFFT errors, chronological age and CPQ Factor B, the measure of intelligence.

Summary

The experiment set out to demonstrate that impulsive and reflective children differ in their response to verbal instructions and in their ability to perform on two game-like tasks which required them to produce or inhibit their motor actions in quick succession. The game "Simon Says" required responding selectively to subtle verbal cues, while the game "Do and Don't" provides a controlled condition in which the instructions are interpreted exactly according to what they mean. The games were administered to two groups of children differing in age. The results indicated that older boys and older impulsive children performed worse on the game "Simon Says" and produced significantly more errors of commission on this task. Younger boys produced more omission errors than the girls, and the impulsive children also made more errors of omission than the reflectives on "Simon Says".

The measures of performance at the two games were intercorrelated and according to the correlation coefficients of the accuracy and errors of commission measures, the two tasks seemed to be appropriate for measuring behavioural self-restraint.

The behavioural measures were correlated with MFFT variables, and with certain self-rated and teacher-rated measures of personality. The best predictors of the performance on both games were MFFT error and Factor B of the CPQ (a measure of intelligence). Commission responding tended to be realted more to CPQ Factors loaded on Anxiety (e.g., Factor Q3) than with factors related to extraversion. Factors loaded on Extraversion (e.g. Factor F) tended to be related to responses of omission. The performance on "Simon Says" could also be predicted from the "Good" or "reflective" subscale of the New TRS. It seems that performance of the two tasks was related to individual differences in personality, but it must be noted that impulsive responding seemed to be related to measures of anxiety or neuroticism, whereas measures of extraversion were related to errors of omission. This is of particular relevance to the discussion in Chapter Seven, where it was seen that Gray has linked extraversion with impulsiveness. The present results suggest that extraversion may be linked to carelessness -- omitting a response -- but not with the inability to exert behavioural restraint.

CHAPTER NINE

DIFFERENTIAL REINFORCEMENT OF LOW RATE BEHAVIOUR: A STUDY OF BEHAVIOURAL SELF-RESTRAINT, VERBAL-INSTRUCTION AND PERSONALITY VARIABLES

Background

By employing the games described in Chapter Eight, it was possible to study behavioural self-restraint in a real life situation. The phenomenon can also be studied in the laboratory, by means of a schedule of reinforcement known as differential reinforcement of low rate of response (DRL). Under the DRL schedule, reinforcement is contingent upon responses which are spaced by an interresponse time of not less than a specified duration. Interresponse time (IRT) less than that already specified is not reinforced but resets the time contingency. For example, if the schedule is DRL-20, only a response which occurs 20 seconds or more after the previous response will be reinforced. Some studies adopt a modification of the procedure by imposing a limit hold (LH) contingency which sets an upper limit on the IRTs which will be reinforced. Apart from IRTs, an alternative criterion for reinforcement is the rate of responding, that is, the emission of a specified number of responses or less within a certain elapsed time interval, rather than a single response. The subject performing a DRL task is under the control of temporal parameters of the schedule and not purely the rate of reinforcement.

Extensive studies comparing the DRL schedule with other schedules have suggested that the DRL schedule generates a lower rate of responding than other intermittent reinforcement schedules with similar reinforcement rates (Richardson, 1973). Most workers have studied DRL as a behavioural baseline, but the schedule has also been investigated from the point of view of how subjects mediate the time between responses (Bruner & Revusky, 1961; Wilson & Keller, 1953), the nature of response burst (defined as responses with interresponse time shorter than two seconds) (Sidman, 1956; Kramer & Rilling, 1969) and how stimulus control (Gray, V.A., 1976) and other motivation variables affect performance (Kramer & Rilling, 1970).

There are also studies which are concerned with the performance of various species on DRL schedule. Animals studies constitute a large proportion of the literature on DRL (e.g., Kramer & Rilling, 1970; Topping, Pickering, & Jackson, 1971; Weisman, 1969), but it has also been studied in human adults (Bruner & Revusky, 1961; Flynn & Tedford, 1976; Singh, 1971; Stein & Flanagan, 1974; Stein & Landis, 1973) and in children (Shapland, Nicholson, Rushton, & Gray, unpublished, Stein & Landis, 1975; Warren & Brown, 1943; Weisberg, 1970; Wesiberg & Tragakis, 1967). The scope extends from interspecies comparison (Hearst, 1972; Powell, 1974) to applications on DRL in clinical treatment (Deitz & Repp, 1974; Nordlund & Rönnberg, 1977).

Before going into some of these studies in detail, we must first consider the measurement of DRL progress, a procedural issue that has concerned several investigators (Weisberg, 1970;

Stein & Landis, 1973; Kramer & Rilling, 1970). One method of charting DRL performance is to group the IRTs into intervals of 2, 3 or 4 seconds and so forth and then plot the frequencies of the responses occurring within each interval. When a complete plot of the relative frequencies of the various class intervals has been obtained, a bimodal curve is usually found. At one end there is a peak with very short IRTs, while the other modal point represents the maximum responding to a particular schedule during stable performance. The short IRTs are often due to response bursts defined as any sequence of two or more responses in which no consecutive responses are separated by more than two seconds (Sidman, 1956). It has been suggested the probability of a burst is related to the length of the preceding IRT (Sidman, 1956). However, this has not been replicated, (Kramer & Rilling, 1969) and not all investigators have reported large numbers of bursts by their subjects (Reynolds, 1964). Children extensively trained on a DRL schedule rarely display bursting (Weisberg, 1970; Wesiberg & Tragakis, 1967).

When Stein & Landis (1975) compared the frequencies of response bursts emitted by reflective and impulsive children, it was found that IRTs of less than 2 seconds accounted for about 30% of their total responses during the last 5 minutes of DRL training (in a 30-minute session) for the former, whereas the reflective children produced this rate in the beginning five minutes of the training, but reduced it to about 10% in the end. It would seem that bursting can be regarded as either a species specific or individual mode of responding. It has been suggested that bursting is due to a lack of stimulus feedback for a criterion response. Blough (1963) was the first to make this point, and Stein & Landis (1975) have provided further evidence in support of this idea. When children performing on DRL are given instructions regarding the criterion schedule, there is an immediate elimination of response bursts. In view of the fact that short response bursts many reflect individual differences in performance and the effects of feedback manipulation, relative frequency recording is probably the best method of charting the responses, and it is among the most frequently used methods.

Interesting though IRT distribution may be, use of this analysis, based entirely on the examination of the frequency plot, fails to provide information on the subtle changes that may occur in DRL training, one of which is the rate of responses produced relative to response opportunity. When time is a dimension being studied, the time intervals presented are confounded by the subject's behaviour. Assuming for example that the IRTs in a DRL-6 schedule are grouped into four intervals of 0-2, 2-4, 4-6 and 6-8 seconds, the subject responding in the second interval would have the opportunity to respond to the first interval, but not to the third and the fourth intervals. When responses occur with equal frequency to each time interval, the actual probability of responding is quite different. The problem raised by this can be surmounted by using interresponse-time-per-opportunity (IRT/OP) analysis (Anger, 1956, 1963). The calculation involves dividing the number of responses that fall in the IRT interval by the number of opportunities that the subject has to respond in that category. The number of opportunities for any IRT category equals the number of responses falling into that category plus all responses with longer IRTs. With this analysis, the IRT/OP curve will show an increasing probability of responses for IRT up to the reinforced value with training, when temporal discrimination has been achieved. Compared with relative frequency analysis, IRT/OP analysis is more sensitive to the detection of temporal discrimination.

Other alternative measures of the performance on DRL training include the rate of responding and the rate of reinforcement. Both, however, are subject to fluctuation. For example, a high but erratic response rate can yield the same frequency of reinforcement as a slow but steady tempo. An efficiency ratio, defined as the number of reinforced responses to the number of total responses, is also widely used. All these indicators represent different performance patterns, and perfect correlation among them is not to be expected. Weisberg (1970) reported that response rate correlated -.89 and .84 with reinforcement rate and response per reinforcement respectively, and that the last two measures correlated -.60 with each other. Shapland, et al. (unpublished) adopted the efficiency measure and derived a time score to indicate the time required by a subject to reach criterion in DRL training. In a series of DRL tasks, with increasing IRT in the DRL schedule, the correlation between time score and efficiency score ranged from .57 to .71 and the correlation reached significance for a group of subjects with mean age about 12 years. For the younger subjects (mean age about $9\frac{1}{2}$ years), only one correlation between time score and efficiency score ($r = .83$) was statistically significant.

Shapland, et al. (unpublished) report a phenomenon which, although not widely documented in other studies, seems to call for the introduction of another index of DRL efficiency. They noted a paradoxical situation when some of the subjects performed at a rate close to extinction and consequently took a long time or even failed to reach the specified criterion, namely, that there should be two consecutive trials in which the child gained at least half the maximum number of reinforcements which could be obtained. The problem here is that the child has learned behavioural restraint by spacing out the responses or responding at very long IRTs, but it is doubtful whether exact temporal discrimination has been achieved. Subjects performing in this pattern will have a high efficiency ratio in the conventional sense, but they may not necessarily be efficient in the sense that they are attempting to maximize the number of reinforcements received. This warrants the calculation of an efficiency ratio which involves dividing the number of reinforcements obtained by the maximum total number of reinforcements available within a period of DRL performance.

Altogether it will be clear that care must be taken in setting up the criterion in DRL training tasks. It is a question of whether the investigator is interested in temporal discrimination, or merely in training subjects to respond at a very low rate and still receive reinforcement without the constraint of any upper limit of interresponse time (i.e., limit hold).

The nature of DRL is complicated, but its different facets can be reflected by different methods for recording DRL training progress. It seems desirable, for the sake of clarity, completeness and easy comparison with other experiments that several measures should be taken of DRL performance.

Adult humans are found to perform well on DRL whether or not they are given instructions about the nature of the task. Children too, when told to find out the way to obtain as many reinforcement as possible, are able to perform appropriately (Shapland, et al., unpublished). Toddlers and older children were both found to respond to DRL schedule control (Weisberg, 1970; Weisberg & Tragakis, 1967). Weisberg & Tragakis (1967) have suggested that subjects adapt best to a DRL schedule with a relatively long pause length (e.g., 20 seconds) if they are first trained with a DRL interval which is one half of the value of the long duration. The potentially facilitative or restrictive nature of other schedules of reinforcement has been examined by Weisberg (1970), who concludes that training on an easier schedule of DRL (DRL-10) promotes better performance of a harder schedule (DRL-18) than no prior experience, experience on a variable ratio schedule, or experience on a fixed interval schedule. Shapland, et al. (unpublished) have noted that it is useful to give a series of DRL tasks of increasing difficulty because the initial task correlates much more than subsequent tasks with measures of intelligence. They conclude that subjects tend to use the first task to find out the nature of DRL, so that giving subjects a series of DRL schedules enables us to distinguish between performance which is primarily a function of learning ability and that which is a function of the ability to restrain behaviour.

The basic skill tapped by DRL tasks — the ability to exert behavioural self-restraint — lends itself to the study of individual differences. Singh (1971) was among the first to study the influence of personality on human DRL performance. She found that subjects with low scores on the Manifest Anxiety Scale (Taylor, 1953) performed better on a DRL task than more anxious subjects, irrespective of whether or not pretraining was given, and whether the training involved a facilitative or an interfering reinforcement schedule.

Stein & Landis (1975) studied the performance of reflective and impulsive children selected by the MFFT. Subjects were put on a DRL-6 schedule, with half of them being informed about the contingency which was in operation. They found that impulsive children emitted more responses on the reinforced key than reflective children when neither group knew about the contingency, but that impulsives got fewer reinforced responses. The effect of conceptual tempo on efficiency also "tended" toward significance. It was also reported that uninstructed impulsive children produced nearly 30% of their total responses as bursts of two seconds or less. Instruction about the contingency almost eliminated the difference between the impulsive and reflective children on DRL performance, as there was no conceptual tempo X instruction interaction in the analysis. The last finding suggests that, given explicit instruction, impulsive children can somehow regulate their performance. This differs from the findings of the "Simon Says" and "Do and Don't" experiments described in Chapter Eight, which showed that impulsive children were worse than the reflective ones when given specific instructions about whether or not to respond. It is possible that the effectiveness of instruction depends on how it is phrased and delivered, and the type of tasks to which it applies. The instruction in Stein & Landis's (1975) experiment was actually telling the subject what the task requirement was for each trial. Broad, global instructions which can serve as a "plan" have been demonstrated to be facilitative (Patterson & Mischel, 1975a, 1975b) in enhancing self-control in resistance to temptation experiments. The present experiment was designed to investigate the use of self-instruction by impulsive and reflective children when they are put on DRL training.

Shapland,et al. (unpublished) interpreted the performance on DRL tasks by two group of children aged between 7-11 years old and 10-12 years old in terms of Gray's model of impulsiveness (Gray, 1970, 1973). They predicted that DRL performance would vary according to an individual's position on the dimension of impulsiveness from neurotic extraversion to stable introversion (see p. 304 and Figure 18). They gave three progressively more difficult DRL tasks, and found that with the younger subjects, DRL performance on the first task was related to extraversion and neuroticism, while performance on the second and third tasks was related to introversion and stability. With the older group, DRL performance was significantly correlated with IQ on the first task, introversion on the second, and stability and the lie scale on the third task. The personality measures used were self-rating on the JEPI. Shapland,et al. suggested that personality measures were influential on the second and third tasks, but that the first task should be regarded as a cognitive task on which subjects became familiar with DRL training.

The present investigation builds on the work of Shapland, et al. (unpublished) and Stein & Landis (1975). The relationship between DRL performance and personality differences will be re-examined, and the variables will include both measures of conceptual tempo and personality ratings. Although Stein & Landis (1975) postulated a relationship between DRL performance and conceptual tempo, they did not suggest any reason for the link. On the basis of the discussion of the mechanisms of reflection-impulsivity in Chapter Seven, it could be predicted either that impulsive conceptual tempo will relate to anxiety and introversion in personality (based on Block,et al.'s (1974) analysis), or that reflective conceptual tempo will relate with anxiety and introversion in personality (based on Kagan,et al.'s (1964) and Messer's (1970) analysis). Neither of these position could predict the correlation reported by Shapland,et al. (unpublished) between behavioural restraint measured by DRL performance and stability and introversion. And these two analyses are also different from Gray's formulation of the impulsive dimension. It is hoped that the discrepancy will be explained and the confusion clarified by examining the relationship between measures of DRL performance and both MFFT and personality variables.

Moreover, the analysis in Chapter Eleven will go further to find out how MFFT measurements can be predicted from personality variables.

Another objective of the present experiment is to investigate individual differences in the use of verbal self-instruction on DRL training. It is assumed that the DRL tasks are different from the tasks so far employed in that DRL involves temporal discrimination instead of just the execution or inhibition of discrete responses. In DRL, the preceding response serves as a stimulus for the next response, whereas in the other experiments, each individual response is treated as being independent. Given the involvement of a time interval, it is possible that verbal instruction could be manipulated so that DRL performance will be aided. It might serve several functions. Depending on what the verbal self-instructions are, they may suggest to the children the nature of the tasks, provide them with instructions how to perform, or they may simply be used to bridge the gap between two responses as a "mediated" response. It is expected that both impulsive and reflective children will benefit from the use of self-instruction. However, impulsive children may manifest qualitative differences from reflectives in the use of self-instruction, or they may use this strategy less effectively than the reflective subjects.

With reference to the use of verbal self-instruction as a "mediated" response in DRL performance, the "mediated" role has a specific definition. A number of studies have investigated the method subjects use to bridge the passing time period between the consecutive responses in DRL. Behaviour which occurs between two responses and is used by the organism as a controlling stimulus in subsequent responding is referred to as mediating behaviour (Ferster & Skinner, 1957). It is different from collateral behaviour, which is generally regarded as behaviour which occurs between responses but does not necessarily influence the pattern of responses. Anger (1963) took as the cornerstone of his analysis of temporal discrimination the proposition that "animal have available some events, either internal or in their behaviour, that change in a consistent way with time after the last respnse, reinforcement, etc. These events function like external stimuli, at least to the extent that differences in responding can be conditioned to these organism differences " (p.479). He was referring to the occurrence and use of mediated responses.

Research with rats (e.g., Wilson & Keller, 1953; Laties, Weiss, & Weiss, 1969) and monkeys (Hodos, Ross, & Brady, 1962) has demonstrated that unscheduled collateral behaviour, such as tail-biting, wood-nibbling, or headjerks serves a further mediating function that regulates temporal discrimination. The presence of these behavioural pattern increases the rate of reinforcement in these studies. If the opportunities to produce mediated behaviour are thwarted, for example by the removal of the piece of wood the rats have been nibbling, DRL performance deteriorates (Laties, Weiss & Weiss, 1969). However, one problem in studying mediating behaviour is that the mode of the behaviour differs widely among species. Laties,et al. (1969) noted, "The precise topography of the collateral behaviour that may appear in subjects maintained on a DRL schedule depends, of course, on the behavioural predilections of the subjects and on the experimental environment" (p.55). This implies that the stimulus function of mediating behaviour can be enhanced by controlling the salience of the provided options to the subjects.

In an experiment using human subjects, Bruner & Revusky (1961) induced mediating behaviour that could be recorded easily by exposing the subjects to four telegraph keys, three of which were irrelevant, since only the pressing of one key could produce reinforcement. During the reinforcement phase, subjects displayed systematic response patterns in such a way that responding on the other keys "filled in" the necessary temporal delay between responses on the reinforced key. By contrast with the baseline phase before and the extinction phase after, DRL reinforcement yielded erratic performance. Post-experiment interviews revealed that all the subjects thought that reinforcement could be obtained only by a pattern of responses on at least one of the other keys before pressing the reinforced key. The authors suggested that the preconception of the subjects were a probable determinant of their behaviour. They concluded, "... thus, these unsolicited, 'impromptu' responses become a functional chain of conditioned reinforcers which successfully maintain DRL performance" (p.350).

Further evidence concerning the influence of the subject's preconceived ideas about the task is provided by Stein & Flanagan (1974). They provided subjects with four keys, only one of which was relevant to DRL reinforcement. They asked their subjects to write down at regular intervals during DRL training what they thought was the reason for their response pattern. The answers were classified into either a response-based hypothesis or a time-based hypothesis about the reinforcement contingency. An answer was classified as response-based if it referred to the necessity of pressing the collateral keys in order to obtain reinforcement. An answer referring to waiting for a period of time as the basis for reinforcement was classified as time-based. The results indicated that subjects who held a response-based hypothesis consistently emitted more collateral behaviour than those who held a time-based hypothesis. However, the nature of the verbal responses was unrelated to either the total number of reinforcements obtained or to the efficiency of DRL performance. Harsem, Lowe & Bagshaw (1978) reported similar findings in several operant tasks. Their subjects formulated different preconceptions about the tasks according to what instructions they were given and subsequently adjusted their response to meet what they thought the task required.

In another study, Edward & Dart (1967) exposed their subjects to four keys on a DRL-10 schedule. Only one key affected reinforcement. When responding was stable, the key (other than the reinforced one) pressed most frequently was removed, then the second most frequently pressed key, until finally only the DRL key remained. In the last phase of training, all the keys were reinstalled. Results showed that not all the subjects engaged in response sequences on the collateral key to obtain reinforcement, and for those who did, performance on the DRL schedule indicated that their terminal pressing was no longer dependent upon the production of the entire sequence of the mediating responses. It would seem that collateral behaviour was important in the acquisition phase of DRL training, but became less so in the maintenance phase. Flynn & Tedford (1976) supported this finding by their observation that subjects who used bicycle pedalling to mediate button-pressing on a bicycle handbar emitted less collateral behaviour on the second day of performance, when their behaviour had already stabilized.

Inasmuch as DRL performance indicated by time or reinforcement measures reflects the influence of individual differences, the records of collateral behaviour provide useful information. Stein & Landis (1973) reported that the temporally spaced responding on a telegraph key was significantly disrupted by the removal of the other keys on which subjects produced collateral behaviour sequences. Moreover, the extent of disruption was related to the baseline (unreinforced) performance of the subjects, and to their collateral behaviour during DRL training. Subjects with slower baseline rates responded infrequently on the collateral keys and maintained a constant rate of responding and reinforcement throughout. In sharp contrast, the subjects with higher baseline rates regularly engaged in collateral responding, developing a characteristic pattern of collateral pressing, and their temporal discrimination was more disrupted when the collateral keys were made unavailable, than the subjects with low baseline rate. Furthermore, despite their eventual adjustment to the DRL schedule in the absence of collateral keys, subjects with higher baseline rates reverted to a pattern of high collateral key-pressing as soon as those keys were reinstated. Stein & Landis (1975) reported a consistent relationship between baseline and collateral behaviour in DRL, and in view of Shapland,et al.'s (unpublished) suggestion that a child's baseline rate of responding is a stable property of his behaviour, it seems reasonable to expect that collateral behaviour may also be an important variable of individual differences.

There is a wide selection of behaviour which may be adopted as collateral responses. It has been reported that covert counting is used by some subject to mediate responses, and it may be expected that the effective use of counting will reflect certain individual differences. Laties, et al. (1969) suggested that stimulus collateral behaviour from internal physiological events are unlikely to become collateral behaviour while Kelleher (1966) suggested that responses with great homogeneity which tend to occur in sequence are possibly suitable as collateral behaviour. Human counting fits this description, and in the present experiment counting is used as a form of verbal instruction as well as collateral behaviour in DRL training.

But before considering the experiment, we should be clear about its experimental rationale. Gray (1973) suggested that consistent patterns of individual differences (CPIDs) may be expected to have an enduring structural basis in the neuroendocrine system (NES). However, whereas the majority of work on CPIDs in human beings relies to a large extent on questionnaire responses, the study of the physiological basis of personality tends to involves experimental animals. Gray proposed the experimental strategy of matching behaviour patterns of animals and man. As the work of Nicholson & Gray (1972) has shown, many behavioural processes related to emotional mechanisms are found in similar form in man and in animals. DRL performance may fulfill the same requirement. However, it has been suggested that the collateral behaviour involved in DRL could be species-specific and the introduction of verbal mediation clearly makes it difficult to claim that DRL involves the direct matching of behaviour between animals and men. Stevenson (1970) is therefore possibly right to insist that children participating in learning experiments should be treated as a species in their own right, and not just as replication subjects for animal studies.

The predictions of the present experiment can be summarized as follows:

1. Impulsive children (classified by the MFFT) will perform worse than the reflective children on DRL.
2. Children who perform well on DRL will be rated low on extraversion and low on neuroticism in personality measures.
3. The use of counting as a form of self-instruction and mediating response will improve DRL performance.
4. Impulsive children, and/or children rated high on measures of extraversion and anxiety will be less efficient in their use of verbal mediating behaviour than the reflectives,

and/or those rated as introverted and stable. Inadequate use of verbal self-instruction may take the form of producing too short or too long mediating responses, such that the time required to reach DRL criteria or the efficiency of the performance will be affected.

5. DRL performance will be related to the child's initial rate of responding.

Methods

Subjects

The subjects were from Westbourne Junior School and Robin Hood Junior School. All of them had participated in the last experiment and were given the MFFT (see Chapter Eight). From the groups of impulsive and reflective children in each age group, twelve reflective and twelve impulsive subjects were selected randomly for each sex. Altogether 96 children participated in the experiment. Their mean age and MFFT scores are shown in Table 98.

Experimental unit and apparatus

The experiment was carried out in a mobile laboratory which was a converted Ford Transit van. It was driven to the school playground and all the subjects were seen individually inside the van. The compartment was equipped with lighting, heating and air conditioning. Curtains were fitted so that the

Table 98 Means and standard deviations of ages and MFFT scores of subjects in DRL experiment

Subjects			N	Age		MFFT errors		MFFT time	
				X	S.D.	X	S.D.	X	S.D.
Old	M	impulsives	12	116.92	5.43	13.00	3.25	74.58	23.44
		reflectives	12	121.33	4.74	4.75	1.54	219.79	91.10
	F	impulsives	12	122.92	5.90	14.67	5.57	82.83	13.31
		reflectives	12	123.33	5.73	5.00	2.00	207.95	62.62
Young	M	impulsives	12	94.42	7.35	19.91	4.56	75.21	12.39
		reflectives	12	95.75	4.09	6.33	2.87	216.00	77.85
	F	impulsives	12	91.08	5.40	19.92	5.93	67.17	18.65
		reflectives	12	98.17	8.33	6.25	1.76	226.13	159.43

subjects working inside the compartment would not be disturbed. The layout of the modile laboratory is presented in Figures 19a and 19b.

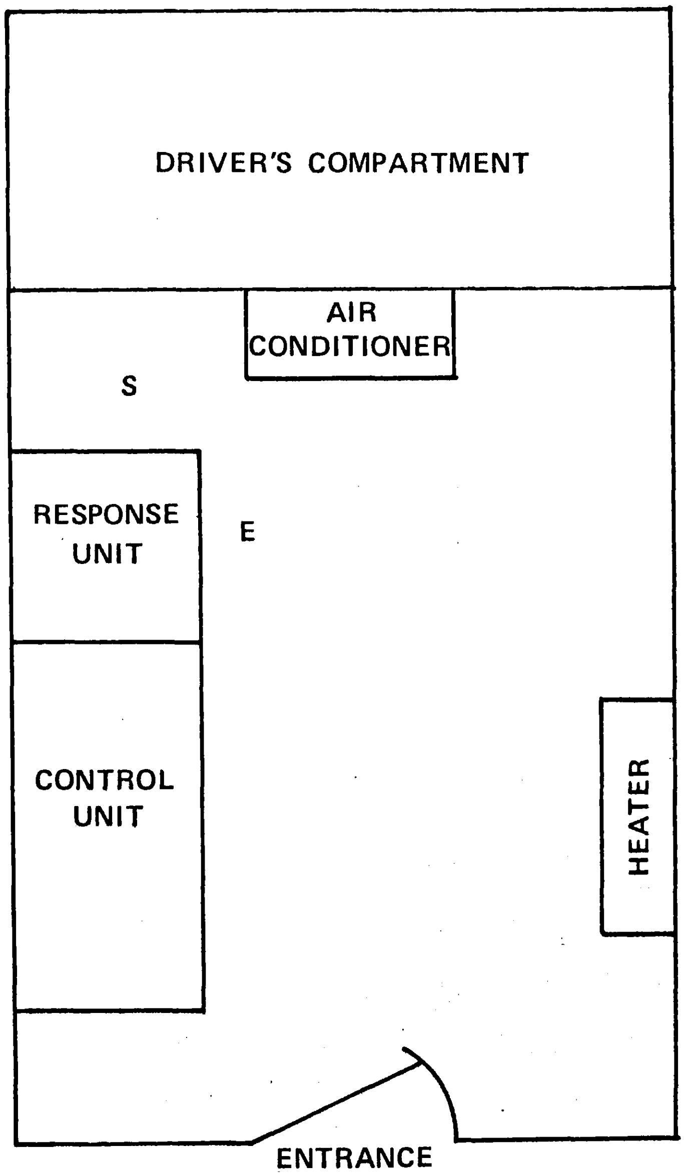
The apparatus for DRL training consisted of a response unit for the subjects and a control unit for the experimenter (E). The apparatus was actually designed for use on a variety of operant tasks with children, but those parts not in use in the present experiment were covered up. The response unit consisted of a stimulus display panel measuring 25" x 20" x 5", mounted at right angle to a response box measuring 5½" x 20" x 35". On the stimulus display panel, four light bulbs were spaced 3" apart. There was a buzzer on the top right hand corner. (A screen which could be used for visual display purposes measuring 8" square was placed below the lights, but it was covered in the present experiment). A lever for pressing protruded from the middle of the response box; it was 4" long and had a black plastic handle. The lever could only be pressed downwards, and not be pushed inwards, pulled or tilted upwards or sideways (Appendices 24b & c).

The control unit was installed at right-angle to the response unit so that the subject, while sitting down and performing on the lever, could not see what E was doing. The control unit was a box measuring 20" x 13¼" x 13½". It was operated by two batteries hidden behind the driver's seat in the van. The DRL schedule was regulated by a dial and the light and buzzer (when used) were operated by on/off switches on the panel. An automatic printer printed in codes the experimental

Figure 19a   The mobile laboratory

Figure 19b   Internal view of mobile laboratory

FIGURE 19C FLOOR PLAN OF MOBILE LABORATORY



(NOT TO SCALE)

conditions and the response time of each press on the lever. The picture and circuit diagram of the unit are presented in Appendices 24c and 25.

Procedures

The subjects were randomly divided into a "speech" group and no speech group with an equal number of reflective and impulsive boys and girls in each group. Each subject was taken to the mobile laboratory and given time to familiarize himself or herself with the surroundings. After being introduced to the apparatus, the subject was asked to practise pressing the lever for two minutes so that a baseline measure could be recorded. The reinforcers were then introduced to the subject. He was given a card and some colour stickers, and was told that he could earn many more colour stickers by playing well in the game. All the subjects were given the stickers to start the game with.

Three DRL experiments were planned for both conditions. The first task required the subject to press with a short IRT. If the subject's baseline rate was less than one second per press, the IRT for the first task was two seconds. If the baseline rate exceeded one second, it was rounded to the next integer and the IRT for the first task was baserate plus two seconds. The second task was a DRL-6 task for subjects with an initial rate of less than one second. For subjects with longer baseline rate, the schedule was baserate + 6 seconds. Similarly, the third task was DRL-12 for most subjects, but baserate + 12 seconds for those with longer than one second IRT.

Pilot testing indicated that children could manifest extremely unusual "superstitious" behaviour when they were told merely to "find out a way to earn the colour stickers". They might press with their elbows or fist and one boy even turned round to depress the lever with his back. It was therefore decided that the child should be discouraged from such behaviour by being given more specific instructions.

In the control condition, the child was told: "Now we are going to play a game with the pressing bar and you can win more colour stickers if you do well. There is a special way of pressing the bar and I want you find it out. When you get it right, I shall say 'good' and give you a point. It has nothing to do with which hand you use, how you sit, or with twisting, pulling or pushing the bar. I am not telling you how to press - you work it out yourself. Remember, I'll say 'good' if you are correct and you should try to keep it up. If you are not right, I shall say nothing. This means you must keep thinking of another way to press. You can try different ways of pressing as often or as little as you like."

In the speech or counting condition, the instruction was: "Now we are going to play a game with the pressing bar and you can win more colour stickers if you do well. There is a special way of pressing the bar and I want you to find it out. When you get it right, I shall say 'good' and give you a point. It has nothing to do with which hand you use, how you sit, or with twisting, pulling or pushing the bar. I suggest that after each press you count aloud from 1 up to any number you like between

1 and 50. Then you press again. After that, you start counting from 1 and then press. Make sure that I can hear you count. I am not telling you how to press and count, and I want you to find it out by trying. Remember, I'll say 'good' when you are correct, and you should try to keep it up. If you are not right I shall say nothing. This means you must think of another way. You can try different ways by pressing as little or as often as you like, and counting up to small numbers or big numbers."

DRL training was divided into consecutive one-minute blocks and the criterion for terminating the trial was that a subject had to be accurate with at least half of his responses in consecutive intervals and be able to accumulate the total maximum reinforcement available in a 1-minute interval, (i.e., 30 reinforcements in a DRL-2 schedule and 10 reinforcements in a DRL-6 schedule).*Note If a child failed to learn to criterion in thirty minutes, the trial was terminated and the subject was not asked to perform further tasks. For every thirty minutes of training, the subject was given a rest which lasted from 15 to 30 minutes. Each subject was seen within one day to complete all DRL tasks if he could meet the criterion of individual tasks.

---

*Note: This scoring method was compared with other measures of DRL learning, including:

a) two consecutive intervals with at least half of the responses being accurate

b) two consecutive intervals with at least half of the maximum available reinforcement

c) all the responses must be accurate and the subject has accumulated the total maximum number of reinforcement available in a one-minute block.

The present method was most sensitive and seemed to reflect what most other methods would have shown individually.

Some children, especially those in the speech condition, were able to reach criterion in about three minutes. However, they were not stopped until they had performed for at least five-minutes. The extra training did not affect the scoring of their performance, and at any rate, all the subjects maintained their performance as the DRL schedule demanded during the extra time.

When a child was moved onto a harder DRL-schedule, he was told, "Now the rules have changed. You work it out by pressing as often or as little as you like (and counting up to small numbers or big numbers). I'll let you know when you are correct; try to get as many 'good' points as you can."

The control panel printed out the latency of the response each time the child pressed the bar and the child was given the due verbal reinforcement if it was longer than the specified IRT. E also used a golf tally to count the total number of reinforcements, which was shown to the subjects at the end of the task, and the appropriate number of colour stickers was delivered. Special care was taken to ensure that while the subject was performing, the reinforcers were kept out of his sight, bearing in mind the evidence on resistance to temptation (see p. 61) that the visual presence of the reinforcers might affect a subject's ability to restrain his or her behaviour.

Personality measures

Self-rated personality measures of the CPQ Form A were available. The subjects also contributed to the standardization sample for the NEW TRS. They were also rated by their teachers on the four NEW TRS subscales.

Scoring and analysis

The baseline IRT was one of the indices recorded. The time taken for each subject to reach criterion was subtracted from 31, so that it yielded a time score, a high score indicating that the subject had taken less time to reach criterion than a low score. A subject with a score of 1 was dropped from further DRL schedules.

One efficiency score (EF1) was derived by dividing the total number of reinforcements by the total number of presses. A second efficiency score (EF2) was calculated by dividing the total number of reinforcements obtained by the total maximum number of reinforcements available during the time period the subject had performed.

A learning index was derived by subtracting the mean IRT during the first two minutes of the first session from the mean IRT of the last two minutes of the final session of DRL training.

Relative frequency distribution and interresponse time/opportunities were analysed and presented graphically. Relative frequency distribution (RFD) and IRTs/OP analysis were performed on the baseline, and on each of the DRL tasks. The interresponse time was divided into successive two-second blocks for the two-minute baseline period, and the last two minutes of performance on the three DRL tasks. RFD was calculated using the formula:

$$\frac{\text{number of IRTs in each interval}}{\text{total number of IRTs in all intervals.}}$$

IRTs/OP was calculated by the formula:

$$\frac{\text{number of IRTs in (a given) interval A}}{\text{number of IRTs in interval A + number of IRTs in intervals greater than A.}}$$

Results

A. The effects of speech on DRL performance

The means and standard deviations of the time scores and efficiency indices on each DRL task and the learning indices are presented in Tables 99a to 101 and Table 111b.

An analysis of variance was performed on each task (Sex X Conceptual tempo or IR X Conditions) with the various indices. The old and young subjects were considered separately as in the last experiment (Chapter Eight). The ANOVA summary tables are presented in Tables 102 to 111a and Tables 112 to 121.

Older age group

Analysis of variance on the time score and efficiency index (EF1) in DRL-2 tasks indicates that there was a significant main effect due to conditions ($F(1,40)=21.35$, $p < .001$; $F(1,40)=59.69$, $p < .001$). The subjects using counting took significantly less time to reach criterion and they were more efficient in the rate of reinforcement they obtained. Efficiency Index 2 (EF2) and the learning index did not suggest any statistically significant results.

Table 99a Means and Standard Deviations of Time Score in DRL Experiments of Older Subject

Conditions		Male				Female			
		Impulsive		Reflective		Impulsive		Reflective	
		X	S.D.	X	S.D.	X	S.D.	X	S.D.
DRL-2	Speech (N = 6)	26.67	2.42	24.83	5.56	27.67	1.03	27.50	1.22
	No Speech (N = 6)	16.00	12.76	17.17	10.21	17.00	9.25	15.00	9.59
DRL-6	Speech	27.67 (N = 6)	1.86	26.83 (N = 6)	3.06	28.00 (N = 6)	0.63	28.16 (N = 6)	1.17
	No Speech	5.8 (N = 5)	5.89	9.83 (N = 6)	8.35	9.33 (N = 6)	5.85	13.20 (N = 5)	7.92
DRL-12	Speech	25.83 (N = 6)	4.45	26.17 (N = 6)	3.76	27.17 (N = 6)	1.47	28.00 (N = 6)	0.63
	No Speech	13.33 (N = 3)	12.50	20.50 (N = 4)	6.25	18.00 (N = 5)	6.25	23.75 (N = 4)	6.02

Table 99b Means and Standard Deviations of Time Score in DRL Experiments of Younger Subjects

Conditions	Male				Female			
	Impulsive		Reflective		Impulsive		Reflective	
	X	S.D.	X	S.D.	X	S.D.	X	S.D.
DRL-2 Speech (N = 6)	26.17	2.64	28.00	1.26	28.33	0.52	27.83	1.47
No Speech (N = 6)	12.67	11.36	17.67	9.99	7.17	8.86	15.00	8.10
DRL-6 Speech	27.50 (N = 6)	1.05	27.00 (N = 6)	1.55	27.50 (N = 6)	1.38	26.17 (N = 6)	3.06
No Speech	8.00 (N = 4)	4.97	12.20 (N = 5)	7.33	13.00 (N = 3)	11.13	10.00 (N = 5)	8.71
DRL-12 Speech	26.83 (N = 6)	1.60	27.50 (N = 6)	1.38	26.68 (N = 6)	1.50	26.33 (N = 6)	2.42
No Speech	14.33 (N = 3)	11.02	20.75	6.55	27.00 (N = 2)	1.41	21.40 (N = 5)	6.43

Table 100a Means and Standard Deviations of Efficiency Score 1 in DRL Experiment of Older Subject

Conditions		Male				Female			
		Impulsive		Reflective		Impulsive		Reflective	
		X	S.D.	X	S.D.	X	S.D.	X	S.D.
DRL-2	Speech (N = 6)	0.84	0.29	0.77	0.33	0.85	0.17	0.89	0.13
	No Speech (N = 6)	0.30	0.32	0.33	0.28	0.24	0.35	0.13	0.09
DRL-6	Speech	0.59 (N = 6)	0.31	0.59 (N = 6)	0.33	0.59 (N = 6)	0.19	0.69 (N = 6)	0.20
	No Speech	0.06 (N = 5)	0.09	0.06 (N = 6)	0.06	0.05 (N = 6)	0.03	0.05 (N = 5)	0.03
DRL-12	Speech	0.54 (N = 6)	0.25	0.42 (N = 6)	0.33	0.26 (N = 6)	0.23	0.[illegible]0 (N = 6)	0.14
	No Speech	0.08 (N = 3)	0.07	0.13 (N = 4)	0.13	0.39 (N = 5)	0.23	0.31 (N = 4)	0.32

Table 100b Means and Standard Deviations of Efficiency Index 1 in DRL Experiments of Younger Subjects

Conditions	Male				Female			
	Impulsive		Reflective		Impulsive		Reflective	
	X	S.D.	X	S.D.	X	S.D.	X	S.D.
DRL-2 Speech (N = 6)	0.90	0.15	0.91	0.10	0.95	0.09	0.80	0.20
No Speech (N = 6)	0.17	0.21	0.29	0.28	0.16	0.22	0.15	0.12
DRL-6 Speech	0.65 (N = 6)	0.21	0.61 (N = 6)	0.31	0.67 (N = 6)	0.20	0.49 (N = 6)	0.15
No Speech	0.06 (N = 4)	0.04	0.06 (N = 5)	0.05	0.05 (N = 3)	0.04	0.18 (N = 5)	0.22
DRL-12 Speech	0.57 (N = 6)	0.19	0.57 (N = 6)	0.23	0.53 (N = 6)	0.17	0.46 (N = 6)	0.26
No Speech	0.14 (N = 3)	0.17	0.09 (N = 4)	0.06	0.35 (N = 2)	0.16	0.24 (N = 5)	0.20

Table 101a Table of Means and Standard Deviations of Efficiency Index 2 in DRL Experiments of Older Subjects

Conditions		Male				Female			
		Impulsive		Reflective		Impulsive		Reflective	
		X	S.D.	X	S.D.	X	S.D.	X	S.D.
DRL-2	Speech (N = 6)	0.42	0.27	0.33	0.14	0.37	0.10	0.37	0.15
	No Speech (N = 6)	0.30	0.23	0.36	0.25	0.27	0.19	0.17	0.10
DRL-6	Speech	0.44 (N = 6)	0.14	0.39 (N = 6)	0.16	0.47 (N = 6)	0.11	0.50 (N = 6)	0.09
	No Speech	0.10 (N = 5)	0.11	0.12 (N = 6)	0.11	0.14 (N = 6)	0.08	0.10 (N = 5)	0.04
DRL-12	Speech	0.47 (N = 6)	0.18	0.37 (N = 6)	0.18	0.42 (N = 6)	0.13	0.44 (N = 6)	0.08
	No Speech	0.09 (N = 3)	0.09	0.22 (N = 4)	0.17	0.22 (N = 5)	0.13	0.35 (N = 4)	0.24

Table 101b Means and Standard Deviations of Efficiency Index 2 in DRL Experiments of Younger Subjects

	Male				Female			
	Impulsive		Reflective		Impulsive		Reflective	
Conditions	X	S.D.	X	S.D.	X	S.D.	X	S.D.
DRL-2 Speech (N = 6)	0.32	0.19	0.42	0.16	0.47	0.09	0.46	0.14
No Speech (N = 6)	0.21	0.20	0.29	0.22	0.12	0.11	0.20	0.12
DRL-6 Speech	0.43 (N = 6)	0.07	0.38 (N = 6)	0.40	0.43 (N = 6)	0.10	0.44 (N = 6)	0.10
No Speech	0.10 (N = 4)	0.07	0.13 (N = 5)	0.09	0.11 (N = 3)	0.07	0.16 (N = 5)	0.07
DRL-12 Speech	0.43 (N = 6)	0.05	0.48 (N = 6)	0.10	0.43 (N = 6)	0.07	0.44 (N = 6)	0.12
No Speech	0.21 (N = 3)	0.17	0.23 (N = 4)	0.09	0.34 (N = 2)	0.08	0.34 (N = 5)	0.17

Table 102 ANOVA Table of DRL-2 Time Score of Older Subjects

Source of Variation	SS	df	MS	F	Sig
Sex	4.69	1	4.69	0.08	N.S.
IR	6.02	1	6.02	0.10	N.S.
Condition	1291.69	1	1291.69	21.35	<.001
Sex x IR	1.69	1	1.69	0.03	N.S.
Sex x Condition	17.52	1	17.52	0.29	N.S.
IR x Condition	1.02	1	1.02	0.02	N.S.
Sex x IR x Condition	17.52	1	17.52	0.29	
Error	2419.83	40	60.50		
Total	3759.98	47			

Table 103 ANOVA Table of DRL-2 Efficiency Index 1 of Older Subjects

Source of Variation	SS	df	MS	F	Sig
Sex	0.01	1	0.01	0.01	N.S.
IR	0.01	1	0.01	0.01	N.S.
Condition	4.14	1	4.14	59.69	<.001
Sex x IR	0.0002	1	0.0002	0.0004	N.S.
Sex x Condition	0.12	1	0.12	1.79	N.S.
IR x Condition	0.003	1	0.003	0.05	N.S.
Sex x IR x Conditon	0.05	1	0.05	0.77	N.S.
Error	2.77	40	0.07		
Total	7.11	47			

Table 104 ANOVA Table of DRL-2 Efficiency Index 2 of Older Subjects

Source of Variation	SS	df	MS	F	Sig
Sex	0.04	1	0.04	1.03	N.S.
IR	0.01	1	0.01	0.39	N.S.
Condition	0.12	1	0.12	3.39	N.S.
Sex x Condition	0.004	1	0.004	0.10	N.S.
Sex x IR	0.04	1	0.04	1.00	N.S.
TR x Condition	0.002	1	0.002	0.06	N.S.
Sex x IR x Condition	0.04	1	0.04	1.16	N.S.
Error	1.46	40	0.04		
Total	1.72	47			

Table 105 ANOVA Table of DRL-6 Time Score of Older Subjects

Source of Variation	SS	df	MS	F	Sig
Sex	55.04	1	55.04	2.13	N.S.
TR	39.24	1	39.24	1.52	N.S.
Condition	3942.19	1	3942.19	152.43	$<.001$
Sex x TR	0.52	1	0.52	0.02	N.S.
Sex x Condition	20.54	1	20.54	0.29	N.S.
TR x Condition	55.04	1	55.04	2.13	N.S.
Sex x TR x Condition	1.02	1	1.02	0.04	N.S.
Error	982.77	38	25.86		
Total	5096.36	45			

Table 106 ANOVA Table of DRL-6 Efficiency Index 1 of Older Subjects

Source of Variation	SS	df	MS	F	Sig
Sex	0.003	1	0.003	0.07	N.S.
IR	0.009	1	0.009	0.22	N.S.
Condition	3.81	1	3.81	96.29	<.001
Sex x IR	0.009	1	0.009	0.22	N.S.
Sex x Condition	0.009	1	0.009	0.23	N.S.
IR x Condition	0.008	1	0.008	0.20	N.S.
Sex x IR x Condition	0.009	1	0.009	0.22	N.S.
Error	1.50	38	0.12		
Total	5.36	45			

Table 107 ANOVA Table of DRL-6 Efficiency Index 2 of Older Subjects

Source of Variation	SS	df	MS	F	Sig
Sex	0.02	1	0.02	1.56	N.S.
IR	0.001	1	0.001	0.08	N.S.
Condition	1.34	1	1.34	108.00	<.001
Sex x IR	0.0003	1	0.0003	0.03	N.S.
Sex x Condition	0.01	1	0.01	1.02	N.S.
IR x Condition	0.00	1	0.00	0.00	N.S.
Sex x IR x Condition	0.01	1	0.01	1.00	N.S.
Error	0.47	38	0.01		
Total	1.85	45			

Table 108 ANOVA Table of DRL-12 Time Score of Older Subjects

Source of Variation	SS	df	MS	F	Sig
Sex	91.77	1	91.77	3.35	N.S.
IR	148.31	1	148.31	5.41	$<.05$
Condition	747.12	1	747.12	27.26	$<.001$
Sex x IR	0.60	1	0.60	0.02	N.S.
Sex x Condition	16.77	1	16.77	0.61	N.S.
IR x Condition	103.17	1	103.17	3.77	N.S.
Sex x IR x Condition	2.69	1	2.69	0.10	N.S.
Error	876.92	32	27.40		
Total	1987.35	39			

Table 109 ANOVA Table of DRL-12 Efficiency Indix 1 of Older Subjects

Soucre of Variation	SS	df	MS	F	Sig
Sex	0.01	1	0.01	0.22	N.S.
IR	0.04	1	0.04	0.81	N.S.
Condition	1.12	1	1.12	22.00	$<.001$
Sex x IR	0.11	1	0.11	2.23	N.S.
Sex x Condition	0.06	1	0.06	1.14	N.S.
IR x Condition	0.06	1	0.06	1.12	N.S.
Sex x IR x Condition	0.002	1	0.002	0.05	N.S.
Error	1.62	32	0.05		
Total	3.02	39			

Table 110 ANOVA Table of DRL-12 Efficiency Index 2 of Older Subjects

Source of Variation	SS	df	MS	F	Sig
Sex	0.06	1	0.06	2.35	N.S.
IR	0.02	1	0.02	0.86	N.S.
Condition	0.50	1	0.50	20.16	$<$ .001
Sex x IR	0.01	1	0.01	0.47	N.S.
Sex x Condition	0.04	1	0.04	1.67	N.S.
IR x Condition	0.09	1	0.09	3.71	N.S.
Sex x IR x Condition	0.01	1	0.01	0.45	N.S.
Error	0.08	32	0.02		
Total	1.53	39			

Table 111a ANOVA Table of Learning Index in the Experiment of Older Subject

Source of Variation	SS	df	MS	F	Sig
Sex	1.34	1	1.34	0.06	N.S.
IR	18.55	1	18.55	0.78	N.S.
Condition	7.92	1	7.92	0.33	N.S.
Sex x IR	6.35	1	6.35	0.27	N.S.
Sex x Condition	70.96	1	70.96	2.97	N.S.
IR x Condition	4.95	1	4.95	0.21	N.S.
Sex x IR x Condition	12.77	1	12.77	0.53	N.S.
Error	956.32	40	23.91		
Total	1079.16	47			

Table 111b Means and Standard Deviations of Learning Index in DRL Experiments

	Male				Female			
	Impulsive		Reflective		Impulsive		Reflective	
	X	S.D.	X	S.D.	X	S.D.	X	S.D.
Old Subjects								
Speech Condition (N = 6)	9.76	3.29	10.05	2.40	7.36	3.77	8.27	5.75
No Speech Condition (N = 6)	4.84	5.31	8.49	6.00	9.37	5.31	9.50	5.92
Young Subjects								
Speech Condition (N = 6)	11.37	5.74	7.30	8.99	9.23	2.61	9.17	4.29
No Speech Condition (N = 6)	6.42	6.32	8.32	7.53	6.38	8.95	10.58	5.23

There was a significant condition main effect on the time score ($F(1,38)=152.43$, $p < .001$), EF1 ($F(1,38)=96.29$, $p < .001$) and EF2 ($F(1,38)=108.00$, $p < .001$) of the DRL-6 task. The results were consistent in indicating that the group using a counting strategy achieved behavioural restraint faster and was also more efficient in the sense that they achieved a more favourable rate of reinforcement and maximized the proportion of reinforcements to responses, than the one that did not.

The findings were replicated in DRL-12 in that the main effect due of Condition was highly significant in the analysis of the time score ($F(1,32)=27.26$, $p < .001$), EF1 ($F(1,32)=22.0$, $p < .001$) and EF2 ($F(1,32)=20.16$, $p < .001$). There was also a significant main effect due to conceptual tempo(IR) in the time score analysis of DRL-12. Reflective children took less time to reach criterion than impulsive children. The former had a mean time score of 24.6, while the latter had a mean time score of 21.09.

Analysis of the learning index did not yield any significant results.

The graphical presentations of RFD and IRTs/OP are shown in Figures 20 and 21. The marked differences between the control group and the speech group is again illustrated. During the two-minute baseline, the two groups were similar in their performance. There was a preponderance of very short IRT responses, which were of two seconds or less in both groups. But in DRL-2, whereas both the reflective and impulsive children still produced about 35% of response bursts in the control condition, those using self-instruction to regulate their responses produced only about 14% response bursts on the RFD analysis. As for the IRTs/OP analysis, the control condition peaked at the 2-4 seconds interval, while the counting groups has a wider spread from the 2-4 seconds interval to the 10-12 seconds interval for the reflective subjects and from the 2-4 seconds interval to the 12-14 seconds interval for the impulsive subjects. On the DRL-6 task, RFD of the control group showed that both reflective and impulsive subjects had reduced short response bursts to less than 15%, while the subjects in the counting group showed less than 5% of such responses. All the children gave a high proportion of responses in the 6-8 seconds interval. IRTs/OP again demonstrated that the group using self-instruction peaked at intervals much longer than the required IRT. The reflectives spread out along the 8-10 seconds interval to the 14-16 seconds interval, while the impulsives peaked at the 12-14 seconds interval, with a probability of .70. By the time the children were performing on DRL-12, only the impulsive children in the no speech group emitted any response bursts, but even those were of a negligible proportion of about 5%. Except for reflective children using counting to regulate their responses, all the children had the highest proportion of responses ranging from 25 to 30% in the 12-14 seconds interval according to RFD. The IRTs/OP of the impulsive children in the control condition was highest at .46 in the same interval, while the impulsive children using speech and the reflective children in the control group had their highest IRTs/OP of .59 and .48 respectively at the

FIGURE 20 RFD AND IRT/OP ANALYSIS IN OLD IMPULSIVES(•RFD, o IRT/OP)

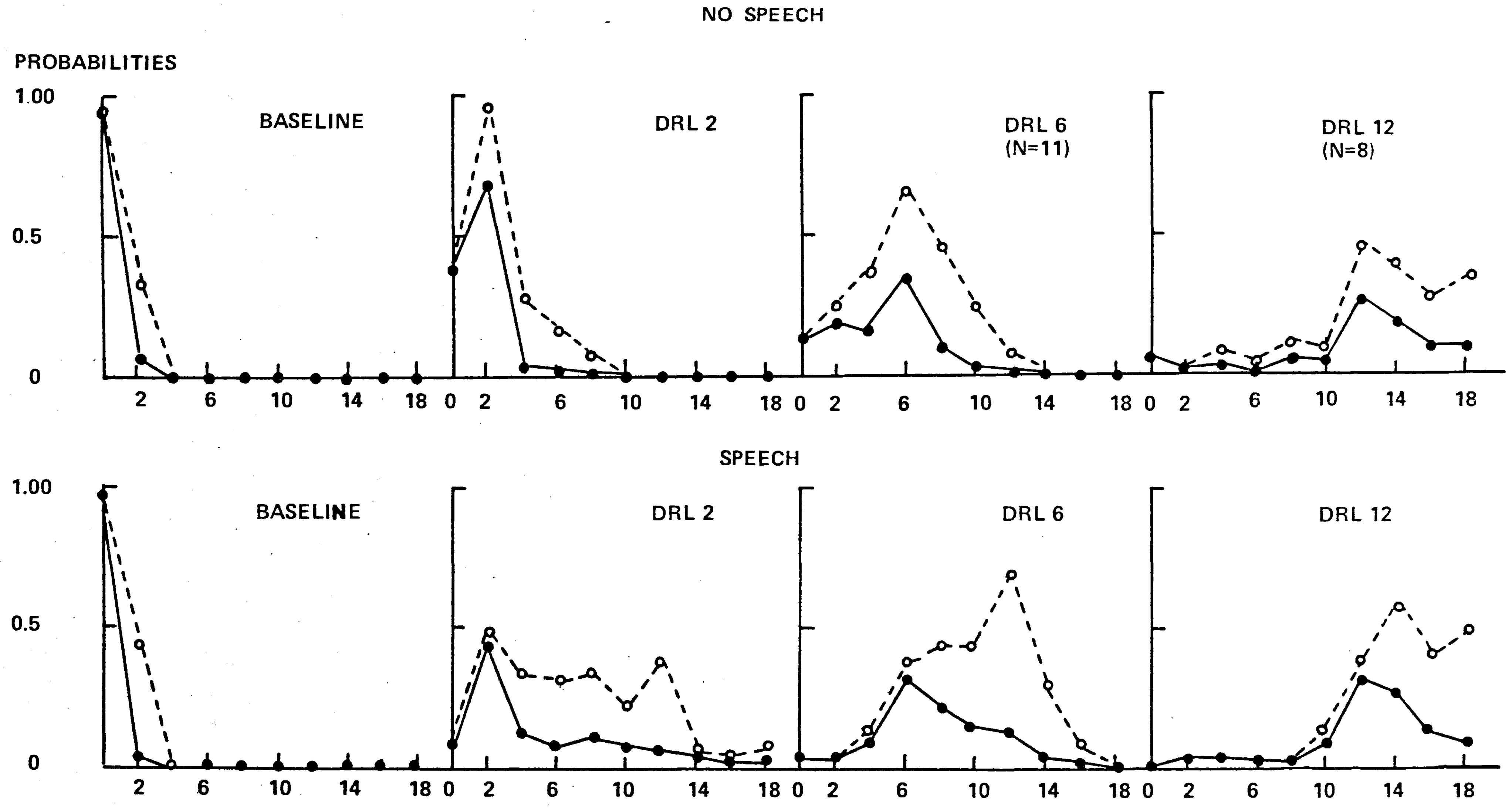


FIGURE 21 RFD AND IRT/OP ANALYSIS IN OLD REFLECTIVES(• RFD, o IRT/OP)

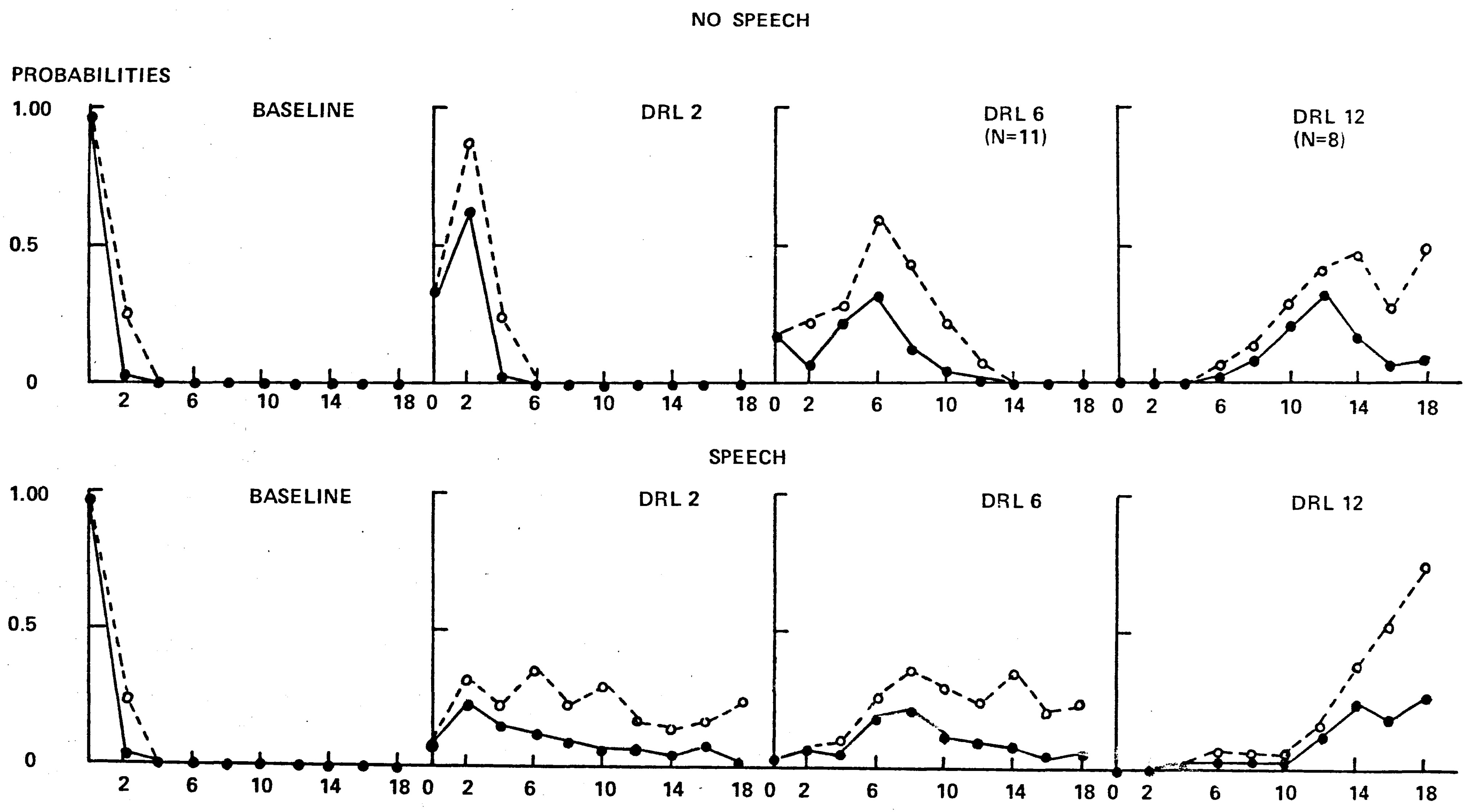


FIGURE 22 TIME SCORES IN DRL EXPERIMENTS OF OLDER SUBJECTS

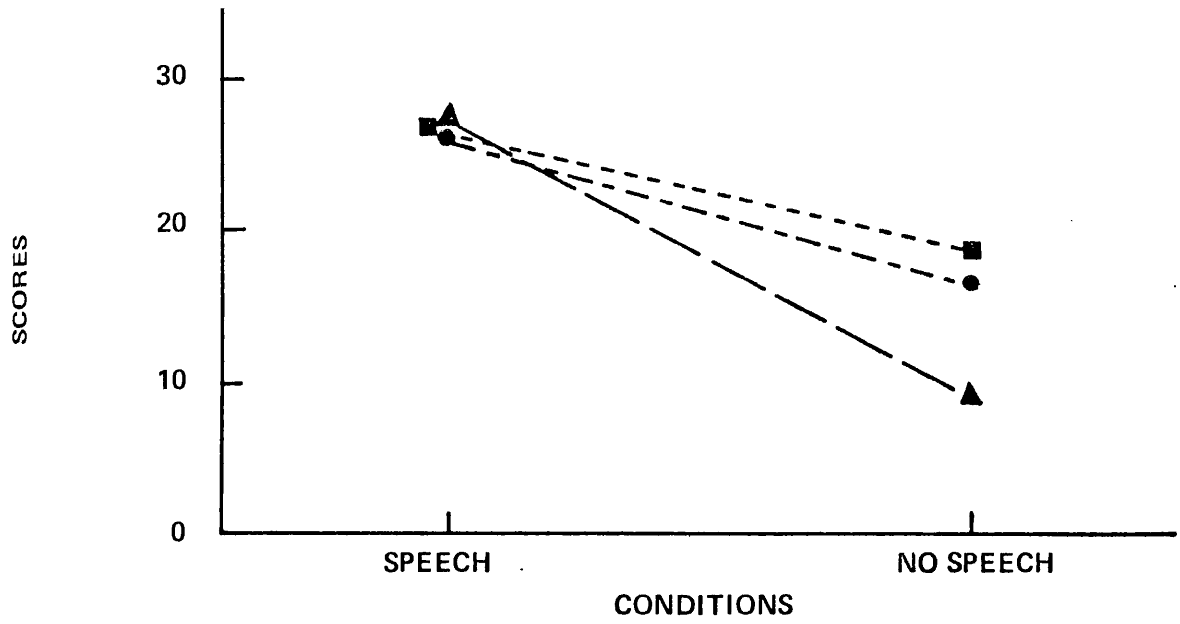


FIGURE 23 TIME SCORES IN DRL EXPERIMENTS OF YOUNGER SUBJECTS

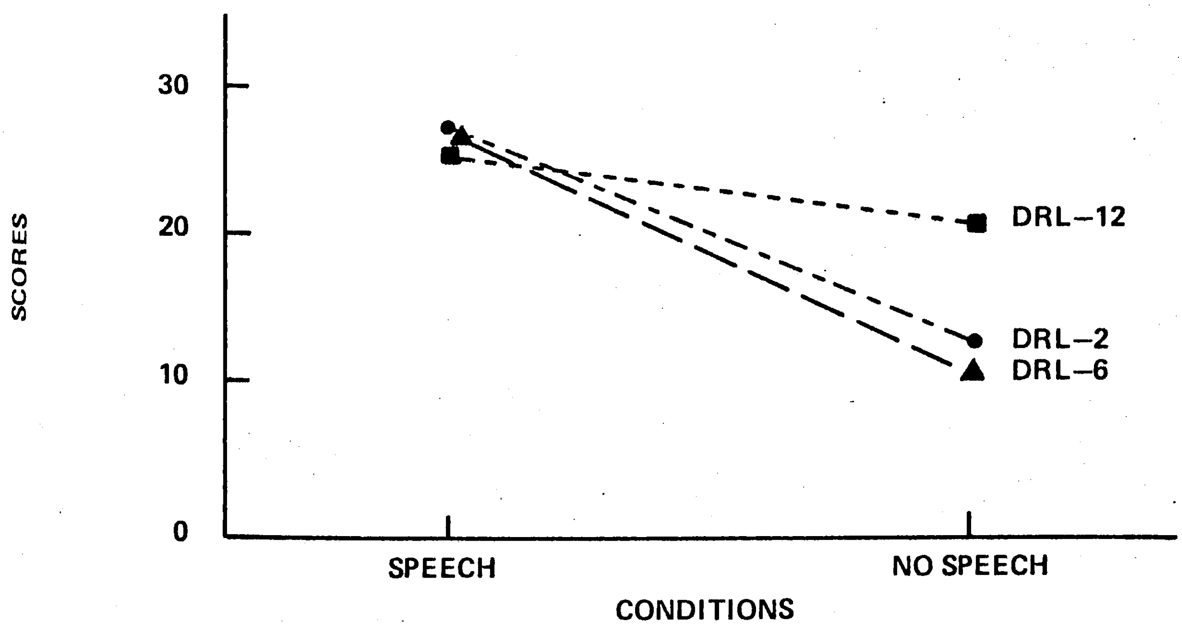


FIGURE 24 EFFICIENCY INDEX 1 IN DRL EXPERIMENTS OF OLDER SUBJECTS

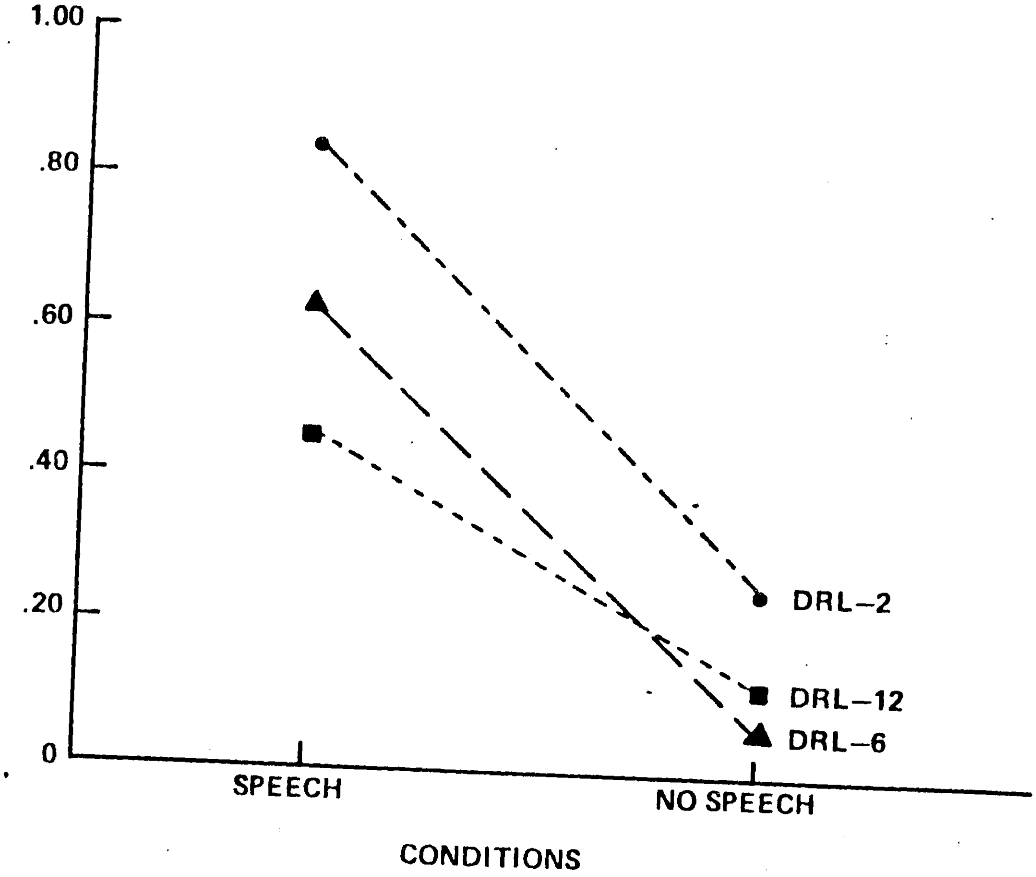


FIGURE 25 EFFICIENCY INDEX 1 IN DRL EXPERIMENTS OF YOUNGER SUBJECTS

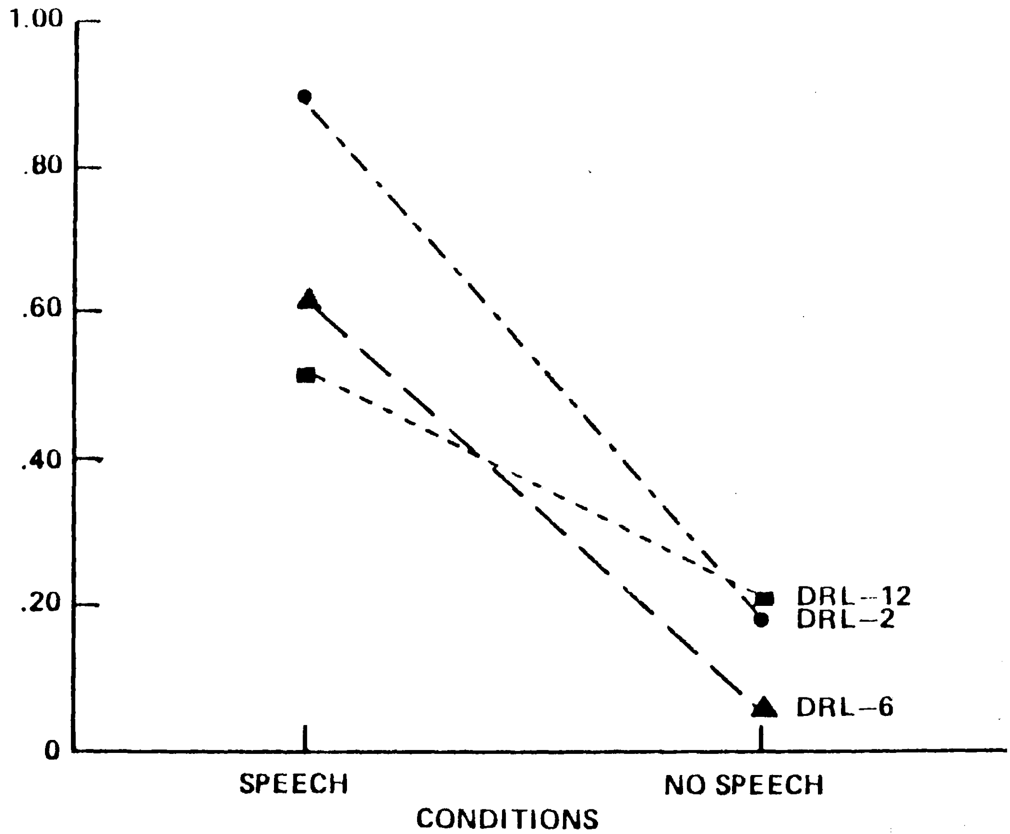


FIGURE 26 EFFICIENCY INDEX 2 IN DRL EXPERIMENTS OF OLDER SUBJECTS

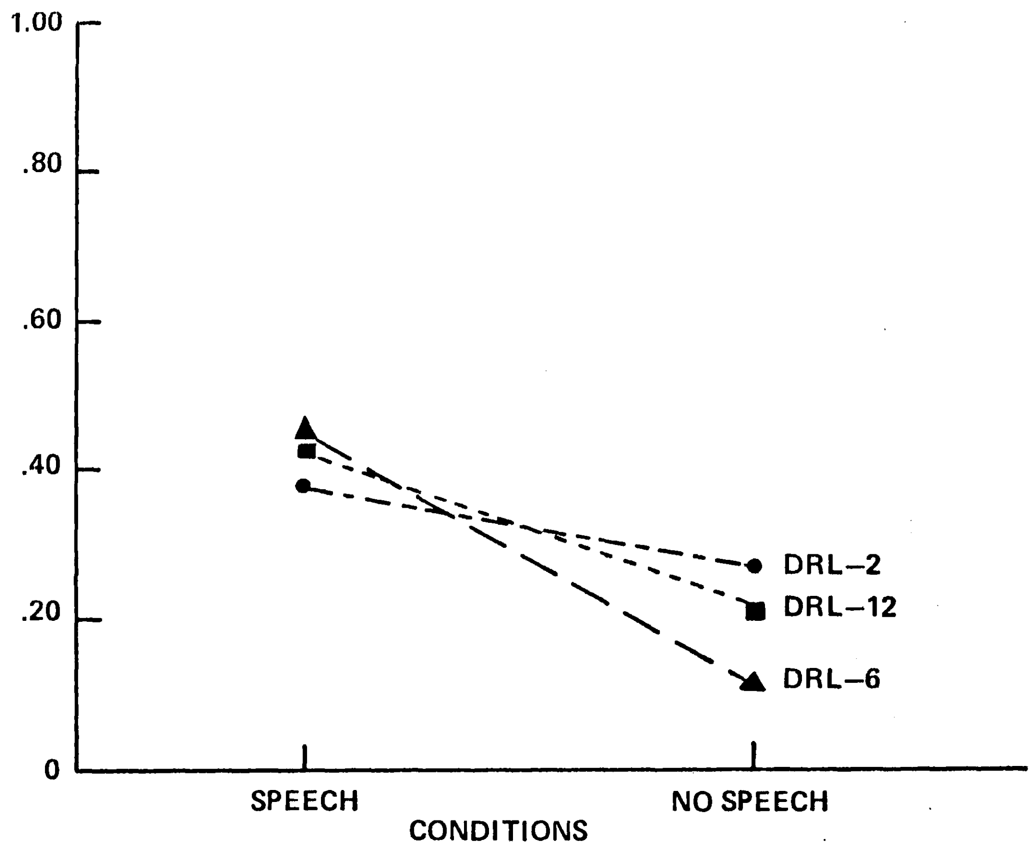
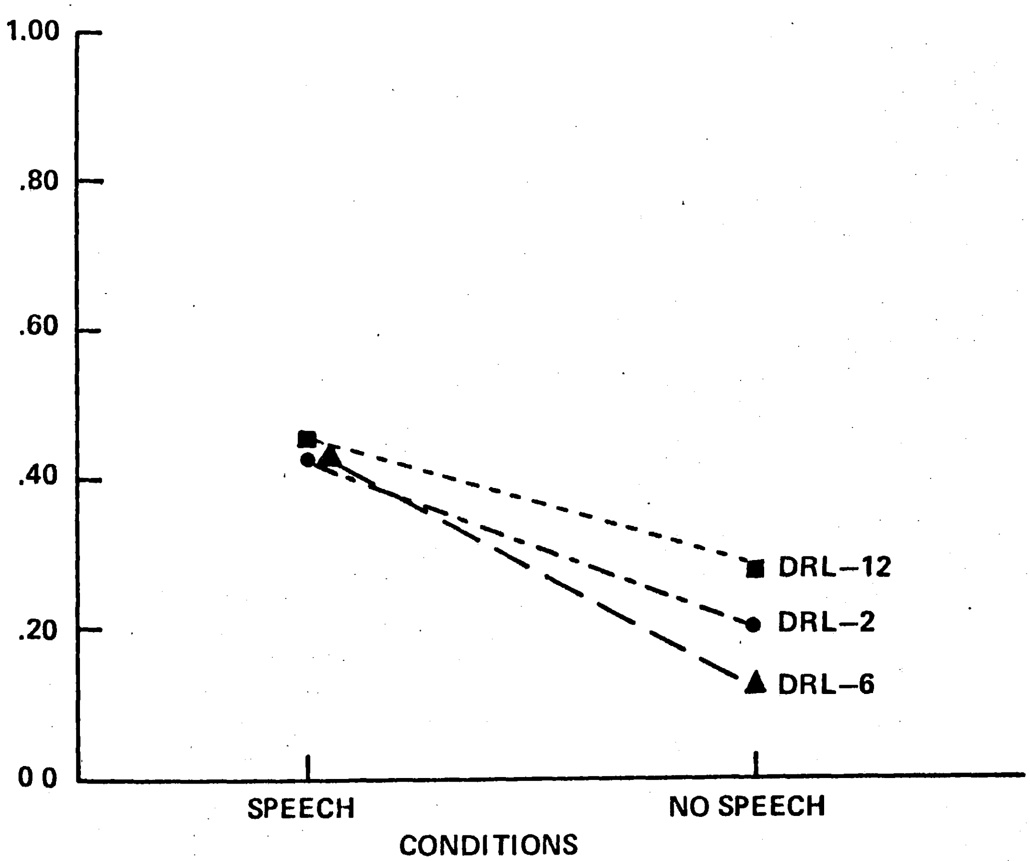


FIGURE 27 EFFICIENCY INDEX 2 IN DRL EXPERIMENTS OF YOUNGER SUBJECTS



next interval. Only the reflective children using counting displayed a tendency to produce responses of very long IRT, and this explained why the IRTs/OP curve continued to rise after the interval of the required schedule. The results seem to suggest that counting as a form of verbal self-regulation successfully reduces the proportion of response bursts of less than 2 seconds IRT. But although the subjects were aided in the sense that they could produce responses with long IRTs and could be considered to be successful in restraining their behaviour, the IRTs/OP analysis clearly demonstrated that they were less exact than the group not using speech in temporal discrimination. The no-speech group usually produced the largest proportion of responses in IRTs/OP at the interval of the required DRL schedule at the end of the training period. The speech group tended to produce much longer IRT responses.

Younger Age group

Analysis of variance produced a significant main effect due to condition in the time score, EF1 and EF2 of DRL-2 and DRL-6. Consistently, the results demonstrated that the group employing verbal self-instruction attained DRL criteria faster and were more efficient than the control group.

DRL-12 yielded more complicated results. Analysis of variance of the time score revealed two significant main effects: Sex ($F(1,30)=5.28$, $p < .05$) and Condition ($F(1,30)=21.37$, $p < .001$). But there were also several significant interactions which should be taken into account, namely the Sex X Conceptual tempo (IR) interaction ($F(1,30)=6.24$, $p < .05$), the Sex X Condition interaction ($F(1,30)=7.92$, $p < .01$) and the Sex X IR X Condition interaction ($F(1,30)=4.46$, $p < .05$). In view of the fact that the cells contained unequal number of cases, further comparisons between the cell means were conducted by post-hoc t-comparison (Winer, 1971, p.449). Whereas the male and female reflectives did not differ significantly in their time scores, male impulsives took significantly longer than female impulsives to reach criterion ($t=2.81$, $df=30$, $p < .005$, one-tailed). Male and female subjects did not differ when both were using verbal self-regulation, but in the control condition, female subjects learnt faster than the male ($t=2.76$, $df=30$, $p < .005$, one-tailed). Female subjects in the control condition and the speech condition did not differ as much between themselves as the male subjects compared between the two conditions which reached statistical significance ($t=4.52$, $df=30$, $p < .005$, one-tailed). Comparison between the cells for the Sex X IR x Condition interaction also provided support for the hypothesis. Among the male impulsives, the counting group needed significantly less time to reach criterion than the control group ($t=3.94$, $df=30$, $p < .005$, one-tailed). The same applies for the male reflectives ($t=2.57$, $df=30$, $p < .01$, one-tailed). In neither the no speech nor the speech condition did results show any significant difference between the female reflectives and the female impulsives, although the trend was in the predicted direction. Finally, in the control group, male impulsives performed worse than the female impulsives ($t=3.07$, $df=30$, $p < .005$, one-tailed).

Table 112 ANOVA Table of DRL-2 Time Scores of Younger Subjects

Source of Variation	SS	df	MS	F	Sig
Sex	28.52	1	28.52	0.59	N.S.
	150.52	1	150.52	3.14	N.S.
Condition	2508.52	1	2508.52	52.25	<.001
Sex x IR	0.19	1	0.19	0.004	N.S.
Sex x Condition	77.52	1	77.52	1.62	N.S.
IR x Condition	99.19	1	99.19	2.07	N.S.
Sex x IR x Condition	20.02	1	20.02	0.42	N.S.
Error	1920.50	40	48.01		
Total	4804.98	47			

Table 113 ANOVA Table of DRL-2 Efficiency Score 1 of Younger Subjects

Source of Variation	SS	df	MS	F	Sig
Sex	0.03	1	0.03	0.94	N.S.
IR	0.001	1	0.001	0.03	N.S.
Condition	5.87	1	5.87	174.65	<.001
Sex x IR	0.06	1	0.06	1.75	N.S.
Sex x Condition	0.01	1	0.01	0.15	N.S.
IR x Condition	0.05	1	0.05	1.43	N.S.
Sex x IR x Conditon	0.001	1	0.001	0.03	N.S.
Error	1.34	40	0.03		
Total	7.36	47			

Table 114 ANOVA Table of DRL-2 Efficiency Index 2 of Young Subjects

Source of Variation	SS	df	MS	F	Sig
Sex	0.0001	1	0.0001	0.004	N.S.
IR	0.05	1	0.05	1.98	N.S.
Condition	0.55	1	0.55	20.95	<.001
Sex x IR	0.008	1	0.008	0.30	N.S.
Sex x Condition	0.10	1	0.10	3.98	N.S.
IR x Condition	0.004	1	0.004	0.15	N.S.
Sex x IR x Condition	0.007	1	0.007	0.28	N.S.
Within cells	1.05	40	0.03		
Total	1.77	47			

Table 115 ANOVA Table of DRL-6 Time Scores of Younger Subjects

Source of Variation	SS	df	MS	F	Sig
Sex	3.01	1	3.01	0.11	N.S.
IR	0.34	1	0.34	0.01	N.S.
Condition	3161.75	1	3161.75	114.08	<.001
Sex x IR	48.83	1	48.83	1.76	N.S.
Sex x Condition	10.10	1	10.10	0.36	N.S.
IR x Condition	6.73	1	6.73	0.24	N.S.
Sex x IR x Condition	30.74	1	30.74	1.11	N.S.
Within cells	914.64	33	27.72		
Total	4176.14	40	104.40		

Table 116 ANOVA Table of DRL-6 Efficiency Index 1 of Younger Subjects

Source of Variation	SS	df	MS	F	Sig
Sex	0.0003	1	0.0003	0.01	N.S.
IR	0.008	1	0.008	0.21	N.S.
Condition	3.20	1	3.2	85.95	<.001
Sex x IR	0.0002	1	0.0002	0.01	N.S.
Sex x Condition	0.03	1	0.03	0.92	N.S.
IR x Condition	0.1	1	0.1	2.69	N.S.
Sex x IR x Condition	0.05	1	0.05	1.42	N.S.
Within cells	1.23	33	0.04		
Total	4.62	40			

Table 117 ANOVA Table of DRL-6 Efficiency Index 2 of Younger Subjects Subjects

Source of Variation	SS	df	MS	F	Sig
Sex	0.008	1	0.008	1.38	N.S.
IR	0.001	1	0.001	0.16	N.S.
Condition	1.04	1	1.04	163.78	<.001
Sex x IR	0.006	1	0.006	0.94	N.S.
Sex x Condition	0.001	1	0.001	0.11	N.S.
IR x Condition	0.01	1	0.01	1.51	N.S.
Sex x IR x Condition	0.0004	1	0.0004	0.06	N.S.
Within cells	0.21	33	0.006		
Total	1.27	40			

Table 118 ANOVA Table of DRL-12 Time Score of Younger Subjects

Source of Variation	SS	df	MS	F	Sig
Sex	105.93	1	105.93	5.28	< .05
IR	1.09	1	1.09	0.05	N.S.
Condition	428.65	1	428.65	21.37	< .001
Sex x IR	125.16	1	125.16	6.24	< .05
Sex x Condition	158.81	1	158.81	7.92	< .01
IR x Condition	0.22	1	0.22	0.01	N.S.
Sex x IR x Condition	89.40	1	89.40	4.46	< .05
Within cells	601.64	30	20.50		
Total	1510.91	37	40.84		

Table 119 ANOVA Table of DRL-12 Efficiency Index 1 of Young Subjects

Source of Variation	SS	df	MS	F	Sig
Sex	0.04	1	0.04	0.97	N.S.
IR	0.04	1	0.04	0.88	N.S.
Condition	1.25	1	1.25	31.38	<.001
Sex x IR	0.01	1	0.01	0.32	N.S.
Sex x Condition	0.19	1	0.19	4.68	<.05
IR x Condition	0.01	1	0.01	0.23	N.S.
Sex x IR x Condition	0.0003	1	0.0003	0.007	N.S.
Within cells	1.20	30	0.04		
Total	2.73	37	0.07		

Table 120 ANOVA Table of DRL-12 Efficiency Index 2 of Younger Subjects

Source of Variation	SS	df	MS	F	Sig
Sex	0.03	1	0.03	2.48	N.S.
IR	0.003	1	0.003	0.28	N.S.
Condition	0.34	1	0.34	28.29	$<.001$
Sex x IR	0.003	1	0.003	0.27	N.S.
Sex x Condition	0.06	1	0.06	4.98	$<.05$
IR x Condition	0.002	1	0.002	0.06	N.S.
Sex x IR x Condition	0.001	1	0.001	0.07	N.S.
Within cells	0.36	30	0.012		
Total	0.80	37			

Table 121 ANOVA Table of Learning Index in DRL Experiments of Younger Subjects

Source of Variation	SS	df	MS	F	Sig
Sex	2.84	1	2.84	0.07	N.S.
IR	2.93	1	2.93	0.07	N.S.
Condition	21.56	1	21.56	0.50	N.S.
Sex x IR	29.85	1	29.85	0.70	N.S.
Sex x Condition	4.63	1	4.63	0.11	N.S.
IR x Condition	78.77	1	78.77	1.84	N.S.
Sex x IR x Condition	2.20	1	2.20	0.05	N.S.
Within cells	1715.88	40	42.90		
Total	1858.65	47			

FIGURE 28 TIME SCORES IN DRL–12 TASK OF YOUNGER SUBJECTS

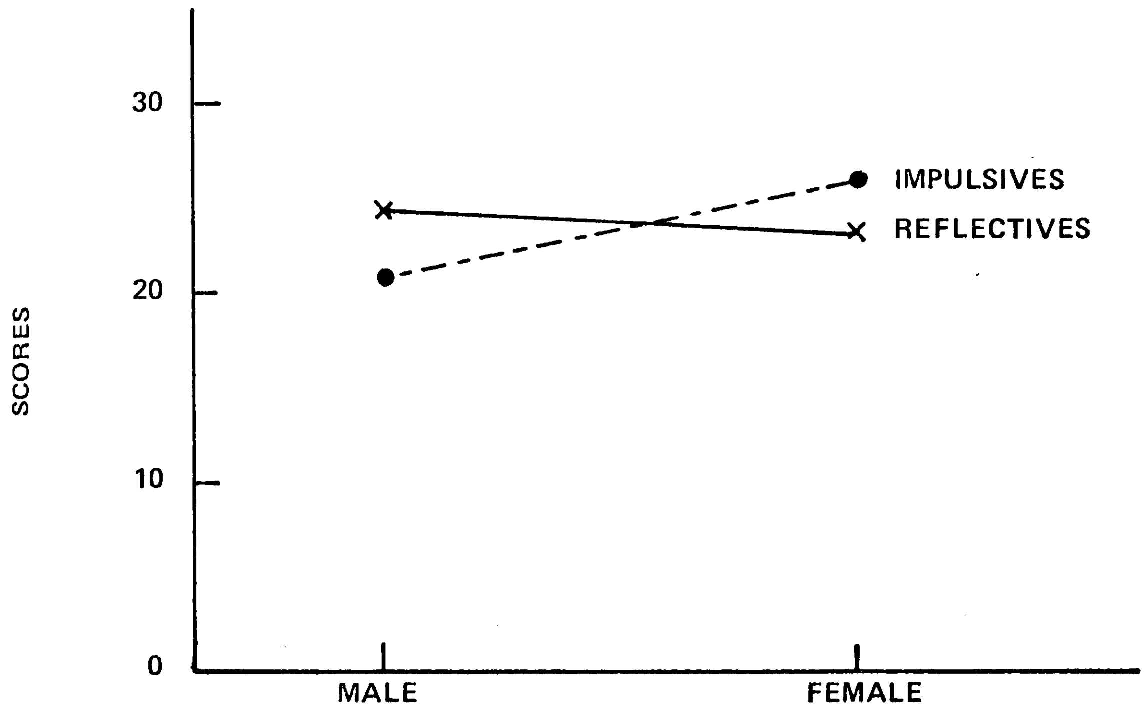


FIGURE 29 TIME SCORES IN DRL–12 TASK OF YOUNGER SUBJECTS

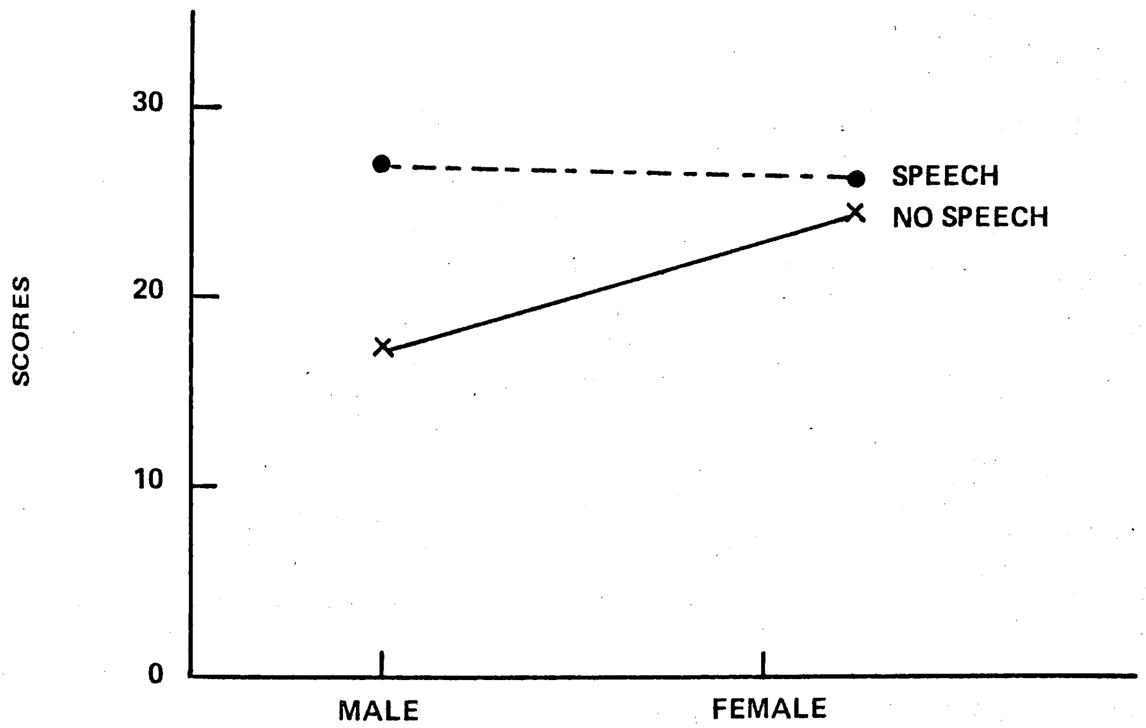


FIGURE 30 EFFICIENCY SCORE 1 IN DRL–12 TASK OF YOUNGER SUBJECTS

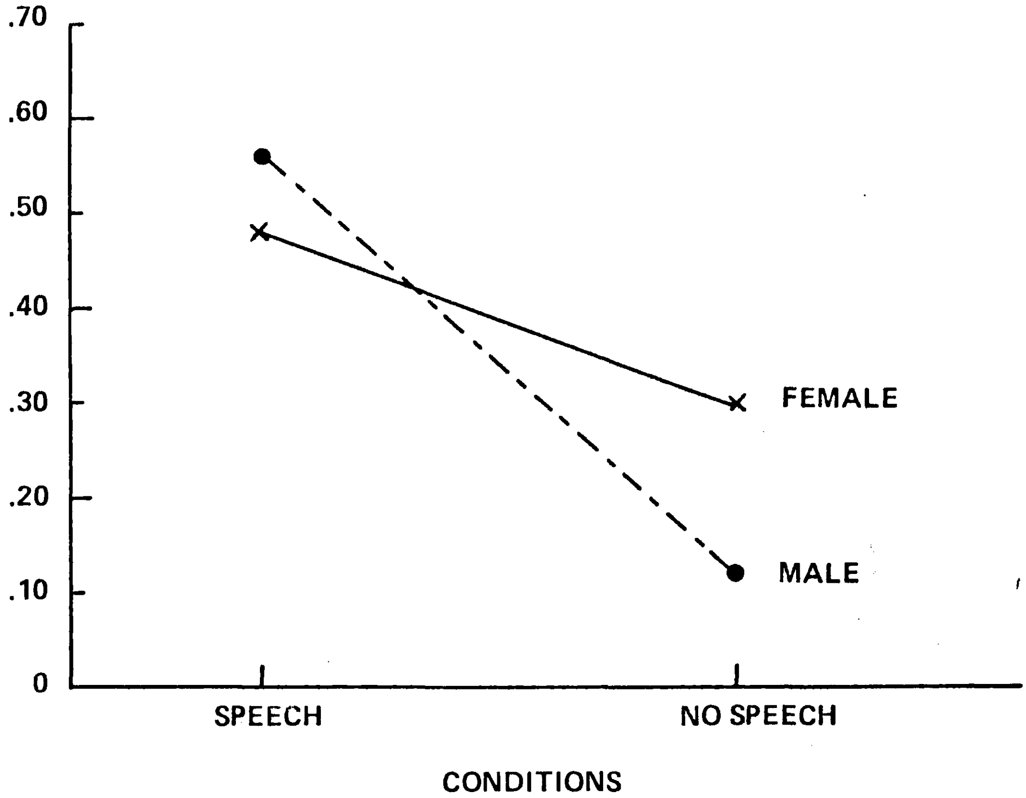


FIGURE 31 EFFICIENCY SCORE 2 IN DRL–12 TASK OF YOUNGER SUBJECTS

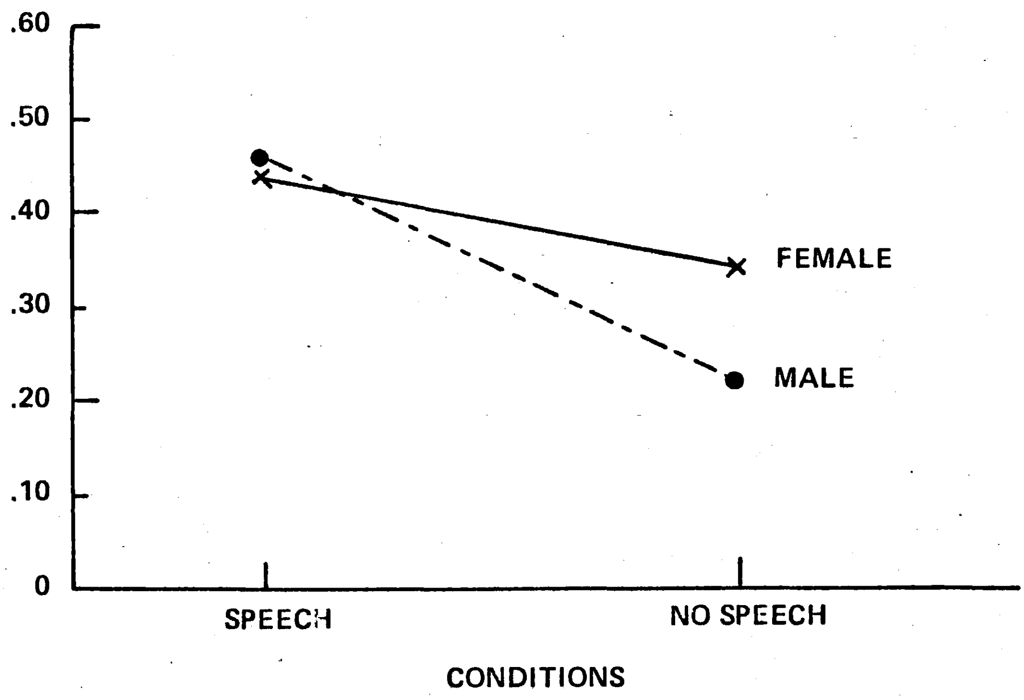
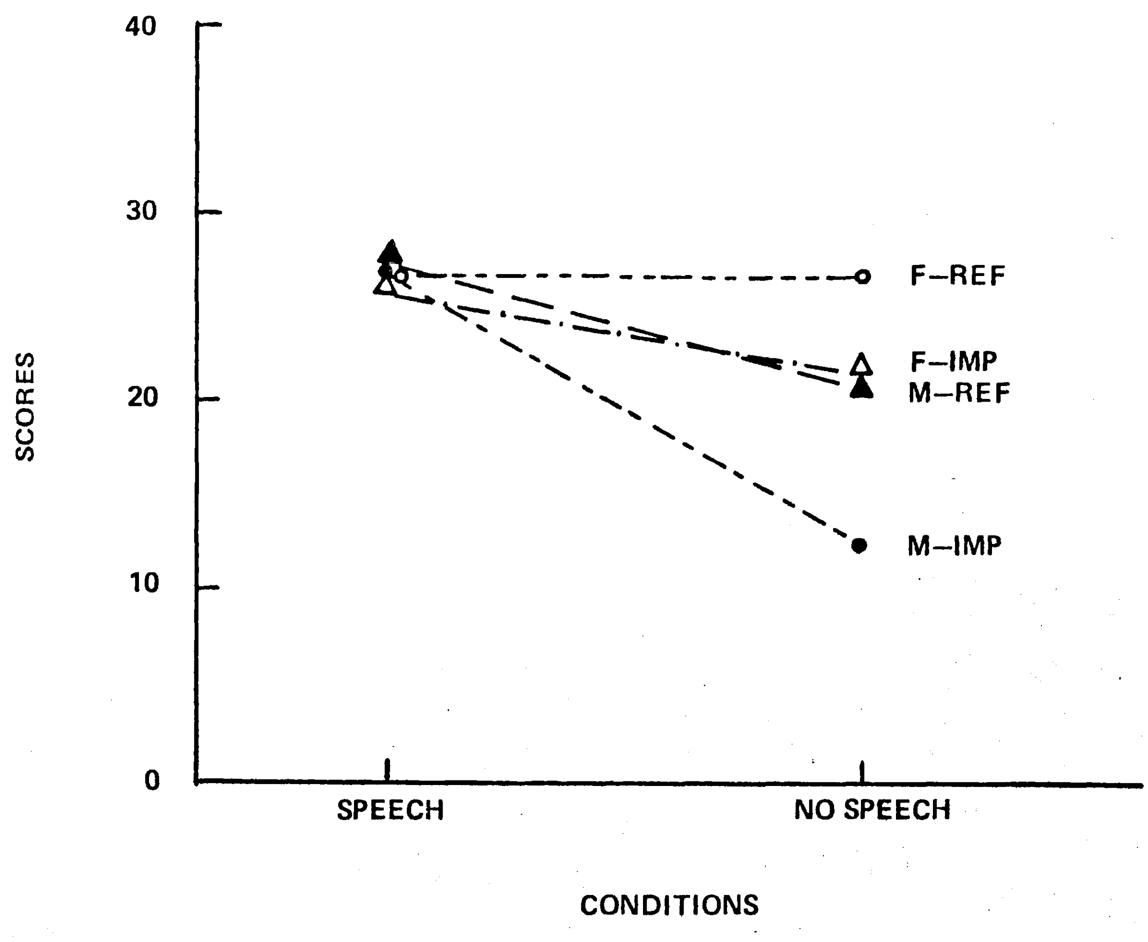


FIGURE 32 TIME SCORES IN DRL–12 TASK OF YOUNGER SUBJECTS



As for the two types of efficiency index (Tables 119 and 120), the analysis showed that there was a significant main effect due to Condition and a significant Sex X Condition interaction for both types of efficiency. According to the ANOVA of EF1, the interaction ($F(1,30)=4.68$, $p < .05$) could be explained by the difference between male and female in the control condition, in which the male subjects performed significantly worse ($t=1.73$, $df=30$, $p < .05$, one-tailed). The analysis of EF2 produced the same pattern. The Sex X Condition interaction ($F(1,30)=4.98$, $p < .05$) was explained by the fact the boys were less efficient than the girls in maximizing reinforcement in the control condition ($t=2.24$, $df=30$, $p < .025$).

RFD and IRTs/OP analysis of the DRL performance of the younger age group demonstrates on baseline performance fairly similar patterns to those of the older subjects (Figures 33 and 34). Both reflective and impulsive subjects produced 99% of their responses with IRT less than two seconds. In the last two minutes of performance in DRL-2 in the control condition, the relative frequency of short response bursts decreased to 60% for the impulsive children and 38% for the reflectives. This was still in sharp contrast to the dramatic disappearance of response bursts when subjects started counting to regulate their behaviour. Response bursts gradually decreased in the control condition throughout DRL training, while such responses in the speech condition were non-existent or remained low all through the DRL tasks.

The use of counting also produced a distinct pattern of responding that was not shared by the control group. Whereas the IRTs/OP probability in the control condition peaked at the scheduled intervals or the interval immediately next to and longer than the scheduled one, the counting group produced probabilities that peaked at very large intervals. For example, the young reflectives had the largest IRTs/OP of .88 at the 2-4 seconds interval and the young impulsives also peaked at the same interval with a probability of .91 in the no-speech DRL-2, and the reflectives using speech had the largest IRTs/OP probability of .68 at the 4-6 seconds interval and a probability of over .40 between the 2-4 seconds interval and the 8-10 seconds interval. Although the impulsive children seemed to fluctuate on IRTs/OP, the highest probability was in the 8-10 seconds interval. RFD in the speech condition tended to be evenly spread out, while the control condition showed a definite interval — the scheduled one — with the highest probability in relative frequency. This can be seen in the figures in the DRL-6 and DRL-12 tasks. Once again, both impulsive and reflective children displayed a rising trend in IRTs/OP on DRL-12, and the same applied to the impulsives in DRL-6 when there was speech accompaniment. The reflective children counting in DRL-16 had IRTs/OP between .27 and .43 from the 6-8 seconds interval to the 12-14 seconds interval. All this indicated the inexact temporal discrimination in the counting group even though subjects produced responses with long IRTs.

FIGURE 33 RFD AND IRT/OP ANALYSIS IN YOUNG IMPULSIVES(•RFD, o IRT/OP)

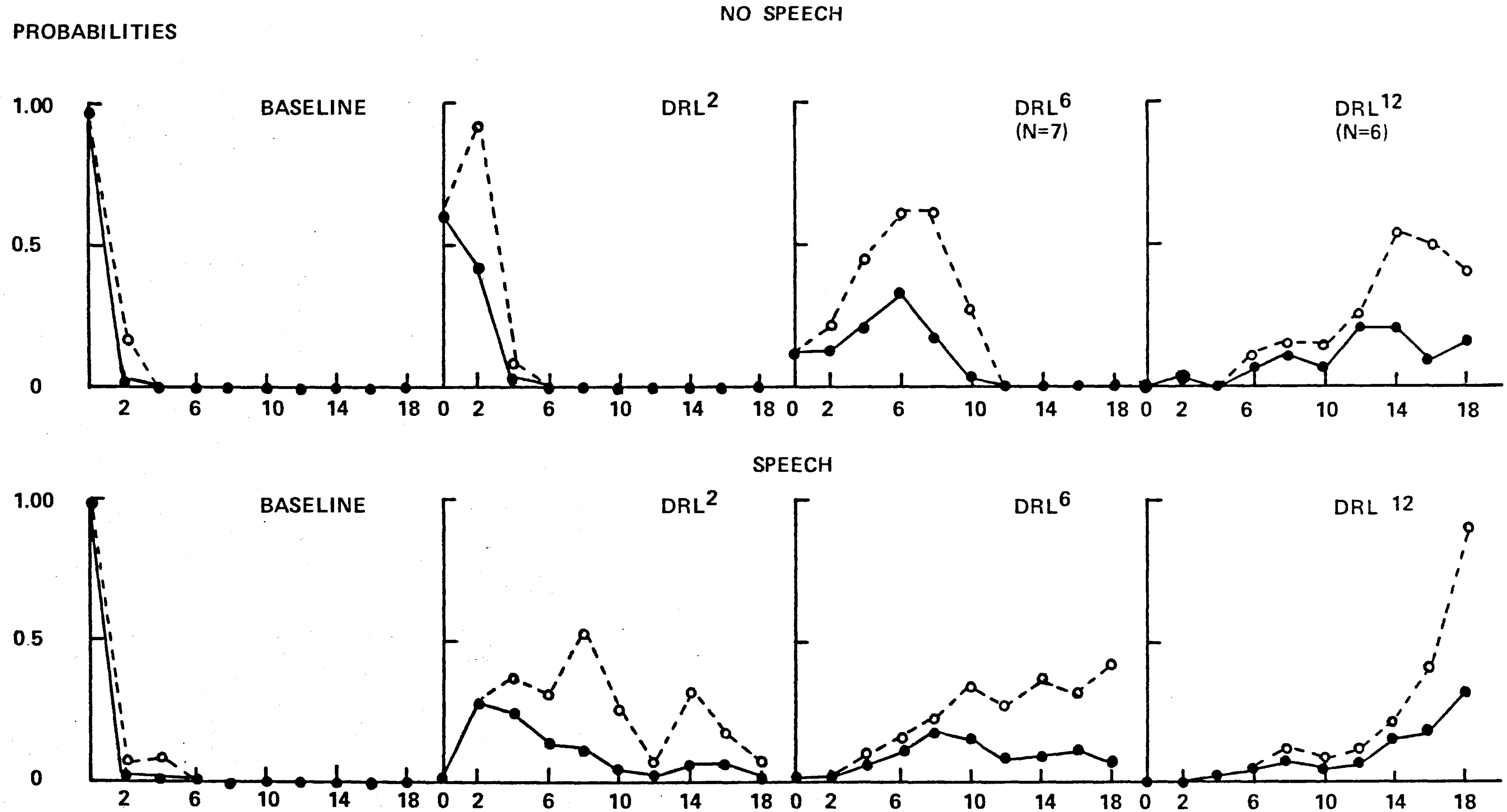
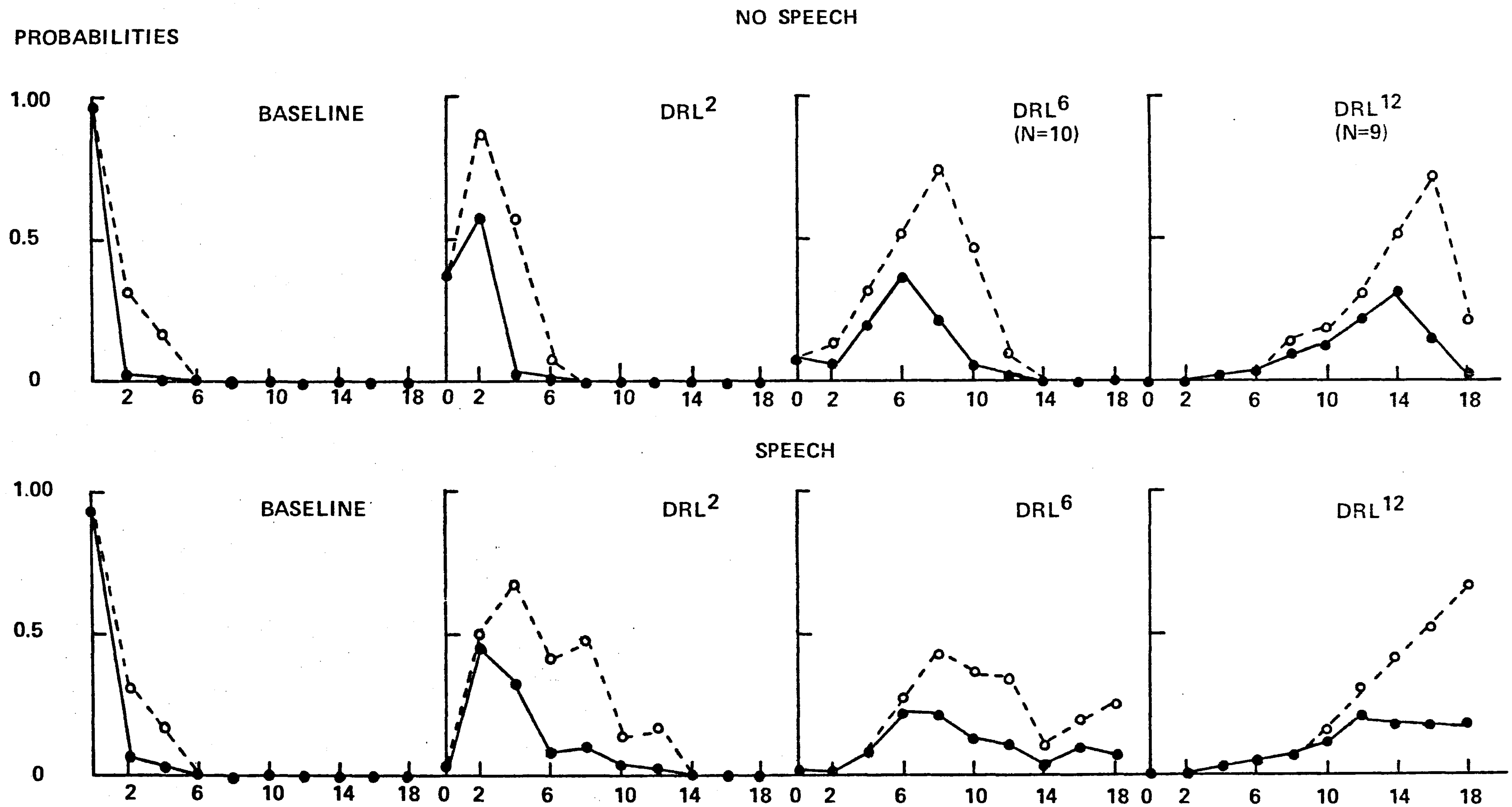


FIGURE 34 RFD AND IRT/OP ANALYSIS IN YOUNG REFLECTIVES(•RFD, & IRT/OP)



Discussion

The use of speech accompaniment in DRL performance produced significant differences in performance compared to the no-speech group in terms of the time taken to reach criterion and the efficiency in obtaining reinforcement. For most of the DRL tasks in the older and the younger age groups, the main effect due to Condition accounted for between 30% to 86% of the variance.

Speech, in the form of counting, proved to be an effective method of promoting behavioural restraint in DRL training. It seems to operate as collateral behaviour which mediates the interval between responses. It is interesting to note how flexible and adaptable the subjects were in utilizing counting as a mediating response , when it was suggested to them.

DRL-2 was a relatively simple task, especially for the counting group. As it was left to subjects to decide how many numbers they should count, most of them adopted an incremental method. For example, after failing to obtain reinforcement by counting 1,2,1,2, they proceeded to counting up to 4 or 5 before pressing on the lever. Some subjects then continued to count up to the same number, while a few increased the number every time they counted. Consequently, by the time these subjects reached the last two minutes of DRL training, that is, when they attained criterion, they were responding with IRTs much longer than 2 seconds. This was reflected by the RFD and IRTs/OP distribution. The same strategies were adopted in DRL-6 and DRL-12, so that the probability of their responses occurring at intervals longer than the scheduled ones was high. This accounted for the fact that the speech group did not attain temporal discrimination as exact as that of the subjects in the no-speech group during the last two minutes of DRL performance on various schedules. This ties in with the finding of Stein & Landis (1973) that subjects engaged in collateral key-pressing were likely to end up with IRTs that were much longer than the DRL schedule required.

The use of collateral behaviour was also related to the assumption held by the subjects regarding the target of the task (Flynn & Tedford, 1976; Stein & Flanagan, 1974). Given the opportunity, most of the subjects reported afterwards that they thought counting was related to the reinforcement contingency. Some subjects suggested that they would obtain reinforcement if they counted large numbers. By contrast, subjects who reached criterion in the no speech condition either said that they were required to press slowly or that thought they should wait before they pressed again.

If DRL performance is judged according to the time taken to learn the schedule of response to criterion, mediating responses in the form of counting result in fast learning. On both efficiency indices, the counting group was also superior to the control group, except for EF2 of the old subjects performing on DRL-2. EF2 represented the efficiency defined by the number of reinforcements actually gained as a proportion of the total number of reinforcements available within the time period. The older subjects were probably responding with extremely long IRTs in DRL-2, so that while their EF1 remained high, they were penalized in terms of EF2. This was evident in DRL-2 in which the maximum number of reinforcements available is very large.

There was only one significant effect due to conceptual tempo among the older subjects, which was in the predicted direction. When the older subjects performed on DRL-12, the reflectives learnt the task to criterion faster than the impulsives, suggesting that reflective subjects exerted better behavioural restraint. It may be that the first two DRL tasks with IRTs schedules of 2 seconds and 6 seconds were easier tasks. The delay required may have been within the capability of all the subjects, and hence they failed to differentiate between the reflective and the impulsive groups, or to indicate any individual differences in the use of verbal self-instruction.

Analysis of time score when the younger subjects performed on DRL-12 revealed several interesting interactions. This time, the results showed that only among the male subjects were differences in conceptual tempo related to differences in the time taken to learn the DRL task in the no speech condition. As predicted, the impulsive boys took longer to learn DRL-12 than the reflective boys.

Verbal self-instruction has overridden differences due to sex or to conceptual tempo, since post-hoc analysis of the interaction showed that the significant differences were found only in the no speech condition, with boys being less efficient and taking more time to learn DRL. Girls, when they counted, did not differ from the control group on the DRL-12 time score, whereas boys did. This could be due to the small number of girls who could reach the requirement of DRL-12 without using speech. Those who did attain this stage in the training may have grasped the nature of the task, and they were able to perform as well as those in the speech group.

The results of this DRL experiment may appear to be incompatible with the results of the three experiments reported in Part I in that they demonstrate an improvement in motor performance as a result of verbal self-instruction in the form of counting. But the contradiction is not unexpected, given the nature of the differences between the two tasks. The fact that instruction hampers the performance of one set of experiments and not that of another indicates an urgent need to refine our thinking about the regulatory role of speech.

The present results could be taken to support Luria's suggestion that self-instruction regulates motor behaviour. However, both the interpretation of the earlier results and the assumptions on which the present experiment was based have departed from Luria's idea that speech is the superior mode of response to the motor mode. The present experiment is based on the assumption that speech and motor responses co-ordinate with each other in situations when both responses are required, and on the "load" hypothesis which states that when the demand of the task exceeds the limited capacity of the subject, the requirement that a speech response should accompany a motor response usually prevents the motor response from occurring. The choice of verbal self-instruction in DRL training is one instance when these assumptions can be applied. The DRL task is a task of behavioural restraint in which the temporal parameter must be taken into account. In accordance with the findings of Experiment 2 (Chapter Three), the joint occurrence of verbal and motor response will slow down the latency of the motor response. When these responses take place in a continuous sequence, the result is longer IRTs between each motor response. The results of the counting group in DRL seems to support this interpretation. At the same time, when the subjects start to count, not only do they produce responses with long IRTs, they also show a marked decrease in response bursts, and this supports the suggestion that speech responses will eliminate motor responses when they are in competition. But whereas it puts a subject at a disadvantage in Experiment 2, it can be put to profitable use in a DRL task.

However, it must be born in mind that counting is a very specific form of verbal self-instruction. The numbers one, two or three do not have any meanings on their own. It is only when used in the context of the DRL tasks that they become functional, either in providing an estimate of the interresponse interval, or in "filling in" the passing time period between responses. It can be said that counting facilitates behavioural restraint in DRL responding, but that it has the disadvantage of causing inexact temporal discrimination. Some subjects were unaware of the temporal nature of the DRL tasks and responded as though reinforcement was contingent on their counting. It is necessary therefore to investigate the effects of different forms of verbal self-instruction on DRL performance.

B. The intercorrelation of DRL measures

The tables of correlations and the means of the DRL variables are presented in Tables 122 to 125.

In the DRL control condition, Pearson's product moment correlation indicates that the baseline IRT (DRLABA) correlates with the Learning Index (DRLALRN) (r=.41, p=.004). It also correlates significantly with the time scores of the three successive DRL tasks, with coefficients around .40, and with EF1 (r=.40, p=.04), EF2 (r=.51, p=.002) of DRL-12 and with EF2 (r=.41, p=.008) of DRL-6. These results suggest that a long IRT at baseline will predict rapid learning of all the DRL tasks, and is related to a greater difference between the rate of responding during the last two minutes' of DRL training and the rate during the first two minutes (i.e., DRLALRN). The rate of responding in this context reflects the mean IRT: hence, the larger the learning index, the more efficiently the subject has learned to delay his responses. The correlation between DRLABA and efficiency suggests that long IRT at baseline is connected with high efficiency in the last two DRL tasks.

DRLALRN is correlated with the time scores of the three tasks, with _r_ equal .52 (p=.002), .76(p=.001) and .51(p=.004) respectively. It also correlates significantly with EF1 and EF2 in DRL-6.

Taking the measures of the separate DRL tasks, the time score of DRL 2 (DA2TSC) correlates with DRL-2 Efficiency Index 1 (DA2EF1) (r=.78, p=.001) and Efficiency Index 2 (DA2EF2)

Table 122

Means and Standard Deviations of DRL (no speech) condition variables

	N	X	S.D.
DRLABA	48	0.84	0.32
DRLALRN	48	7.99	6.21
DA2TSC	48	14.71	9.89
DA2TP	48	927.65	824.46
DA2CP	48	67.23	44.67
DA2EF1	48	0.22	0.24
DA2EF2	48	0.24	0.19
DA6TSC	39	10.05	7.18
DA6TP	39	558.64	380.51
DA6CP	39	21.46	13.77
DA6EF1	39	0.07	0.09
DA6EF2	39	0.12	0.07
DA12TSC	30	19.80	7.54
DA12TP	30	165.03	166.44
DA12CP	30	9.47	3.30
DA12EF1	30	0.17	0.17
DA12EF2	30	0.25	0.16

Means and standard deviations of DRL (no speech) condition variables

	N = 39		N = 30	
	X	S.D.	X	S.D.
DRLABA	0.85	0.34	0.93	0.34
DRLALRN	9.78	5.48	12.28	3.33
DA2TSC	17.87	8.12	19.73	6.55
DA2TP	648.05	583.99	490.60	405.40
DA2CP	76.54	42.61	67.33	33.14
DA2EF1	0.27	0.25	0.29	0.26
DA2EF2	0.29	0.18	0.30	0.18
DA6TSC	-	-	12.77	5.88
DA6TP	-	-	389.20	161.11
DA6CP	-	-	26.03	12.09
DA6EF1	-	-	0.09	0.10
DA6EF2	-	-	0.16	0.06

Table 123 Intercorrelations of DRL variables in the no speech condition (two-tailed)

Variables	1	2	3	4	5	6	7	8	9	10	11
1. DRLABA	—	.41 (.004)	.29 (.02)	-.04	-.002	.42 (.008)	.19	.41 (.008)	.43 (.018)	.40 (.04)	.51 (.002)
2. DRLALRN		—	.52 (.002)	.23	.23	.76 (.001)	.39 (.014)	.63 (.001)	.51 (.004)	.34	.24
3. DA2TSC			—	.78 (.001)	.85 (.001)	.35 (.02)	.06	.32 (.04)	-.24	-.05	-.12
4. DA2EF1				—	.92 (.001)	.06	.03	.14	-.38 (.04)	-.19	-.35
5. DA2EF2					—	-.01	.01	.13	-.44 (.016)	-.30	-.38 (.04)
6. DA6TSC						—	.18	.68 (.001)	.65 (.001)	.30	.36 (.04)
7. DA6EF1							—	.45 (.004)	-.12	-.08	-.13
8. DA6EF2								—	.15	-.03	-.01
9. DA12TSC									—	.70 (.001)	.80 (.001)
10. DA12EF1										—	.87 (.001)
11. DA12EF2											—

Table 124 Means and Standard Deviations of variables in DRL (speech) condition

	N	X	S.D.
DRLABA	48	0.96	0.39
DRLALRN	48	9.06	4.83
DA2TSC	48	27.13	2.57
DA2TP	48	54.25	96.78
DA2CP	48	33.04	17.91
DA2EF1	48	0.87	0.19
DA2EF2	48	0.40	0.16
DA6TSC	48	27.35	1.87
DA6TP	48	30.77	28.33
DA6CP	48	13.56	5.28
DA6EF1	48	0.61	0.24
DA6EF2	48	0.44	0.11
DA12TSC	48	26.81	2.38
DA12TP	48	23.94	27.38
DA12CP	48	8.42	3.83
DA12EF1	48	0.49	0.22
DA12EF2	48	0.44	0.12

Table 125 Intercorrelations of DRL variables in speech conditions (two-tailed)

Variables	1	2	3	4	5	6	7	8	9	10	11
1. DRLABA	—	-.21	.24 (.051)	.12	.17	-.03	.05	.07	-.02	-.17	-.10
2. DRLALRN		—	.12	-.33 (.02)	.41 (.004)	-.09	-.30 (.04)	.02	-.02	-.0003	-.16
3. DA2TSC			—	.56 (.002)	.58 (.002)	.43 (.002)	.22	.50 (.002)	.21	.22	.30 (.04)
4. DA2EF1				—	.01	.58 (.0073)	.60 (.002)	.56 (.002)	.30 (.04)	.28 (.05)	.28 (.05)
5. DA2EF2					—	.03	-.26	.16	.10	.02	.12
6. DA6TSC						—	.65 (.001)	.65 (.001)	.24	.24	.15
7. DA6EF1							—	.58 (.002)	.29 (.04)	.43 (.002)	.25
8. DA6EF2								—	.41 (.004)	.28 (.05)	.32 (.024)
9. DA12TSC									—	.59 (.001)	.55 (.002)
10. DA12EF1										—	.80 (.001)
11. DA12EF2											—

(r=.85, p=.001). The time score of DRL-6 (DA6TSC) correlates only with Efficiency Index 2 (DA6EF2) (r=.68, p=.001). As for the time score of DRL-12 (DA12TSC), this correlates with both efficiency indices. Within each task, the two efficiency indices correlate significantly with each other, with r values of .92, .45, and .87 for DRL-2, DRL-6 and DRL-12 respectively. Generally speaking, children who are fast to learn DRL to criterion are also efficient performers. They obtain a high proportion of reinforcements relative to the number of responses they produced, and relative to the number of reinforcements available during the total time they spent on the DRL tasks. The exception was DRL-6, in which DA6TSC related only with DA6EF2.

As for inter-task correlations, DA2TSC correlates with DA6TSC (r=.35, p=.02) and DA6EF2 (r=.32, p=.04). This means that children who are fast in learning DRL-2 are also fast in learning DRL-6 and efficient in maximizing the reinforcement in DRL-6. DRL-2 time performance does not relate to DRL-12 performance significantly. As for the relation between DRL-6 and DRL-12, DA6TSC correlated with DA12TSC (r=.65, p=.001) and with DA12EF2 (r=.36, p=.04). So learning DRL-6 in a short time also predicts learning DRL-12 in a short time as well as the ability to maximize reinforcement in DRL-12. However, none of the efficiency indices relate with one another across tasks.

Looking now at the correlations in the DRL condition with speech accompaniment (Table 125, the only measure that significantly correlates with DRLABA is DA2TSC (r=.24, p=.05), and this has to be accepted at one-tailed analysis, in view of the correlation between the same variables in DRL no-speech condition. It seems that when verbal self-instruction was used, the baseline performance of the subjects, despite being a fairly stable variable, fails to predict the performance of DRL tasks.

DRLALRN, on the other hand, is related to the efficiency scores of DRL-2 and the time score of DRL-6.

The correlation of the measure within each DRL task reveals that the time score in each task correlates significantly with the two efficiency indices, confirming that those who learned the task to criterion quickly are also more efficient in obtaining reinforcement. As for the correlation between the efficiency indices, whereas DA6EF1 and DA6EF2 correlated significantly (r=.58, p=.002), and DA12EF1 and DA12EF2 are also related (r=.80, p=.001), the efficiency indices in DRL-2 are not related at all. This supports the suggestion that counting in DRL-2 considerably increases IRT, and reduces the opportunity to press on the bar, so that although EF1 may be high, EF2 will not be.

Inter-task correlation when speech was used also differed from the pattern of inter-task correlations in the no-speech condition. The significant correlations were those between DRL-2 and the other two tasks. DA2TSC significantly predicts DA6TSC (r=.43, p=.002), DA6EF2 (r=.50, p=.002) and DA12EF2 (r=.30, p=.04). DA2EF1 relates with all the measures in DRL-6 and DRL-12. Only DA2EF2 does not correlate significantly with any inter-task variables. It seems that once the subject has grasped the strategy of performance in DRL-2, he will generalize it to subsequent DRL tasks. At the same time, the efficiency indices in DRL-6 are also correlated with the time and efficiency measures of DRL-12.

Discussion

The pattern of correlation in the different conditions suggests that the use of self-instruction alters the nature of the tasks and the relation among the different measures.

Consider for example the correlation between baseline IRT and the other measures in the two conditions. When no speech is employed, DRLABA predicts the time scores of the three DRL tasks — longer baseline IRT is favourable to faster learning to DRL criterion, even when the adjustment of the DRL schedule according to the baseline IRT is taken into account. However, when speech is used, the baseline no longer predicts performance. The baseline IRT also tends to predict DRL-6 and DRL-12 time scores better than the DRL-2 time score, perhaps because DRL-2 is comparatively easy to learn and the baseline rate affects performance less than on the later, more difficult tasks.

A long baseline IRT is connected with efficiency in maximizing performance in DRL-6 and DRL-12. It is not related to DA2EF2 because subjects with long IRTs in the baseline period (i.e., high DRLABA) respond very infrequently and so have less opportunity to maximize reinforcement in DRL-2 in which little behavioural restraint is demanded.

A similar explanation, based on the intricate relationship between EF1 and EF2 measures, can be employed to explain the lack of correlation between DA6EF1 and DA6EF2. It may be useful to reiterate that EF1 reflects the proportion of reinforcement a subject gains relative to total number of responses, while EF2 describes the number of reinforcements gained relative to the maximum total number of reinforcement available. Slow presses in a short IRT schedule will therefore yield a high EF1, but not a high EF2 score. A schedule requiring fairly long IRTs, such as DRL-6 and DRL-12, requires presses which are more widely spaced to yield high efficiency on both efficiency measures, while rapid responding will have a more adverse effect on EF1 than on EF2. DRL-6 is a difficult schedule in the sense that although the subjects have got some idea of the nature of a DRL task from DRL-2 training, they might not have got the idea of the requirement of long IRTs in DRL-6. Their tendency to press frequently on DRL-6 means that they are unlikely to be efficient on DA6EF1.

The prediction of the performance of one DRL task on the basis of the performance of a previous one was also an intricate one. Shapland, et al. (unpublished) reported that the relationship between the time taken to learn the first and the third DRL tasks is less close than that between the time required to learn the second and third tasks. They also found that a child efficient in learning the first task (their efficiency scores were equivalent to the present EF1) were fast to learn the second. The time scores in the present study support their findings. DA2TSC is related to DA6TSC and DA6EF2, but not to any DRL-12 measures. At the same time, DA6TSC is correlated significantly with DA12TSC and DA12EF2. However, departing from the results obtained by Shapland,et al. (unpublished), efficiency (EF1 and EF2) in the first task correlates significantly with the third task in the negative direction, but not with the second task, and neither efficiency index of the second task is related to the performance on the third. The negative correlation between DA2EF1 and DA12TSC, and that between DA2EF2 and DA12TSC and DA12EF2, could be explained by the fact that responding at a high frequency is an efficient strategy on DRL-2, but not on DRL-12.

When speech accompaniment was used, variables in individual DRL tasks are generally correlated significantly. The exception DA2EF1 and DA2EF2 may again be due to the fact that responses of long IRTs as a result of counting are detrimental to EF2.

A cognitive element was also apparent in the inter-task correlations. Speed of learning DRL-2 predicts speed of learning and EF2 in DRL-6, and EF2 in DRL-12. EF1 in DRL-2 predicts speed of learning and efficiency (both types) of DRL-6 and DRL-12, with larger coefficients with DRL-6. The efficiency scores of DRL-6 are also related to speed of learning and EF1 in DRL-12. What made the present pattern differ from that in the no-speech condition is that once the subject had grasped the task, transfer of learning seems to take place immediately to subsequent ones. There was, therefore, no difference between the relationship between the first and second tasks, and that between the second and third tasks. Moreover, in the counting condition, unlike the no-speech condition, all subjects learned all tasks to criterion.

C. <u>The correlation of DRL measures with MFFT and personality variables</u>

Given that baseline performance represents a fairly stable characteristic in the child's behaviour, it was hypothesized that long baseline IRTs would correlate positively with personality measures that loaded on stability and introversion, and negatively with measures of anxiety, extraversion or impulsiveness. The baseline IRT of all the subjects were correlated with MFFT and personality measures (Table 126, and see Appendix 26 for the means and standard deviations of the varaibles). DRLABA significantly correlated with CPQ Factors E (Submissiveness vs Dominance), F (Desurgency vs Surgency) and O (Unperturbed adequacy vs Guilt proneness) in the negative direction. The coefficients were in the high .20s. Consistent with prediction, long IRT tended to be related to low anxiety, unassertiveness and slow and languid behaviour. DRLABA correlated negatively with the CPQ extraversion measures (EXT) ($r=-.23$, $p=.012$) as expected, and positively with the "Good pupil" subscale of the NEW TRS (NTRS-G), indicating that a child rated as reflective and thoughful also tended to have long IRT responses in the baseline.

Next we shall look at the patterns of correlations in the no speech DRL conditions (Table 127).

If DRL performance provides a measure of behavioural restraint and MFFT a measurement of cognitive reflection-impulsivity, we might expect to find a positive correlation between the speed of learning DRL and the time measure of MFFT, and a negative correlation between speed of learning DRL and

Table 126 Correlations between DRL Baserate and Personality Variables (one-tailed)

	MFFT		CPQ									
VARIABLES	TERR	TIME	A	B	C	D	E	F	G	H	I	J
DRLABA	-.13	.05	-.04	.09	-.07	-.05	-.26 (.005)	-.23 (.001)	.01	-.10	.17	.12

	NEW TRS										
VARIABLES	N	Q	Q3	Q4	ANK	EXT	G	E	N	P	ANE
DRLABA	-.15	-.28 (.003)	.17	-.14	-.16	-.23 (.012)	.23 (.029)	-.17	-.09	-.13	-.08

MFFT errors. The results (Table 127) (see Appendix 27 for the means and standard deviations of the variables) showed that only DA2TSC and DA12TSC significantly correlated with MFFT errors, with r=-.31 (p=.02) and -.32 (p=.04) respectively. DRLALRN also correlated with MFFT errors (r=-.31, p=.02) in accordance with prediction. However none of the DRL measures correlated with MFFT latency.

Prediction in the same direction as in the baseline measure was made for the learning index (DRLALRN) since the greater the learning index, the greater degree of behavioural restraint was achieved. There was a significant positive correlation between DRLALRN and Factor G of the CPQ (Super ego weakness vs Super ego strength). A high score on Factor G indicates emotional stability, and the correlation (r=.27, p=.03) was in the predicted direction. DRLALRN was negatively related with Factor O (Unperturbed adequacy vs Guilt proneness)which is a factor loaded on ANX (r=-.24, p=.05) and a low score on Factor O represented a confident attitude. The negative correlation with CPQ Anxiety (ANX) and the positive correlation with the "Good pupil" subscale of the NEW TRS (NTRS-G) were in the predicted direction. So there is some evidence that the ability to learn greater behavioural self-restraint is related to emotional stability and a reflective and thoughtful disposition.

Taking the time scores of the three successive DRL tasks, DA2TSC correlated only with B, a measure of intelligence. This is in line with the suggestion made by Shapland,et al. (unpublished) that the first DRL task is more a cognitive task, and so more closely related to IQ than the later tasks, on which performance is more affected by personality. DA6TSC was correlated with Factor C (Ego weakness vs Ego strength) (r=.37, p=.01), Factor G (r=.28, p=.04), and NTRS-G (r=.34, p=.04). The speed of learning DRL-6 could be predicted from high scores of Factors C and G, both of which were representative of emotional maturity and stability. DA6TSC correlated negatively with Factors F (r=-.27, p=.05), J(Zeppia vs Coasthenia) (r=-.32, p=.02) and O (r=-.40, p=.006). Factors F and O load on Anxiety and the correlations are in the expected direction. But the relation with Factor J is harder to interpret. A low J score indicates a vigorous character and willingness to accept common standards, and it is not obvious why this should be related to speed of learning. Possibly it is not due to the ability to restrain behaviour, but rather to the willingness to try out different ways of responding that enables a subject to learn DRL-6 faster. Coming to DA12TSC, it correlated positively with Factor A (Schizothymia vs Cyclothymia), a high score of which suggests readiness to co-operate and sociability (r=.39, p=.04) and Factor I (Harria vs Premsia). But, the direction of the correlation with Factor I is the opposite of that predicted, for a high rating on I indicates tender-mindedness and anxiety. However, the correlation evaluated on a two-tailed test does not reach statistical significance. DA12TSC correlated negatively with Factors D, E, F and O. Low scores on these factors represent emotional placidity, self-sufficiency, a tendency to react slowly and an absence of fears. These are the attributes which might be expected to contribute to behavioural self-restraint. Success in mastering DRL-12 was also related to low anxiety, as shown by the significant negative correlation with Factor Q4 (Low ergic tension vs high ergic tension) (r=-.35, p=.03) and ANX (r=-.37, p=.02).

Efficiency Index I was almost entirely unrelated to personality measures. The only significant correlations were between DA12EF1 and Factor F (r=-.54, p=.001) and between DA12EF1 and Factor I (r=.41, p=.01). It is easy to understand the relationship with Factor F, a low score of which stands for languidity, but the connection with Factor I, where a high score indicates a tendency to be impatient and frivolous, has no obvious explanation.

Efficiency Index 2 in DRL-6 did not correlate with any measure of personality. The only significant correlation DA12EF2 held with Factor F (r=-.50, p=.004, two-tailed), which implies that a slow tempo of response and a serious temperament is associated with the ability to maximize reinforcement in the DRL-12 task. By contrast, DA2EF2 correlated significantly with several personality variables. These included a negative correlation with Factor G (r=-.29, p=.04, two-tailed) and a positive correlation with Factor E (r=.30, p=.04, two-tailed). This suggests that the ability to maximize reinforcement in DRL-2 requires both a relaxed disposition and a tendency to disregard rules, together with an assertive and self-assured attitude.
It appears that the ability to exert behavioural self-restraint and to maximize reinforcement are related to different personality qualities.

Table 127 Correlations between DRL measures (no speech condition) and MFFT and personality variables

	VARIABLES	MFFT		CPQ									
		ERROR	TIME	A	B	C	D	E	F	G	H	I	J
	DRLALRN	-.31 (.02)	-.01	.10	.28	.23	-.20	-.08	-.23	.27 (.03)	.23	.20	-.21
	DA2TSC	-.31 (.02)	-.19	-.05	.35 (.007)	.18	.10	.20	.09	-.14	.11	-.10	.08
	DA2EF1	-.11	-.11	-.12	.21	.10	.13	.22	.20	-.22	.17	-.19	.11
*	DA2EF2	-.15	-.11	-.09	.27	.08	.20	.30 (.04)	.24	-.29 (.04)	.12	-.25	.07
	DA6TSC	-.21	-.007	.22	.16	.37 (.01)	-.23	-.14	-.27 (.05)	.28 (.04)	.10	.10	-.32 (.02)
	DA6EF1	-.17	.21	-.02	-.04	-.04	-.12	.03	-.11	-.01	-.06	-.03	.13
*	DA6EF2	-.13	.12	.02	.01	.02	-.01	.09	-.15	-.08	.11	-.002	-.14
	DA12TSC	-.32 (.04)	.11	.39* (.04)	-.12	.29	-.33 (.04)	-.31 (.05)	-.52 (.002)	.10	.04	.31 (.05)	-.30
	DA12EF1	-.17	.04	.26	-.15	.23	-.14	-.19	-.54 (.001)	-.10	-.09	.41 (.01)	.08
*	DA12EF2	-.26	.16	.23	-.16	.17	-.22	-.22	-.50 (.004)	-.05	-.14	.34	.06

(*two-tailed test)

Table 127 (con't) Correlation between DRL measures (no speech condition) and MFFT and personality variables

	VARIABLES							NTRS			
		N	O	Q3	Q4	ANX	EXT	G	E	N	P	AGE
	DRLALRN	-.14	-.24 (.05)	.12	-.08	-.25 (.05)	-.01	.30 (.04)	-.09	-.23	-.04	.11
	DA2TSC	-.02	-.16	-.08	.21	.03	.07	.22	.16	.06	.05	.23
	DA2EF1	.11	-.08	-.21	.21	.11	.13	.02	.21	-.02	.005	.12
*	DA2EF2	.17	-.06	-.21	.26	.16	.16	.01	.24	.02	.07	.22
	DA6TSC	-.23	-.40 (.006)	.04	-.23	-.33 (.02)	.001	.34 (.04)	-.08	-.10	-.19	-.13
	DA6EF1	-.05	-.05	-.03	-.03	-.03	-.11	-.08	-.07	-.03	.04	-.19
*	DA6EF2	-.002	-.06	-.07	.05	.007	-.04	.23	.02	-.11	-.20	-.09
	DA12TSC	-.14	-.34 (.03)	.14	-.35 (.03)	-.37 (.02)	-.07	.18	-.12	.09	.03	-.26
	DA12EF1	-.12	-.09	.08	-.21	-.16	-.23	.11	-.09	.43 (.01)	.20	.34 (.04)
*	DA12EF2	-.07	-.16	.14	-.19	-.21	-.25	.22	-.23	.32	.07	.35 (.06)

Turning now to the behavioural measures of DRL under verbal self-regulation, the results show that the correlations were fairly scattered (Table 128). On the assumption that personality difference are correlated with the use of speech and its effectiveness in regulating DRL performance, it was predicted that impulsive children and those high on anxiety and extraversion would perform less well in DRL tasks, in the sense that they would take longer to restrain their behaviour. It was predicted that they would achieve DRL criterion faster and would be less efficient in the rate of reinforcement (EF1). As in the analysis of the no speech condition, no specific prediction was made in relation to EF2.

In the results, DA2TSC correlated significantly and in the predicted direction with Factor O (r=-.26, p=.04) and Factor Q4 (r=-.26, p=.04). It was also negatively correlated with ANX (r=-.28, p=.03). This implies that even when self-instruction is used, speed of learning DRL-2 tasks is related to low scores on factors loaded on anxiety. But the negative correlations between DA6TSC and NTRS-G, and the positive correlation between DA12TSC and Factor A are contrary to prediction, so neither DRL-6 nor DRL-12 yield findings to support the pattern obtained in DRL-2.

The efficiency indices also yielded rather inconsistent correlations. Among the EF1 measures, only DA6EF1 correlated significantly with Factor C (r=-.35, p=.007, two-tailed) which was contrary to prediction. The same applies to the correlation between DA12EF1 and Q3 (r=-.31, p=.032, two-tailed) which suggests

Table 128 Correlations between DRL measures (speech condition) and MFFT and personality variables

VARIABLES	MFFT		CPQ									
	ERROR	TIME	A	B	C	D	E	F	G	H	I	J
DRLALRN	.05	-.16	-.08	-.07	.13	-.06	.005	.05	-.33	.10	-.13	.05
DA2TSC	.10	-.03	.13	-.02	.17	.02	-.18	-.14	.06	.30	.07	.04
DA2EF1	.15	.16	.05	-.12	-.14	.17	-.09	-.03	.07	-.04	.01	.12
* DA2EF2	.07	-.08	.19	-.03	.38 (.008)	-.10	-.03	-.001	-.09	.41 (.004)	-.10	.04
DA6TSC	.16	-.07	.11	.03	-.09	-.07	-.10	-.15	.16	.09	.11	.22
DA6EF1	.07	.01	-.09	.15	-.35 (.007)	.24 (.05)	.05	-.08	-.002	-.15	.20	.28 (.03)
* DA6EF2	.09	-.12	-.03	.20	-.21	.09	-.10	-.25	.14	-.06	.24	.07
DA12TSC	-.03	-.24	.30 (.02)	.11	.08	-.02	.19	-.004	.02	.09	-.06	-.005
DA12EF1	-.001	-.16	.18	.23	-.03	.23	.21	.11	-.20	.08	-.17	.08
* DA12EF2	.02	-.10	.22	.28	.17	.25	.31 (.02)	.16	-.16	.11	-.23	-.14

(*two-tailed test)

Table 128 (con't) Correlations between DRL measures (speech conditions) and MFFT and personality variables

VARIABLES	N	O	Q3	Q4	ANX	EXT	G	NTRS E	NTRS N	NTRS P	AGE
DRLALRN	.13	.34 (.009)	-.04	-.05	.08	.05	-.16	.22	.08	.19	-.13
DA2TSC	-.02	-.26 (.04)	.10	-.26 (.04)	-.28 (.03)	.09	.05	.06	.15	.06	-.13
DA2EF1	-.03	-.21	-.01	-.05	-.02	-.02	-.19	-.11	.004	-.13	-.15
* DA2EF2	.003	-.18	.17	-.26	-.35 (.014)	.27	.24	-.07	.15	-.02	-.12
DA6TSC	-.06	-.02	.02	-.08	-.06	-.02	-.38 (.034)	.17	.01	.10	.08
DA6EF1	.001	.13	-.16	.13	.28	-.17	-.22	-.07	-.17	-.10	.003
* DA6EF2	-.19	.15	.13	-.03	.07	-.24	-.07	-.10	-.19	-.12	.08
DA12TSC	-.09	-.15	.02	.04	-.09	.17	-.01	-.05	-.36	-.33	-.09
DA12EF1	.14	.01	-.31* (.032)	.26 (.038)	.24 (.050)	.20	-.04	.14	-.09	.01	-.26 (.040)
* DA12EF2	.06	-.18	-.15	.22	.08	.27	.09	.01	-.05	-.11	-.16

that a lax disposition and high emotionality is correlated with efficiency. On the other hand, DA12EF2 was positively correlated with Factor E (r=.31, p=.02, two-tailed) which could be explained on the assumption that an assertive and self-assured child tends to be better at maximizing his reinforcement even in a behavioural restraint task. DA2EF2 correlated with Factor C (r=.38, p=.008) and Factor H (r=.41, p=.004). The combination of being emotionally stable and being responsive and venturesome seems to be associated with high efficiency on EF2 in the DRL-2 task. There are a large number of reinforcements available in this test, so the subject needs to be able to maintain a balance between exercising the appropriate degree of behavioural restraint with the aid of counting, and responding to the temporal discrimination by not having unduly long IRTs, in order to maximize the reinforcement. The negative correlation of DA2EF2 and ANX (r=-.35, p=.014) was in accord with the prediction that good performance on DRL is related with low anxiety.

Overall, it must be said that individual differences in DRL performance with self-instruction seem to have relatively little connection with individual differences in the personality variables studied here.

Discussion

First of all, the correlations between the measures of DRL in the no speech condition and personality variables confirmed several of the findings of Shapland,et al. (unpublished). Comparison of the correlation between the speed of learning and personality variables in the course of the three DRL tasks suggested that the first task was not related to personality factors. DA2TSC correlated significantly with Factor B, a measure of intelligence, confirming that the first task is predominantly cognitive in nature, and supporting the proposal that a "warm up" task is desirable in DRL training.

Speed of learning in DRL-6 was related to high Factor C, low Factor O and a low overall Anxiety score, so emotional stability seems to be related to learning behavioural self-restraint. At the same time, behavioural restraint may also be related to reflectiveness (NTRS-G), a tendency to be slow and languid (Factor F) and a willingness to act according to group standards (Factor J). There was some support for the relation between behavioural self-restraint on DRL performance and low anxiety found by Singh (1971) and Shapland,et al. (unpublished). Factor F is a factor loaded on CPQ extraversion, and the unusually large correlations between it and speed of learning provided support for the extraversion connection reported by Shapland, et al. (unpublished.) The correlation between DRL-12 performance and Factor F, which reached r=-.52 (p=.002), further confirmed this result.

It is worth noting the correlation between DA12TSC and Factor I. A high score on Factor I implies a greater tendency to avoid physical threats (according to Porter & Cattell,1968, due to overprotection). The fact that it predicts behaviour restraint and speed of performance in learning DRL-12, brings to mind Kagan,et al.'s (1964) suggestion that the fear of errors enhances a reflective disposition. This seems to be an exception to the general trend of the present results that low anxiety is related to behavioural inhibition. This agrees with Block,et al.'s (1974) view, but there was no support for his other prediction that the reflectives would score higher on extraversion (see discussion in Chapter Seven). In fact, the relation between measures of the MFFT and DRL measures was confined to the errors measures. Correlation coefficients were about -.30. MFFT variables are no more useful as predictors of DRL performance than personality measures. Behavioural self-restraint was only moderately related to cognitive inhibition.

Factor A changed from being negatively correlated with DA2TSC to being positively related with DA6TSC and DA12TSC, though only the last correlation reached statistical significance. High scores on Factor A indicate sociability. It seems that to do well in the DRL tasks, a willingness to try out different tempo of responding is also important to speed of learning. Shapland,et al. (unpublished) found that Extraversion was related to efficiency in their first DRL task. In this respect, the present finding is difficult to explain, as it is not obvious why the sociability and not the impulsive aspect of extraversion should be related to behavioural performance.

Coming to the efficiency measures, DA2EF2, the ability to maximize reinforcement, required some degree of venturesomeness and independence and assertiveness. This was reflected by its positive correlation with Factors E, F and H. None of the personality variables correlated significantly with the efficiency measures of DRL-6. Generally, while personality differences may be related to the speed of learning, they are only related to efficiency (EF2) in DRL-12. To be efficient on DRL-12 required different attributes from those in DRL-2. As the results suggests, chronological age and being careful are the variables connected with DRL-12 Efficiency Index 2.

The most noticable phenomenon in the speech condition is that personality did not relate to DRL performance in a consistent pattern. It seemed that once the children had grasped the use of self-instruction in regulating the DRL performance, personality differences played hardly any part in predicting their degree of behavioural restraint. As for the first DRL task with counting, speed of learning in DRL-2 was related to low anxiety, and maximizing reinforcement in this task was associated with low anxiety and a degree of venturesomeness. These findings are in contrast with the no speech condition in which the first task seems to be related most closely with intelligence. There is less resemblance in the pattern of correlation between DRL with counting and Shapland,et al.'s (unpublished) results than that between DRL no-speech condition and Shapland,et al.'s findings. The point demonstrated here is that the use of self-instruction to regulate DRL performance not only enables children to learn the task faster, but also tends to override any influence due to personality difference on performance. The hypothesis that individual differences in personality will be related to differences in the use of speech accompaniment, and be reflected in DRL results, has not been supported.

MFFT variables related to only two time measures in the no-speech conditions and not at all in the counting condition. These findings again suggest that speech regulation tends to obscure any differences related to conceptual tempo.

D. Correlation of DRL and SS-DD measures

The present experiment has shown that DRL tasks are measures of behavioural restraint and are related in certain circumstances with personality differences in anxiety and extraversion (or impulsiveness). The last experiment (Chapter Eight) showed that the games "Simon Says" and "Do and Don't" also provide measures of behavioural restraint, and that they are able to differentiate between children classified as reflective or impulsive by the MFFT.

If the two tasks share any similarity in measuring the ability to inhibit or restrain behaviour, it may be expected that the speed of learning the DRL tasks and efficiency (EF1) on them would be related to the accuracy of performance in SS and DD, as well as to the measure of errors of commission. As verbal self-instruction was expected to improve performance in the DRL tasks, doing well on DRL (counting condition) might be expected to relate to accuracy in SS and DD as well as the commission errors. No specific predictions were made regarding the second efficiency index (EF2).

If we look at Table 129a, which presents the correlations between measures of DRL in the no-speech condition and the measures of SS and DD (See Appendix 29 for the means and standard deviations of the variables), it can be seen that DRLALRN correlates significantly with SSOMI (r=-.36, p=.006), DDACC (r=.40, p=.002), p=.038) and DDOMI (r=-.28, p=.026). The correlations are all in the predicted direction. Accuracy of performance at the game "Do and Don't"(DDACC) correlates positively and significantly with the speed of learning in all three DRL tasks and the efficiency indices of DRL-6. SSACC correlates with DA6TSC. SSOMI correlates with DA6TSC (r=-.49, p=.001) and DA6EF2 (r=-.42, p=.008, two-tailed), while DDCOM is related with DA6TSC (r=-.27, p=.050) and DA6EF1 (r=-.27, p=.046). It appears that the closest relationships are found between the second DRL tasks and the games, particularly "Do and Don't".

By contrast, there are few correlations between DRL and SS and DD when DRL is under speech regulation (Table 129b). The hypothesis is therefore not supported, and there is no evidence that behavioural restraint on DRL with speech accompaniment is related to the type of restraint in SS and DD which relies on the discrimination and response to verbal cues. Although DDACC correlated with DA6TSC (r=.27, p=.033), DDCOM with DA12TSC (r=-.29, p=.028) and DDOMI with DA6EF1 (r=-.38, p=.003), these results are not sufficient to allow us to draw any firm conclusion.

Discussion

Measures of DRL-2 in the no speech condition were not related to performance of DD and SS, possibly because the subjects

Table 129a   Correlations between DRL measures (no speech condition) and SSDD variables

VARIABLES	SIMON SAYS			DO AND DON'T		
	ACC	COM	OMI	ACC	COM	OMI
DRLABA	-.04	.10	-.16	.15	-.10	-.11
DRLALRN	.20	-.12	-.36 (.006)	.40 (.002)	-.26 (.004)	-.28 (.026)
DA2TSC	.06	-.05	-.03	.30 (.020)	-.18	-.22
DA2EF1	-.06	.07	-.01	.07	.06	-.20
*DA2EF2	-.05	.04	.03	.10	.01	-.17
DA6TSC	.29 (.035)	-.18	-.49 (.001)	.43 (.003)	-.27 (.050)	-.26
DA6EF1	-.13	.14	.02	.37 (.010)	-.27 (.046)	-.17
*DA6EF2	.11	.003	-.42 (.008)	.44 (.006)	-.30	-.23
DA12TSC	.28	-.22	-.44 (.007)	.36 (.025)	-.30	-.14
DA12EF1	.19	-.17	-.23	.14	-.05	-.16
*DA12EF1	.34	-.32	-.28	.21	-.10	-.21

(*two-tailed test)

Table 129b Correlations between DRL (speech condition) measures and SSDD measures

VARIABLES	SIMON SAYS			DO AND DON'T		
	ACC	COM	OMI	ACC	COM	OMI
DRLABA	.10	-.07	-.19	.11	-.08	-.09
DRLALRN	.01	-.08	.11	-.05	-.004	.12
DA2TSC	-.08	.10	-.003	.02	-.11	.16
DA2EF1	-.08	.13	.08	.17	-.15	-.10
DA2EF2	.01	.01	-.09	-.10	-.006	.25
DA6TSC	.03	.02	-.11	.27 (.033)	-.20	-.23
DA6EF1	.07	.04	-.16	.28 (.029)	-.13	-.38 (.003)
DA6EF2	.07	.01	-.11	.25	-.19	-.21
DA12TSC	.15	-.12	-.05	.21	-.29 (.028)	.05
DA12EF1	.13	-.10	.01	.23	-.22	-.11
DA12EF2	.10	-.15	-.02	.13	-.16	-.01

(*two-tailed test)

in the DRL-2 tasks were still adapting to the experimental situation and finding out what the nature of DRL tasks was. On this analysis, DRL-6 can be considered a better measure of behavioural restraint. It is related to SS and DD on several measures in the predicted direction. The ability to follow instructions to execute or inhibit behaviour on "Do and Don't" is related to the speed of learning of the DRL tasks and the amount of behavioural restraint achieved (DRLALRN). The ability to inhibit responding in "Do and Don't" is also linked with DRLALRN and the speed of learning and efficiency in DRL-6. It would appear that the ability to react to instructions put in a straightforward manner to respond or not to respond correlates with the ability to exert behavioural restraint on DRL. The game "Simon Says" also predicts DRL performance, at least where omission scores are concerned. The last experiment showed that omission errors are related to extraversion, defined in terms of carelessness and heedlessness, and the present experiment shows that success at DRL is related to Factor F, which is loaded on extraversion. This substantiates the role extraversion plays in behavioural restraint, and it may imply that achieving behavioural restraint is not simply a question of not producing errors of commission, but is also related to qualities such as attentiveness.

Summary and Conclusions

The experiment was designed to explore the performance of reflective and impulsive children on three successive DRL tasks, with or without the use of verbal self-instruction, which took the form of counting. The correlations between DRL performance and personality variables, and the correlation between DRL and SS and DD performance were also explored. The results can be briefly summarised as follows:

1. There is evidence that verbal self-regulation facilitates DRL performance. Verbal self-instruction in the form of counting provides an estimate of the interval between two responses. However, long IRTs between responses, which is taken as a measure of behavioural restraint, was achieved at the expense of temporal discrimination, as can be seen from IRTs/OP analysis, and it also reduces the efficiency of the subjects in maximizing reinforcement (EF2) in tasks which requires only a short IRT.

2. DRL performance without speech accompaniment is correlated with personality measures. Speed of learning DRL and efficiency (EF1) tends to be related to stability. There is some suggestion that the speed of learning and efficiency (EF1 and EF2) are related to measures of extraversion, but this appears only in the correlation with Factor F which is loaded on extraversion on the CPQ. High scores on NTRS-G also predict good performance on DRL.

3. MFFT errors correlate with the speed of DRL learning in DRL-2 and DRL-12 in the no-speech condition. Although DRL is a temporal discrimination task, MFFT latency is unrelated to DRL performance.

4. The use of counting seems to have obscured any connection between DRL performance and individual differences in personality. Unlike the no-speech condition in which performance on the first DRL task was related to intelligence, performance at the first DRL task using speech seemed to be more related with measures of anxiety. Subsequent DRL tasks using speech were not related to the personality variables studied here.

5. Task similarities were found between the DRL tasks and the games "Simon Says" and "Do and Don't". The two games correlated particularly significantly with DRL-6, the second DRL task, and the overall learning index of DRL. This may be enough to support the view that the two tasks are both measures of behavioural restraint. This may also be related to certain relatively stable personality characteristics, but evidence to support this conclusion comes only from the no-speech, and not the counting, condition in the present experiment.

CHAPTER TEN

TYPES OF VERBAL SELF-INSTRUCTION, AND THE RELATIONS BETWEEN PERSONALITY AND DEVELOPMENTAL VARIABLES AND BEHAVIOURAL SELF-RESTRAINT IN DRL PERFORMANCE

The last experiment demonstrated that verbal self-instruction produced a definite effect on DRL performance. However, counting is only one form of behavioural regulation through verbal means. It was helpful in enhancing behavioural self-restraint but less so in producing accurate temporal discrimination.

It has been suggested that counting provides an "internal clock" when time is used as a variable in experiments (Bindra & Waksberg, 1956; Fraisse, 1963). But Shapiro (1973) considers that counting is no more effective than speaking nonsense words aloud. "It further became clear that counting to ten or saying 'verb' were functionally equivalent to the subjects and that the mode or responding overrode any considerations of 'meaning' that may have been inherent in counting" (Shapiro, 1973). The task referred to in the quotation was reaction time, but his conclusion may be relevant to DRL training, and in particular to the verbal self-regulation of DRL performance.

In the experiments described in Part I, it was found that the meaning of the verbal self-instruction played no part in facilitating motor responses; in fact, verbal self-instruction was actually detrimental to performance. In Chapter Nine, counting produced favourable results in DRL training, but the conclusion drawn was a cautious one. To the extent that counting resulted in responses with long IRTs, some subjects thought that counting was the response required in order to obtain reinforcement. The results in Chapter Nine suggest that it would be interesting to compare various types of instructions and different modes of uttering the instructions.

In the present experiment, three sets of verbal self-instructions were included in addition to a no speech group and a counting group. The instructions were "a, b, c", "wait a bit", and "once again". The utterance "a, b, c" was designed to be a neutral instruction, while "wait a bit" was a meaningful instruction, which, if responded to by the subjects, might be expected to facilitate their performance in DRL training. On the other hand, "once again", although meaningful, could have the opposite effect to "wait a bit" because a subject responding to this instruction would press the lever again at short IRTs. In order to explore further the facilitative effect of speech on DRL shown in the last chapter, these three sets of instruction were each given to two different groups, one of which was asked simply to say the instruction once, while it was suggested to the other that the instruction ought to be repeated. Thus there were eight groups in all.

A problem which arose in the last experiment was that subjects were dropped at various stages of DRL training when they failed to meet one of the specified criteria. This could create difficulties in analysis of, say, an analysis of variance design with repeated measures on unequal number of subjects in the cells. One solution is to design a DRL training task with finer grading in terms of difficulty so that although subjects might differ in the time taken to learn a DRL schedule, or in the level of DRL schedule they can reach within a set period of time, no subjects will be dropped from the design. The same indices such as Efficiency Index 1, Efficiency Index 2 which were used in the last DRL experiment can still be used. The learning index in the present experiment, as in the previous one, is the difference between the IRT during last ten minutes of performance and that of the first two minutes of performance.

The relationship between the performance on this modified version of the DRL task and measures of personality differences will also be examined.

It is hypothesized that impulsiveness, as shown either represented by "high error-low latency" on the MFFT or by high scores of extraversion and anxiety, will be related to shorter IRTs reached at the end of the DRL training in the no speech condition. Similarly, impulsiveness will be related to a smaller learning index, because subjects who have learned to space their responses to reach a longer IRT level will have a greater difference between their mean IRT at the end of their performance and that at the beginning. Impulsive children will be less efficient on Efficiency Index 1 (EF1) because they tend to produce superflous responses that lower the rate of reinforcement, but they may be just as efficient as reflective children on Efficiency Index 2 (EF2) in maximizing the reinforcement.

When speech is used, it is expected that:

1. All conditions involving verbal self-instruction will produce better results in terms of IRT reached and EF1 than the no speech condition.
2. Among the conditions using speech, counting will produce better results than the other groups in terms of IRT level reached and Efficiency Index 1. Counting may be detrimental to Efficiency Index 2 according to the findings of the last experiment.
3. Excluding the no speech condition and the counting condition, repeating the instructions will produce better results than saying the instructions once.
4. The self-instruction "wait a bit" (whether repeated many times or uttered once) will produce better results than the self-instruction "once again" (whether repeated many times or uttered once).
5. The self-instruction "a, b, c" will be less effective than "wait a bit" in enabling subjects to reach larger IRTs level on the grounds that subjects responding to the meaning of the instructions will slow down their responses if it is about waiting. By contrast, "a, b, c" is a neutral instruction which does not seem to provide any suggestion. The self-instruction "a, b, c" will be more effective than "once again" for the reason that subjects saying "once again" will be responding at a faster rate.

Methods

Subjects

164 children (77 boys and 87 girls) from St. Dunstan's Junior School in Sutton, Surrey formed the original sample. The mean age of the subjects was 114.4 months (S.D.=7.52). The mean age of the boys was 114.9 months (S.D.=6.36) and that of the girls was 114.02 months (S.D.=8.44).

Selection of the subjects

The subjects were seen individually and given the MFFT. The procedure was the same as that described in Chapter Eight. The results are presented in Table 130.

The latency and error scores were compared between male and female subjects. There was no significant difference between the sexes in latency ($F(1,160)=0.48$) or in errors ($F(1,160)=0.08$). Consequently, although different medians were used to select impulsive and reflective children from each sex in order to provide an equal number of subjects in each cell balanced for sex, it was considered appropriate to combine Male and Female as one factor in the analysis of variance design of the present DRL experiment.

Using the double-median-split method, 26 males were identified as reflective and 26 as impulsive. 28 females were identified as reflective and 26 as impulsive. From each group of subjects, 24 were randomly selected to participate in the DRL experiment. Their mean scores on the MFFT are shown in Table 131.

Table 130 Means and standard deviations of age and MFFT scores in original sample

	Male (N = 77)	Female (N = 87)
Age (months)		
$\bar{X}$	114.90	114.00
S.D.	6.39	8.44
range	95-127	94-127
MFFT latency (seconds)		
$\bar{X}$	157.36	148.12
S.D.	86.97	71.98
median	131.25	131.25
range	45.0-535.5	47.0-366.0
MFFT error		
$\bar{X}$	8.31	8.14
S.D.	5.00	4.57
median	2.70	7.21
range	0-24	0-23
latency x error r	-.49*	-.52*

(* $p < .001$, one-tailed)

Table 131 Means and standard deviations of age and MFFT scores of subjects in DRL experiment (N = 24 in each group)

		Age		MMFT error		MFFT latency	
		$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.
M	Impulsive	114.63	5.22	12.96	4.00	90.60	22.15
	Reflective	116.75	7.06	3.38	2.20	235.67	101.67
F	Impulsive	112.83	3.67	12.58	3.67	93.88	23.07
	Reflective	114.79	7.74	4.00	2.00	217.88	68.39

Apparatus

The experimental setting and the apparatus were the same as those described in Chapter Nine. The children were seen individually in the mobile laboratory.

Procedures

DRL experiment

The design was a 3-way analysis of variance design with planned comparisons. The subjects were divided according to sex and conceptual tempo (IR) and three subjects in each group were randomly assigned to one of the eight experimental conditions.

After familiarizing the subjects with the surroundings and the apparatus, they were introduced to DRL training: "Now we are going to play a game by pressing this lever. First of all, I want you to do some practice. You see, the lever can be pressed down, like this. When I say start, you go on pressing until I tell you to stop." The subject was left to press for two minutes and the baseline rate of pressing was recorded.

Then the subjects were handed a card and some colour stickers. They were told that they could gain more stickers by playing well in the game. The following instruction was then given: "Now we are going to play a guessing game about a special way of pressing this lever. If you do well, you can get more colour stickers. But let me tell you that it has nothing to do with how you sit, which hand you use, or pushing, pulling or twisting the lever, ..."

The opening instructions were different for the different conditions. The common core was: "Once you are correct, I'll say 'good' and it means that you have gained a point. If I do not say anything, it means that you are not quite right yet and you must keep trying different ways. Remember, you can press (and count/ say ' . . . ' /repeat ' . . . ') as much or as little as you like to find out. The idea is to get as many 'good's' from me as you can."

This was preceded by the following instructions for the respective conditions:

A. For the DRL (no speech) condition:

"In this game, all you have to do is to try different ways of pressing the lever as often or as little as you like."

B. Counting condition:

"In this game you press the bar and I want you start counting. Each time you start with one and count up to any number you like between one and 50. Then you press again. After that, you start counting. You can count small numbers or big numbers. I am not telling you exactly how to do it. You must try different ways of pressing and counting as much or as little as you like to find out the special way. Make sure I can hear you count. Once I say good, try to keep it up."

C. Single utterance of "a, b, c" or "wait a bit" or "once again":

"In this game, you press the bar and I want you to say 'a, b, c / wait a bit / once again'. Then you press again, and then say the words. I am not telling you exactly how to do it. So to find out the special way, you should try different ways of pressing and saying ' . . . ' as often or as little as you like. Make sure I can hear you say the words. Once I say 'good', try to keep it up."

D. Repetition of "a, b, c" or "wait a bit" or "once again": "In this game, you press the bar and I want you to repeat 'a, b, c / wait a bit / once again' once or as many times as you like. Then you press again and repeat the words. I am not telling you exactly how to do it. To find out the special way you should try different ways of pressing and repeating ' . . . ' as often or as little as you like. Make sure that I can hear you say the words. Once I say 'good', try to keep it up."

The training was divided into separate one-minute blocks. The schedule to start with was DRL-2 for all the subjects. The criterion for learning was that the subject should obtain reinforcement for at least half of the responses produced, and should obtain in consecutive one-minute blocks the maximum number of reinforcements available in a one-minute interval of a particular schedule. When criterion was reached, the trial was terminated. The reinforcement was given to the subject but kept out of his sight during the training. He was then introduced to the next schedule. The instruction was: "Good. Now let us change the rule a little and it is up to you to find that out. Still, you have to press (and count / say ' . . . ' / repeat ' . . . '). But it is for you to do this as often or as little as you like to find out the special way, so that you can get many 'good' points." The subjects were also reminded that the special way had nothing to do with their posture or which hand they used.

The DRL schedule increased each trial by two seconds. The entire training session lasted twenty minutes. The maximum IRT level reached was DRL-18. At the end of the session, the subjects were praised, and rewarded with the colour stickers they earned.

Personality measures

The children from two classes were part of the sample that formed the standardization of the New TRS (Sample C). They were rated by their teachers on the four NTRS subscales and rated themselves on personality questionnaires: the CPQ, the JEPI and the EPQ.

Developmental measures

Co-operation was enlisted from the school in providing a measure of the children's reading ability. The children were tested by their teachers during the summer term on the Schonell Graded Reading Test and a reading age obtained. This was transformed into a reading quotient with reference to the chronological age of the children.

Results

A. Verbal self-instruction and DRL performance

The means and standard deviations of the DRL measures are presented in Table 132 to 135. The DRL measures included the IRT

Table 132 Means and standard deviations of IRTs reached by subjects

		Conditions							
		1	2	3	4	5	6	7	8
Male	$\overline{X}$	.33	13.33	2.00	8.67	3.00	10.00	2.33	9.33
Impulsive	S.D.	.58	1.15	1.00	3.06	2.65	4.00	1.53	5.03
Male	$\overline{X}$	1.33	13.33	2.00	13.33	4.33	11.33	2.00	10.00
Reflective	S.D.	.58	4.62	1.00	3.06	1.53	2.31	0.00	5.29
Female	$\overline{X}$	1.33	15.33	3.00	8.00	3.67	6.00	1.67	6.33
Impulsive	S.D.	.58	1.15	1.00	6.93	3.79	2.00	.58	3.51
Female	$\overline{X}$	1.00	14.00	1.67	6.00	3.00	11.33	3.67	7.33
Reflective	S.D.	1.00	2.00	.58	0.00	1.00	2.31	3.79	4.16

Table 133 Means and standard deviations of Efficiency Index I

		Conditions							
		1	2	3	4	5	6	7	8
Male	$\overline{X}$	.07	.79	.23	.72	.38	.74	.22	.78
Impulsives	S.D.	.04	.04	.13	.16	.26	.15	.19	.14
Male	$\overline{X}$	.17	.83	.32	.81	.41	.86	.26	.73
Reflectives	S.D.	.02	.23	.16	.12	.09	.06	.06	.20
Female	$\overline{X}$	.14	.88	.32	.66	.35	.53	.29	.51
Impulsives	S.D.	.08	.04	.14	.27	.28	.05	.16	.15
Female	$\overline{X}$	.19	.86	.22	.51	.30	.80	.26	.58
Reflectives	S.D.	.01	.09	.09	.01	.04	.08	.19	.16

Table 134 Means and standard deviations of Efficiency Index II

		Conditions							
		1	2	3	4	5	6	7	8
Male	$\overline{X}$	.07	.27	.20	.57	.30	.40	.20	.50
Impulsives	S.D.	.06	.11	.10	.06	.10	.10	.10	.10
Male	$\overline{X}$	.20	.30	.30	.33	.37	.50	.27	.37
Reflectives	S.D.	.00	.10	.17	.06	.06	.10	.06	.06
Female	$\overline{X}$	.17	.33	.33	.40	.30	.43	.27	.37
Impulsives	S.D.	.11	.06	.12	.10	.20	.06	.15	.06
Female	$\overline{X}$	.20	.27	.20	.37	.30	.54	.23	.43
Reflectives	S.D.	.00	.06	.10	.06	.00	.06	.15	.06

Table 135 Means and standard deviations of learning index in DRL experiment

		Conditions							
		1	2	3	4	5	6	7	8
Males	$\overline{X}$	.29	10.47	.73	8.39	2.50	6.18	1.02	11.16
Impulsives	S.D.	.32	4.79	.60	2.02	2.94	5.06	1.55	6.37
Male	$\overline{X}$	.91	16.51	2.24	14.25	4.02	11.70	1.08	6.77
Reflectives	S.D.	.46	4.97	1.67	6.57	1.09	3.47	.98	3.64
Female	$\overline{X}$	.52	15.79	1.57	7.07	2.96	4.56	.91	4.48
Impulsives	S.D.	.61	4.54	.88	8.06	4.04	2.94	.83	2.12
Female	$\overline{X}$	.83	12.14	.65	2.74	1.94	10.63	3.53	6.04
Reflectives	S.D.	.87	4.78	.45	1.72	1.50	2.49	5.30	4.24

level reached by the subjects, two efficiency indices and a learning index. The Efficiency Index 1 (EF1) was derived by dividing the number of reinforcements obtained by the number of responses produced during the entire training period. The Efficiency Index 2 (EF2) was obtained by dividing the number of reinforcements obtained by the maximum number of reinforcements available from the schedules the subjects had performed. This was calculated individually depending on how long a subject spent on a particular IRT schedule. For a subject who reached DRL-18 in the twenty minutes of performance, the maximum number of reinforcements available would be 290. The learning index was calculated by subtracting the mean IRT during the first two minutes of the training from that of the last two minutes of the training.

The results were analysed by analysis of variance with planned comparisons.* The results are shown in Table 136 to 139.

The analysis showed that all the four indices produced consistent results. There was a significant main effect due to condition at $p < .001$. Planned comparisons on the interresponse time reached showed that subjects in the no speech condition reached

---

* The contrasts are the planned comparisons of the eight conditions according to hypotheses 1 to 5. Assuming orthogonality, the coefficients are:

Contrast 1	7	-1	-1	-1	-1	-1	-1	-1
Contrast 2	0	6	-1	-1	-1	-1	-1	-1
Contrast 3	0	0	1	-1	1	-1	1	-1
Contrast 4	0	0	0	0	1	1	-1	-1
Contrast 5	0	0	2	2	-1	-1	-1	-1

a significantly lower IRT level than all the other groups using some form of verbal self-instruction ($F(1,64)=47.37$, $p < .001$). Counting was the form of speech regulation that enabled the longest IRT level to be reached ($F(1,64)=85.96$, $p < .001$). Excluding the control and the counting group, multiple utterances irrespective of the content surpassed single utterances in the IRT level attained ($F(1,64)=88.98$, $p < .001$). The other comparisons, however, did not reach significance. The hypothesis that saying "wait a bit" would be more effective than saying "once again" was not supported, nor did saying "a, b, c" produce significantly different results from using the other forms of self-instruction.

Analysis of the Learning Index also produced a significant main effect due to condition ($F(7,64)=20.25$, $p < .001$). Planned comparison also yielded the same significant results as those obtained in the analysis of IRT level reached.

The main condition effect was significant in the analyais of EF1 ($F(7,64)=40.65$, $p < .001$). The first three planned comparisons also yielded findings that supported the first three hypotheses. Consistent with the results already mentioned, counting was more efficient than the other speech groups ($F(1,64)=6.26$, $p < .05$) and repeating the self-instructions was more efficient than saying the instruction once ($F(1,64)=13.73$, $p < .001$). The no-speech condition remained the most inefficient of the eight groups ($F(1,64)=8.34$, $p < .01$).

On EF2, the results were also consistent with those already mentioned. There was a significant main effect due to condition

Table 136 ANOVA of Interresponse time reached

Source of Variation	SS	df	MS	F	Sig.
Sex	16.67	1	16.67	2.09	N.S.
IR	12.04	1	12.04	1.51	N.S.
Conditions	1797.50	7	256.79	32.18	<.001
contrast 1	378.00	1	378.00	47.37	<.001
contrast 2	686.00	1	686.00	85.96	<.001
contrast 3	709.38	1	709.38	88.89	<.001
contrast 4	18.75	1	18.75	2.35	N.S.
contrast 5	2.25	1	2.25	0.28	N.S.
Sex x IR	3.37	1	3.37	.42	N.S.
Sex x Condition	74.50	7	10.64	1.33	N.S.
IR x Condition	34.13	7	4.88	.61	N.S.
Sex X IR x Condition	53.13	7	7.59	.95	N.S.
Within cells	510.67	64	7.98		
Total	2502.00	95			

Table 137 ANOVA of learning index

Source of variation	SS	df	MS	F	Sig.
Sex	44.84	1	44.84	3.58	N.S.
IR	28.29	1	28.29	2.26	N.S.
Conditions	1776.30	7	253.76	20.25	$<.001$
contrast 1	318.35	1	318.35	25.39	$<.001$
contrast 2	805.35	1	805.35	64.22	$<.001$
contrast 3	627.05	1	627.05	50.00	$<.001$
contrast 4	16.88	1	16.88	1.35	N.S.
contrast 5	1.10	1	1.10	0.09	N.S.
Sex x IR	24.35	1	24.35	1.94	N.S.
Sex x Condition	132.49	7	18.93	1.51	N.S.
IR x Condition	90.97	7	13.00	1.04	N.S.
Sex x IR x Condition	164.93	7	23.56	1.88	N.S.
Within cells	802.16	64	12.54		
Total	3064.34	95			

Table 138   ANOVA of Efficiency Index 1

Source of variation	SS	df	MS	F	Sig
Sex	0.08	1	0.08	3.87	N.S.
IR	0.02	1	0.02	1.07	N.S.
Conditions	5.78	7	0.83	40.65	<.001
contrast 1	1.67	1	1.67	8.34	<.01
contrast 2	1.25	1	1.25	6.26	<.05
contrast 3	2.75	1	2.75	13.73	<.001
contrast 4	0.10	1	0.10	0.51	N.S.
contrast 5	0.01	1	0.01	0.05	N.S.
Sex x TR	0.02	1	0.02	0.80	N.S.
Sex x Condition	0.24	7	0.35	1.70	N.S.
IR x Condition	0.11	7	0.15	0.74	N.S.
Sex x IR x Condition	0.10	7	0.01	0.67	N.S.
Within cells	1.30	64	0.20		
Total	7.64	95			

Table 139 ANOVA of Efficiency Index 2

Source of variation	SS	df	MS	F	Sig.
Sex	0.00	1	0.00	0.00	N.S.
IR	0.00	1	0.00	0.05	N.S.
Condition	0.93	7	0.00	14.64	<.001
contrast 1	0.36	1	0.36	40.28	<.001
contrast 2	0.04	1	0.04	4.29	<.05
contrast 3	0.46	1	0.46	52.09	<.001
contrast 4	0.05	1	0.05	5.27	<.05
contrast 5	0.008	1	0.008	0.95	N.S.
Sex x IR	0.004	1	0.004	0.40	N.S.
Sex x Condition	0.034	7	0.005	0.53	N.S.
IR x Condition	0.11	7	0.02	1.79	N.S.
Sex x IR x Condition	0.12	7	0.02	1.94	N.S.
Within cells	0.58	64	0.009		
Total	1.78	95			

(F(7,64)=14.64, $p < .001$), and to the first three planned comparisons turning out to be significant. The fourth comparison was also significant (F(1,64)=5.27, $p < .05$) in the analysis. This suggests that saying "wait a bit" (once or repeated) was more efficient in terms of maximizing reinforcement than saying "once again" (once or repeated).

Neither sex nor conceptual tempo produced any significant results.

Discussion

Verbal self-instruction again demonstrated its facilitative power in the shaping of DRL performance with graded IRT intervals. The question as to which aspect of verbal self-instruction was exerting an effect was also answered. Examination of the difference between multiple and single utterances gave little indication that meaning had any influence on the performance. Instead, multiple utterances filled in the time intervals more effectively and were almost as effective as counting. It made no difference whether the child said "a, b, c", "wait a bit" or "once again", as far as extending the IRT level reached, the learning index or Efficiency Index 1 were concerned. It seemed that verbal self-instruction did not take on the function of providing a plan for the behaviour to be executed.

Counting, as in the last experiment, was the most effective mode of verbal self-instruction. It seemed to give a useful estimate of the interval between response and was particularly effective in lengthening IRT, and consequently increasing the

Learning Index. However, efficiency again did not benefit to the same extent, as can be seen in the larger probability level in the second contrast in planned comparison of the efficiency indices (Tables 138 and 139).

However, apart from the greater success of saying "wait a bit" in yielding high EF2 when compared with saying "once again", the meaning of the verbal self-instructions did not seem to have played any part. The content of the self-instruction seemed to be much less important than the mode saying it. Subjects in the counting and multiple utterance conditions could work out that by gradually increasing the number to count, or the number of times the instruction was repeated, they would be able to receive reinforcement when they pressed the lever. They reported after the experiment that the increase in verbalization was related to the progress of the game. By contrast, subjects in the control condition seldom advanced beyond DRL-4 and tended to spend a long period of training time testing out the reinforcement contingency. Verbal self-instruction may have given clues as to how to perform well on DRL training, but it did not help subjects to realise the exact target of DRL training.

B. Intercorrelation among DRL variables

The correlations are presented in Tables 140 and 141. The means and standard deviations of the variables are in Table 142.

In the no speech condition, the IRT level reached (DBIRT) was significantly correlated with the learning index (DRLBLRN) ($r=.60$, $p=.02$), EF1 ($r=.63$, $p=.02$) and EF2 ($r=.62$, $p=.02$).

Children who reached high IRT levels were also efficient. The learning index correlated significantly with the efficiency indices, which were related with each other (r=.97, p=.002). The baseline IRT, however, did not yield any significant correlations with other DRL measures.

The correlation pattern was different in the counting condition. DBIRT correlated with DBEF1 (r=.92, p=.002), and DRLBLRN also correlated with DBEF1 (r=.68, p=.014). This would have been expected, as children who used counting tended to produce responses with long IRTs, and most of the responses would have reached the specified schedule or beyond and have been reinforced. This pattern of behaviour was detrimental to EF2, which is reflected in the negative correlation between DBEF2 and DBIRT, DBEF1,and DRLBLRN, even though the correlations did not reach statistical significance. The baseline again did not predict DRL performance.

In the single utterance conditions, which were pooled together since there was no significant difference among them, all the measures were significantly intercorrelated, except the baseline, which was unrelated to any other variables. The multiple utterance conditions were also pooled together. DBIRT correlated significantly with DBEF1 (r=.90, p=.002), and with DRLBLRN (r=.89, p=.002). DREF1 related with DREF2 (r=.43, p=.01) and DRLBLRN (r=.86, p=.002). DBEF2 also correlated with DRLBLRN (r=.96, p=.002). There was sufficient evidence from the results to conclude that if a subject performed well on one index, he would tend to perform well on the other indices.

Table 140 Intercorrelations among DRL B variables (No speech condition and counting condition) (two-tailed)

VARIABLES	1	2	3	4	5
1. DRLBBA	-	-.04	.20	.26	.04
2. DBIRT	.35	-	.63 (.02)	.62 (.02)	.60 (.02)
3. DBEF1	.20	.92 (.002)	-	.97 (.002)	.57 (.05)
4. DBEF2	.26	-.29	-.26	-	.57 (.05)
5. DRLBLRN	.21	.56	.68 (.014)	-.29	-

(No speech condition top right hand corner, counting condition lower left hand corner)

Table 141 Intercorrelation among DRLB measures (Single utterance and multiple utterance conditions) (two-tailed)

VARIABLES	1	2	3	4	5
1. DRLBBA	-	.08	.06	-.03	.10
2. DBIRT	.20	-	.84 (.002)	.75 (.002)	.94 (.002)
3. DBEF1	.22	.90 (.002)	-	.92 (.002)	.80 (.002)
4. DBEF2	.06	.25	.43 (.01)	-	.70 (.002)
5. DRLBLRN	.06	.89 (.002)	.86 (.002)	.96 (.002)	-

(Single utterance in top right hand corner,multiple utterance in lower left hand corner.)

Table 142 Means and standard deviations of variables for Intercorrelation tables 140 and 141

Condition 1 (no speech)	N	$\overline{X}$	S.D.
Variables			
DRLBBA	12	1.05	0.40
DBIRT	12	1.00	0.74
DBEF1	12	0.14	0.06
DBEF2	12	0.15	0.08
DRLBLRN	12	0.64	0.57
Condition 2 (counting)			
Variables			
DRLBBA	12	1.00	0.48
DBIRT	12	14.00	2.41
DBEF1	12	0.84	0.11
DBEF2	12	0.29	0.08
DRLBLRN	12	13.73	4.83
Condition 3, 5 and 7 (single utterance)			
Variables			
DRLBBA	36	1.17	0.48
DBIRT	36	2.69	1.82
DBEF1	36	0.30	0.15
DBEF2	36	0.27	0.11
DRLBLRN	36	1.93	2.22
Condition 4, 6 and 8 (multiple utterance)			
Variables			
DRLBBA	36	1.02	0.50
DBIRT	36	8.97	3.94
DBEF1	36	0.68	0.17
DBEF2	36	0.43	0.10
DRLBLRN	36	7.83	5.02

Discussion

Baseline IRT was not significantly correlated with any other variable in any of the conditions. This may be due to the graded nature of the task. In the previous DRL experiment (Chapter Nine), it was found that initial IRT usually predicted the performance of the first DRL task, but that once the subject has grasped the nature of the task, initial baseline IRT did not predict performance at a higher level. Since the IRT level reached and the efficiency scores of the present experiment are the amalgamated score of twenty minutes' performance, the influence of the baseline IRT would probably have been masked.

The different measures interrelated with one another positively and significantly in both the no speech and in the single utterance conditions. Particularly high correlations were obtained between the two efficiency indices, which suggests that children who obtained a high rate of reinforcement are responding in accordance with the IRT schedule and so can maximize their reinforcements. This was not the case in the multiple utterance conditions, in which EF2 and DBIRT did not correlate significantly, despite the fact that other measures did so. A different pattern of correlation between DBEF2 and other variables can be observed in the counting condition. Subjects in the counting conditions produced responses with such long IRTs that DBIRT and DBEF1 became inversely related with DBEF2.

C. <u>Correlation of DRL measures with personality and developmental variables</u>

The results in Section A provided by analysis of variance suggested that neither sex nor conceptual tempo showed any difference in DRL performance. The present section will investigate the relationship between DRL performance and conceptual tempo variables and personality measures by means of correlation studies.

As in the previous experiment, the expectation is that impulsiveness as measured by the MFFT and by personality questionnaires (high N and high E) will be related to poor performance on the DRL. The baseline IRT will be related to the personality measures in that the longer the baseline IRT, the more it is related to stability and introversion, or reflectivity.

The correlation tables of the various DRL conditions are shown in Tables 143 to 147. The means and standard deviations of the variables are in Appendices 29 to 32.

The correlations between baseline IRT (DRLBBA) and the personality measures (Table 143) are positive for CPQ Factor B, a measure of intelligence (r=.21, p=.023), Factor D (Placidity of temperament vs Excitability) (r=-.22, p=.017) and the neuroticism measure of the EPQ (EPQ-N) (r=-.29, p=.003). The negative correlation with the neuroticism measures confirmed the hypothesis that stability is related to long baseline IRT. A low score on Factor D also indicated a placid and phlegmatic disposition.

As for the DRL no speech condition (Table 144), most of the behavioural measures of DRL performance correlated significantly

Table 143 Correlation between DRL(B) Baseline Rate and MFFT, Personality and Developmental Variables

VARIABLES	MFFT		CPQ													
	ERRORS	TIME	A	B	C	D	E	F	G	H	I	J	N	O	Q3	Q4
DRLBBA	.14	-.04	-.005	.21 (.023)	.16	-.22 (.017)	-.09	-.12	-.11	.12	-.11	-.15	.02	-.05	.03	-.12

VARIABLES	CPQ		NEW TRS				EPQ				JEPI			AGE	RQ
	EXT	ANX	G	E	N	P	P	E	N	L	E	N	L		
DRLBBA	-.002	-.17	-.16	.01	-.02	-.18	-.05	-.10	-.29 (.003)	.04	.006	-.19	-.004	-.07	.06

Table 144 Correlation of DRL (control condition) measures and MFFT, Personality and Developmental Variables

VARIABLES	MFFT		CPQ											
	ERROR	LATENCY	A	B	C	D	E	F	G	H	I	J	N	O
DRLBLRN	-.52 (.041)	.53 (.038)	.14	.18	-.19	.17	-.31	-.12	-.49	-.31	.08	.22	.18	.03
DBIRT	-.48	.35	.02	.20	-.29	-.04	-.29	-.26	-.26	-.41	.06	.43	.12	.32
DBEF1	-.67 (.008)	.61 (.018)	.48	.36	-.11	-.10	-.50	-.28	.05	-.07	.17	.26	-.40	.13
DBEF2 *	-.60 (.040)	.51	.46	.20	-.16	-.07	-.47	-.28	-.01	-.11	.07	.22	-.36	.18

*(two-tailed test)

The number of subjects in the correlation between DRLB measures and other variables were:
MFFT (N=12), CPQ (N=12), New TRS (N=7), EPQ (N=12), JEPI (N=8), AGE (N=12), RQ (N=12)

Table 144 (con't)

VARIABLES	CPQ Q3	Q4	ANX	EXT	NEW TRS G	E	N	P	EPQ P	E	N	L	JEPI E	N	L	AGE	RQ
DRLBLRN	-.11	.28	.28	-.12	.18	-.54	-.60	-.50	-.38	-.13	.26	-.37	-.06	.07	-.18	.37	.40
DBIRT	-.33	.34	.44	-.26	.89 (.003)	-.84 (.009)	-.82 (.01)	-.85 (.008)	-.48	-.27	.46	-.12	-.60	.44	-.40	.29	.43
DBEF1	-.18	.25	.17	.04	.23	-.12	-.54	-.31	-.27	-.19	.07	-.07	.60	-.01	-.12	.34	.21
DBEF2*	-.17	.27	.22	.02	.08	-.06	-.43	-.29	-.29	-.09	-.02	-.05	.29	-.20	.00	.26	.20

*(two-tailed test)

only with the MFFT. DBIRT was significantly related to all four subscales of the New TRS and in the expected direction. It was positively correlated with NTRS-G (r=.89, p=.003) and negatively correlated with NTRS-E (r=-.84, p=.009), NTRS-N (r=-.82, p=.01) and NTRS-P (r=-.85, p=.008). The results suggested that stability and introversion and low psychoticism were conducive to behavioural self-restraint on a graded DRL task, and that teacher-rated "goodness" or reflectivity predicted DRL performance. DRLBLRN and DBEF1 correlated with both the errors and latency measures of the MFFT, and in the expected direction. DBEF2 significantly correlated with MFFT errors (r=-.60, p=.040, two-tailed) and approached statistical significance (two-tailed) in its correlation with MFFT response time (r=.51). DBIRT also correlated with the MFFT measures in the predicted direction, with the coefficients approaching statistical significance. It seems that the correlations in this study provide stronger evidence than the previous study (Chapter Nine) that reflection-impulsivity measured by the MFFT is related to behavioural self-restraint as recorded in DRL training. The reflective child tends to reach better DRL results than the impulsive ones.

When the conditions involving verbal self-regulation are examined, the results are consistent with those of the previous DRL experiment: when counting is used, behavioural measures of DRL performance are virtually unrelated to personality variables. It can be noted in Table 145 that the only significant correlation was between DBEF2 and age (r=-.56, p=.030, two-tailed). DBEF2 is a measure which reflects how efficient the subject is in

Table 145 Correlation between DRL (counting condition) measures and MFFT, Personality and Developmental variables

VARIABLES	MFFT		CPQ											
	ERROR	LATENCY	A	B	C	D	E	F	G	H	I	J	N	O
DRLBLRN	-.33	.21	.17	.25	.08	.11	.06	.06	-.47	.02	-.06	.01	.21	-.13
DBIRT	0	.02	.05	-.03	.12	-.13	.03	-.07	-.17	.08	-.07	0	.20	.22
DBEF1	-.28	.18	.04	.06	.07	-.01	.06	-.05	-.32	-.10	.03	.19	.26	.36
DBEF2	.18	-.29	.17	.25	-.06	.19	.01	-.15	-.23	.01	.26	-.17	-.14	-.36

The number of subjects in the correlation between DRLB measures and other variables are:
MFFT, CPQ, EPQ, AGE and RQ (N=12), JEPI (N=5) and NTRS (N=5)

Table 145 (con't)

VARIABLES	CPQ Q3	CPQ Q4	CPQ ANX	CPQ EXT	NEW TRS G	NEW TRS E	NEW TRS N	NEW TRS P	EPQ P	EPQ E	EPQ N	EPQ L	JEPI E	JEPI N	JEPI L	AGE	RQ
DRLBLRN	-.38	.36	.17	.09	-.64	.77	.37	.42	.15	.15	.09	-.10	-.75	.82	.61	-.31	.13
DBIRT	0	0	.01	.02	-.44	-.16	-.01	-.47	.34	.05	-.08	-.15	.07	.35	-.04	.32	-.36
DBEF1	-.18	.18	.22	-.05	-.37	.04	-.09	-.37	.34	-.09	.13	-.10	-.27	.69	.12	.16	-.27
DBEF2	-.02	.26	.02	-.01	-.25	.58	.65	.88	-.47	.37	.01	.25	-.47	-.07	.66	-.56* (.030)	.42

(*two-tailed test)

maximizing reinforcement, that is, the proportion of reinforcement obtained and the total reinforcement available. It could be due to the fact that older children tended to be more cautious, and when they were asked to count and perform on the DRL tasks, they tended to count larger numbers. Although they were reinforced each time they pressed, the sparce responding led to a low efficiency index (EF2). It was noted that there was a strong positive correlation between DRLBLRN and JEPI-N (r=.82), which was contrary to prediction. The correlation, however, is not significant on a two-tailed test.

There were few significant correlations in the single-utterance conditions (Table 146). DBEF1 correlated with CPQ ANX (r=-.29, p=.041). This suggested that stability was related to being efficient in obtaining a high rate of reinforcement, in accordance with prediction. There was a positive correlation between DBEF1 and the EPQ-Lie scale (r=.31, p=.031). If we accept Eysenck's (Eysenck & Eysenck, 1975) claim that neuroticism and lie scale are negatively correlated, this relation between DRL efficiency and lying makes sense in that DBEF1 correlated negatively with the Neuroticism measures on the EPQ. Indirectly this might imply that efficiency was related to low neuroticism. However, there may be many reasons for lying and this makes further interpretation difficult. The correlation with CPQ Factor H (Threctia vs Parmia) was a positive one which meant that efficiency was related to venturesomeness. Similar findings were reported in the last DRL experiment, where the explanation proposed was that children who could adapt better to change and were fairly active could perform

Table 146 *Correlation between DRL (Single utterance conditions) measures and MFFT, Personality and Developmental Variables*

VARIABLES	MFFT		CPQ											
	ERROR	LATENCY	A	B	C	D	E	F	G	H	I	J	N	O
DRLBLRN	.03	.05	.004	.14	.01	.05	.13	-.01	-.04	.09	-.04	-.004	.18	-.03
DBIRT	.12	-.04	.10	.12	.06	-.09	.04	-.09	.05	.14	-.01	.01	.13	-.14
DBEF1	.11	-.04	.10	.25	.23	-.21	.06	-.03	.10	.29 (.045)	-.13	-.09	.11	-.21
DBEF2*	.04	.03	.08	.23	.17	-.20	.03	-.04	.18	.25	-.09	.01	.06	-.20

*(two-tailed test)

The number of subjects in the correlation of DRL measures and other variables were:
MFFT, CPQ, EPQ, AGE & RQ (N=36), JEPI and NEW TRS (N=18)

Table 146 (con't)

VARIABLES	CPQ				NEW TRS				EPQ				JEPI			AGE	RQ
	Q3	Q4	ANX	EXT	G	E	N	P	P	E	N	L	E	N	L		
DRLBLRN	-.02	-.14	-.04	.04	.08	-.17	.24	-.09	.07	-.11	-.04	.16	-.26	.25	.09	-.09	.21
DBIRT	-.004	-.19	-.15	.06	.12	-.20	-.22	-.13	.01	-.14	-.10	.20	-.25	.28	.16	-.13	.19
DBEF1	-.08	-.22	-.29 (.041)	.16	.39	-.16	.31	-.06	-.06	-.19	-.27	.32 (.031)	-.16	-.01	.17	-.11	.19
DBEF2*	-.23	-.30	-.36	.13	.27	-.10	.33	-.03	-.04	-.25	-.16	.31	-.09	.08	-.03	-.03	.14

Table 147 Correlation between DRL (multiple utterance condition) measures and MFFT, Personality and Developmental measures

VARIABLES	MFFT		CPQ											
	ERROR	TIME	A*	B	C	D	E	F*	G	H*	I	J	N	O
DRLBLRN	-.16	.11	.29	-.21	.26	-.03	.11	.38 (.002)	-.28	.29	-.27	-.18	.08	-.36 (.015)
DBIRT	-.20	.23	.30	-.11	.27	-.17	.09	.35 (.038)	-.22	.29	-.22	-.24	.03	-.48 (.002)
DBEF1	-.13	.17	.31	-.05	.27	-.07	.24	.49 (.002)	-.37 (.013)	.45 (.006)	-.32 (.029)	-.17	.15	-.45 (.003)
DBEF2	.17	-.16	.28	.05	.19	.14	.04	.34 (.042)	-.27	.35 (.036)	-.16	-.01	.25	-.004

*(two-tailed)

The number of subjects in the correlation of DRL measures with other variables was N=6 except for JEPI (N=11) and NEW TRS (N=10)

Table 147 (con't)

VARIABLES	CPQ				NEW TRS				EPQ				JEPI			AGE	RQ
	Q3	Q4	ANX	EXT	G	E	N	P	P	E	N	L	E	N	L		
DRLBLRN	-.26	-.34 (.020)	-.25	.40 (.007)	-.06	-.20	-.30	-.16	.16	.16	-.23	-.28 (.049)	.31	-.40	-.58 (.030)	.05	.09
DBIRT	-.27	-.28	-.32 (.028)	.39 (.009)	-.21	.03	-.20	.05	.06	.18	-.32 (.029)	-.23	.07	-.43	-.64 (.017)	.10	.03
DBEF1	-.20	-.23	-.32 (.028)	.53 (.001)	.13	.05	-.20	-.14	.25	.30 (.037)	-.37 (.012)	-.43 (.005)	.23	-.55 (.040)	-.54 (.042)	-.005	-.005
DBEF2*	.31	-.02	-.15	.41 (.012)	-.21	-.50	-.34	-.30	.35 (.036)	.27	-.12	-.33	.25	-.22	-.43	-.14	-.23

*(two-tailed test)

well. This would be in accordance with the present procedure with which the DRL training was conducted, because the subjects were likely to experience several changes of the DRL schedules if they did meet the criteria.

It was interesting that the correlational analysis involving the multiple utterance conditions yielded several significant findings. But since some of the correlations were in the opposite direction to that originally predicted, it was necessary to re-examine them by two-tailed tests of significance.

Dealing first with the results that confirmed the hypotheses, it can be seen that measures of neuroticism and anxiety correlated with DRL performance in the negative direction. This implies that when children use multiple utterance of self-instruction, stability favour successful performance. CPQ ANX correlated significantly with DBIRT ($r=-.32$, $p=.028$) and DBEF1 ($r=-.32$, $p=.028$). The same DRL measures also correlated significantly with EPQ-N, and the correlation between DBEF1 and JEPI-N was also significant ($r=-.55$, $p=.040$). DRLBLRN, DBIRT and DBEF1 correlated negatively with Factor O (Unperturbed adequacy vs guilt proneness) and reached a high level of statistical significance. This suggests that a self-confident and expedient attitude is associated with good performance when DRL performance is accompanied by repeated self-instructions. The negative correlation between DRLBLRN and Q4 (Low ergic tension vs high ergic tension) is also in line with prediction.

In contrast to the single utterance condition, the significant correlations involving the lie-scale in the multiple utterance conditions were all in the negative direction, despite the fact that the behavioural measures were all negatively correlated with neuroticism. The correlations reached a significant level on two-tailed tests, and they were not easy to interpret, especially in view of the uncertainty which surrounds the relationship between the lie scale and neuroticism.

The positive correlation between the behavioural measures and CPQ EXT and the factors loaded on extraversion of the CPQ, such as Factors A, F and H was in the opposite direction to that predicted. Although the correlation with Factor A did not reach statistical significance on a two-tailed test, those involving the other factors did. It would seem that if the subjects were asked to repeat self-instructions to themselves on this graded DRL task, the predictions that were applied to a no speech DRL task could not be applied here. High scores of Factors A, H and F suggested an outgoing, adventureous and cheerful character. The significant correlation with all the measures of DRL implied that these personality traits not only enabled the child to exercise behavioural self-restraint to reach schedules with long IRTs, but also to achieve a high rate of reinforcement and efficiency in maximizing reinforcement. Apparently the child must be able to adjust to the changes of schedule frequently and be flexible with the self-instruction that mediated their DRL responses. Also important to their performance on EF2 was that they must not extend the repetition for too long. What seems to be lack of persistence in the performance can be advantageous as far as Efficiency Index 2 is concerned.

Apart from one significant correlation between DBEF2 and age in the counting condition, there was no indication that either age or reading ability played any part in predicting DRL performance with or without verbal self-instruction.

Discussion

The pattern of significant correlations in the DRL no speech condition provided evidence that a graded DRL task was also a measure of behavioural self-restraint. Attaining long IRTs in the schedule seemed to be associated with such personality characteristics as low extraversion, low neuroticism and low psychoticism. Teacher-rated reflectivity was also related to reaching a long IRT level. There was evidence that performance on the graded DRL tasks without speech correlated with MFFT measures of errors and response time, which suggests that behavioural restraint and cognitive restraint may after all be correlated. The present experiment provided more convincing evidence for this suggestion than did its predecessor, in which only MFFT error correlated with the time measures of two of the DRL tasks.

While performance in the counting condition and the single utterance conditions did not yield any consistent correlation with personality measures, the results in the multiple utterance conditions cannot be ignored. According to the correlations, good performance on DRL with repetition of self-instruction is related to low measures of anxiety and high measures of extraversion. There was no connection at all between the performance and measures of reflection-impulsivity measured by the MFFT. It has been suggested earlier in this chapter that the meaning of the self-instruction had little effect on DRL performance. It was however important how the instructions were verbalized. Multiple utterance differed from counting in the sense that the repetition of simple phrases did not provide a means of timing in the way of aiming at a fixed number in a sequence as did counting. It seemed that some subjects were less inclined to go on repeating the instructions than those subjects using counting who carried on with counting large numbers. Consequently, it is reasonable to expect children who were rated as being venturesome and bold to benefit in this respect. They tended to be expedient and could work out when to stop repeating the instruction, at a time interval that was long enough to enable them to be reinforced, but not too long to reduce their efficiency at maximizing reinforcement. Although the multiple utterance conditions did not produce IRT levels as high as those in the counting condition, the multiple utterance method of self-instruction seems suitable for subjects who score high on stability and extraversion.

Summary and Conclusions

A series of graded DRL tasks were used in the present investigation to measure behavioural restraint. As a technique, this has the advantage that subjects are not discarded as the task becomes more difficult, and this avoids the problem of having unequal number of subjects in the cells in the experimental design.

The role of verbal self-instruction in behavioural self-restraint was made somewhat clearer. In the present task, although verbal self-instruction seemed to facilitate performance, it did not seem to be the case that subjects used it as a means to devise an appropriate or efficient behavioural strategy. The results supported those of the last experiment in suggesting that verbal self-instruction acts as mediating behaviour, useful in filling up the time interval between responses, or as a means of estimating the time interval. The content of the self-instruction seems to be less important than whether or not it is repeated.

The correlations between the behavioural measures and personality variables supported the prediction that successful performance on DRL tasks is related to stability and introversion in a no speech DRL condition. However, the results of the counting and single utterance conditions did not support this link. There was an unexpected finding in that in the multiple utterance condition, it appeared that stability and extraversion were related to successful performance. These results were interpreted in terms of the strategy subjects might adopt in coping with the requirement of repeating instructions. It seems that repeating a self-instruction a series of times cannot provide as exact an estimate of the time interval between two responses as counting a series of fixed numbers. Some subjects were therefore less inclined to continue repeating the instructions for very long. The correlations between extraversion and DRL performance in the multiple utterance condition suggests that children who are less persistent are likely to stop repeating the self-instructions. This was a useful strategy, because they tended to repeat the words "just enough" to obtain reinforcement. By so doing, they were also efficient at maximizing reinforcement, more so than children using counting.

Neither age nor reading ability appeared to be related to DRL performance.

CHAPTER ELEVEN

THE PREDICTABILITY OF IMPULSIVENESS

The previous chapters attempted to investigate the relationship between impulsiveness and the performance of motor tasks involving behavioural restraint. Measures of impulsiveness were obtained from the MFFT, which provides an indication of cognitive reflection-impulsivity, and self-rated and teacher-rated measures of personality.

The results of the three experiments reported in Part I suggested that errors of commission in motor responses tended to be correlated with measures of extraversion. The experiments in Part III used two games -- "Simon Says" and "Do and Don't" -- and the performance of DRL training as measures of behavioural restraint. These experiments provided some indication that the tasks reflected individual differences in performance that were correlated with individual differences in some personality variables. Children who were rated as impulsive tended to perform less well on DRL in Experiment 5 (see Chapter Nine). Children who were rated as impulsive on the MFFT did not perform as well as the reflectives in the two games "Simon Says" and "Do and Don't". Measures of neuroticism or anxiety seemed to be related to DRL performance in Experiment 5 and Experiment 6. Experiment 6 also provided some evidence that MFFT variables are related to graded DRL performance in the no speech condition.

Given that different measures of impulsiveness have correlated with one another, the aim of the present chapter is to report on the results of an analysis in which the findings were integrated in an attempt to redefine impulsiveness and to predict impulsive behaviour. The role of verbal self-instruction will not be discussed here because the present investigation has shown that verbal self-instruction tend to override any influence due to individual difference in personality in performance.

Of all the measures used in the investigation, the MFFT has been one of the most controversial (see Chapter Seven). The debate has been whether MFFT response time and MFFT errors provide a valid measure of impulsivity. The MFFT variables were nevertheless used in an attempt to explore the generality of impulsiveness, and to investigate the link between other measures of impulsiveness scores and the MFFT variables.

First of all, the correlations between the MFFT variables and other personality and developmental variables were examined. There were two groups of subjects who formed the original sample from which reflective and impulsive children were selected to participate in the two DRL tasks. The first sample consisted of 256 children (134 boys and 122 girls) (see Chapter Eight) and the second sample consisted of 164 children (77 boys and 87 girls) (see Chapter Ten), all of whom were tested on the MFFT. Not all of these children completed the personality measures, due to reasons such as illness or changing schools. The number of subjects will be specified when the results are presented.

Table 148 shows the correlation of all the variables for the entire first sample. Table 149 presents the inter-correlations for the first sample separated by sex. The means and standard deviations of the variables are shown in Appendices 34 and 35.

As can be seen from Table 148, MFFT errors correlated significantly with time (r=-.25, p=.001). This was lower than the correlation of -.57 obtained by Salkind (1978) from over 500 children aged nine in his standardization sample.

Assuming that impulsiveness measured by the MFFT is related to impulsiveness in personality measures, it is predicted that high MFFT errors will be related to factors loading high on extraversion on the CPQ and the Exvia measure of the CPQ, and also with factors loading high on the anxiety measure of the CPQ and ANX. It should be related negatively to the "good pupil" measure of the New TRS and positively with the extraversion and neuroticism measures. It is also likely to be related positively to the New TRS psychoticism measure. The correlation of the MFFT latency with the personality variables should be in the opposite direction to that of the MFFT errors.

In fact, MFFT errors significantly correlated with CPQ Factors A (r=-.18, p=.004, two-tailed), N (Naieté vs Shewdness) (r=.12, p=.04, two-tailed) and Q3 (Weak self-sentiment vs Strong self-sentiment) (r=-.12, p=.02). Whereas the correlation with Q3 supported the prediction that a child who is careless and lacking in self-control would make a lot of errors, the correlation with Factors A and N did not agree with the prediction, because a low score on Factor A signifies being detached and cool and a high score on Factor N means that the child is shrewd and calculating. MFFT errors also correlated significantly with NTRS-G (r=-.31, p=.001), which confirmed the hypothesis. NTRS-G contains items that describe a good pupil as well as items describing reflectivity, such as "reflective", "thoughtful", "systematic", etc. and this is in accordance with what is required to produce few errors on the MFFT. The relation with age was also a significant one (r=-.33, p=.002), indicating that errors decreased with increasing age.

By contrast, MFFT latency correlated significantly with only two variables, namely Factor B (r= .11, p=.04) and Factor O (r=-.10, p=.05) (Unperturbed adequacy vs guilt proneness). This implies that intelligence is linked with a slower response latency, but it must be noted that intelligence is related to errors to a greater extent (r=-.35, p=.001) than to response time. This agrees with previous findings (see Messer, 1976) that errors tend to be related better with measures of IQ than to response time. Factor O, loaded on Anxiety, suggests a serene and self-assured disposition and it would seem reasonable that a child with these qualities is unlikely to make hasty responses.

When the subjects were separated by sex, the MFFT latency and error correlations were similar to that of the entire sample. For males, the correlation was r=-.26 (p=.001) and for females, the correlation was r=-.25 (p=.003). These coefficients were both smaller than those reported by Salkind (1978), who reported a correlation of r=-.62 for boys and r=-.57 for girls. For both sexes, MFFT errors correlated significantly with CPQ Factor B, NTRS-G and age in the expected direction, but the correlation with

Factor A was in the opposite direction. The correlations between MFFT latency and the personality variables for the girls were similar to those for the entire sample in that there were relatively few significant correlations. The only significant correlation was with NTRS-E ($r=-.20$, $p=.02$) which was in accordance with the prediction that a low score on extraversion will be related to a long response time. As for the males, the significant correlations with response time included Factor J (Zeppia vs Coasthenia) ($r=-.20$, $p=.02$, two-tailed), N ($r=-.19$, $p=.04$, two-tailed), O ($r=-.19$, $p=.02$) and Q3 ($r=.19$, $p=.02$). While the first two correlations suggest that a boy who rates himself as zestful and forthright will produce long response times, the latter two correlation confirmed the hypothesis that a child who presented himself as self-assured and calm and controlled had longer latency. The results appear to be mixed. Whereas correlations involving variables loaded on anxiety seem to be in accordance with prediction, those involving variables loaded on activity or extraversion did not support the predictions. It implies that the performance on MFFT errors and response time may not be explained in the same manner as the personality theorists would explain impulsiveness because the latter see impulsiveness as being related to high extraversion.

The intercorrelations amongst the CPQ factors indicate that most of them tended to correlate significantly with one another. First of all, considering the entire sample, CPQ ANX correlated significantly with Factors D (Placidity of temperament vs Excitability), E (Submissiveness vs Dominance), F (Desurgency vs

Surgency), J (Zeppia vs Coasthenia), N (Naiveté vs Shrewdness), O (Unperturbed adequacy vs Guilt proneness) and Q4 (Low ergic tension vs High ergic tension) positively. It correlated negatively and significantly with Factor A (Schizothymia vs Cyclothymia), B, C (Ego weakness vs Ego strength), G (Super ego weakness vs Super ego Strength), H (Threctia vs Parmia), I (Harria vs Premsia) and Q3 (Weak self-sentiment vs Strong self-sentiment). ANX also correlated with EXT in the negative direction (r=-.20, p=.001). The correlations involving factors which loaded on ANX in the formula provided by Cattell were all in the expected direction. CPQ EXT also correlated significantly with all variables except Factors B and Q4.

CPQ ANX and EXT were correlated significantly among the girls (r=-.45, p=.001) and among the boys (r=-.23, p=.005). It must be remembered here that the CPQ Sten score derived for the boys and girls for this part of the correlation were obtained from the norms appropriate to each sex. There were significant correlations between ANX and all variables on the CPQ except Factors B, F and I among the girls. EXT among the girls failed to correlate with Factors G, N, Q3 and Q4, but these were not involved in the calculation of EXT in Cattell's formula. Among the boys, ANX correlated with all factors except Factor B, while EXT produced significant correlations with Factors A, C, E, F, and H in the positive direction and with Factors I, J and O in the negative direction. The interpretation of these correlations must be constrained by the fact that there are no British standardization norms for the Cattell factors. While working with the HSPQ, Butcher, Ainsworth & Nesbitt (1963) suggested that certain Factors, namely A, E and N yielded discrepant results from the American norms. It may be significant that the two factors which produced discrepant results with MFFT errors from those predicted were Factor A and Factor N, two of the factors about which doubts have been raised. It seems possible that the unexpected results were due to the different ways British children rate themselves on these factors as compared with the American children.

The intercorrelations amongst the NTRS subscales will not be elaborated here, as details of the new TRS have been discussed in Chapter Six.

As for the Age variable, it correlated only with the error score of the MFFT. The correlation was r=-.33 for the entire sample, -.35 for the boys and -.32 for the girls. It did not correlate with MFFT latency. Age correlated positively with Factors B, O and Q3 in the entire sample. For boys, an increase in age accompanied an increase in Factor B, the intelligence measure, and Factor O, self-rated apprehension or insecurity. For girls, Age correlated with Factors B and H, and the neuroticism and psychoticism measures of the New TRS. This is interesting, because it appears to imply that while the overall sample gained in self-control with advancing age, boys tended to become more anxious whereas girls became more venturesome as they grow older. The teacher's rating also suggested that girls scored more highly on Psychoticism as they grew older, and also became more emotional.

Table 148 Intercorrelation between MFFT, Personality and Age Variables (all subjects in First Sample (B))

	1	2	3	4*	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23*
1 MFFT ERRORS	–	-.25 (.001)	-.18* (.004)	-.35 (.001)	-.03	.01	-.002	.09	-.08	-.06	-.09	.10*	.12* (.04)	.04	-.12 (.02)	-.04	.05	-.06	-.31 (.001)	-.01	.08	.04	-.33 (.002)
2 MFFT TIME		–	.05	.11 (.04)	.02	-.03	-.001	.09	.02	-.02	-.07	-.07	-.03	-.10*	.05	.003	-.05	.08	.02	-.01	.04	-.01	.06
3 CPQ A			–	.21 (.002)	.43 (.001)	-.29 (.001)	-.06	-.18 (.003)	.15 (.009)	.33 (.001)	.04	-.34 (.001)	-.20 (.001)	-.37 (.001)	.28 (.001)	-.22 (.001)	-.46 (.001)	.50 (.001)	.17 (.01)	-.05	-.09	-.10	.06
4 B*				–	.02	-.02	-.04	-.21 (.002)	.10	.05	.15 (.018)	-.19 (.004)	-.29 (.002)	-.07	.30 (.002)	-.11	-.17 (.008)	-.02	.43 (.002)	-.05	-.08 (.008)	-.17	.47 (.002)
5 C					–	-.21 (.001)	.06	.04	.19 (.001)	.34 (.001)	-.06	-.33 (.001)	-.16 (.007)	-.50 (.001)	.25 (.001)	-.21 (.001)	-.54 (.001)	.39 (.001)	.04	.07	-.01	-.09	-.07
6 D						–	.51 (.001)	.42 (.001)	-.42 (.001)	-.27 (.001)	-.33 (.001)	.44 (.001)	.53 (.001)	.20 (.001)	-.42 (.001)	.26 (.001)	.70 (.001)	.04	-.28 (.001)	.28 (.001)	.17 (.006)	.23 (.001)	.12
7 E							–	.57 (.001)	-.44 (.001)	.08	-.55 (.001)	.08	.49 (.001)	-.05	-.38 (.001)	.34 (.001)	.34 (.001)	.41 (.001)	-.26 (.001)	.17 (.008)	.10	.09	.03
8 F								–	-.35 (.001)	.05	-.78 (.001)	.10	.61 (.001)	-.08	-.45 (.001)	.35 (.001)	.34 (.001)	.65 (.001)	-.35 (.001)	.14 (.02)	.12 (.02)	.26 (.001)	-.04
9 G									–	.14 (.01)	.33 (.001)	-.25 (.001)	-.49 (.001)	-.14 (.01)	.52 (.001)	-.44 (.001)	-.52 (.001)	-.11 (.04)	.14 (.03)	.02	-.01	.05	.07
10 H										–	-.06	-.33 (.001)	-.14 (.01)	-.29 (.001)	.17 (.004)	-.20 (.001)	-.48 (.001)	.65 (.001)	.14 (.04)	-.001	-.07	-.05	.11
11 I											–	-.05	-.56 (.001)	.08	.44 (.001)	-.29 (.001)	-.28 (.001)	-.56 (.001)	.40 (.001)	-.12 (.04)	-.12 (.03)	-.22 (.001)	.16
12 J												–	.30 (.001)	.26 (.001)	-.32 (.001)	.33 (.001)	.51 (.001)	-.25 (.001)	-.22 (.003)	.10	.09	.11	-.08
13 N													–	.11 (.03)	-.63 (.001)	.50 (.001)	.59 (.001)	.27 (.001)	-.38 (.001)	.06	.10	.21 (.002)	-.12
14 O														–	-.21 (.001)	.16 (.001)	.60 (.001)	-.37 (.001)	-.09	.001	.05	.03	.15 (.02)
15 Q3															–	-.57 (.001)	-.74 (.001)	-.11 (.05)	.33 (.001)	.01	-.09	-.11	.19 (.002)
16 Q4																–	.74 (.001)	.05	-.17 (.01)	-.01	.01	.02	.02
17 ANX																	–	-.20 (.001)	-.30 (.001)	.07	.11 (.05)	.14 (.03)	.02
18 EXT																		–	-.10	.08	.01	.11	.05
19 TRS G																			–	-.38 (.001)	-.37 (.001)	-.49 (.001)	.05
20 E																				–	.37 (.001)	.62 (.001)	.11
21 N																					–	.56 (.001)	.13
22 P																						–	.17 (.012)
23 AGE																							–

(* = two-tailed test; unmarked and underlined coefficients = one-tailed test)
(Number of subjects in accordance with the table of means and standard deviations. For each cell, between NEW TRS variables and CPQ variables, where TRSG = 156, TRSE = 198, TRS N = 226 and TRS P = 198).

Table 149 Intercorrelations among MFFT, Personality and Age Variables

	1	2	3	4*	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23*
1 MFFT ERRORS	–	-.25 (.003)	-.19* (.04)	-.35 (.001)	-.09	-.02	-.02	.18	-.12	-.09	-.04	-.02	.03	.09	-.11	-.08	.06	-.04	-.39 (.001)	-.01	.05	.04	-.32 (.002)
2 MFFT TIME	-.26 (.001)	–	-.02	.10	.01	.002	-.09	.07	.03	-.06	-.05	.06	.08	-.06	.08	.18	.08	-.003	.15	-.20 (.02)	-.01	-.11	.09
3 CPQ A	-.17 (.04)*	.11	–	.25 (.006)	.46 (.001)	.37 (.001)	.01	-.21 (.01)	.15 (.05)	.25 (.003)	.05	-.34 (.001)	-.18 (.03)	-.36 (.001)	.28 (.001)	-.19 (.02)	-.47 (.001)	.53 (.001)	.17	-.16	-.01	-.23 (.01)	.16
4 B*	-.15 (.05)	.11	-.03	–	.19 (.04)	.01	.16	-.001	.15	.18	-.07	-.22 (.018)	-.22 (.02)	-.12	.18 (.04)	.08	-.11	.23 (.014)	.44 (.002)	-.06	-.10	-.24 (.02)	.44 (.002)
5 C	-.001	.04	.36 (.001)	.11	–	-.31 (.001)	.11	.10	.19 (.02)	.33 (.001)	-.10	-.34 (.001)	-.10	-.58 (.001)	.27 (.002)	-.24 (.006)	-.61 (.001)	.48 (.001)	.11	-.01	-.14	-.12	.03
6 D	.001	-.05	-.16 (.04)	.17	-.14	–	.35 (.001)	.28 (.001)	-.29 (.001)	-.25 (.003)	-.08	.35 (.001)	.38 (.001)	.10	-.27 (.002)	.43 (.001)	.66 (.001)	-.18 (.03)	-.11	.28 (.003)	.14	.13	.06
7 E	-.06	.000	.003	.17	.08	.46 (.001)	–	.42 (.001)	-.34 (.001)	.11	-.35 (.001)	-.08	.37 (.001)	-.13	-.24 (.005)	.28 (.001)	.21 (.01)	.29 (.001)	-.13	.22 (.02)	-.05	-.04	.02
8 F	.06	.001	-.02	-.07	.08	.45 (.001)	.51 (.001)	–	-.17 (.04)	.15	-.49 (.001)	-.07	.35 (.001)	-.19 (.02)	-.20 (.02)	.15	.11	.52 (.001)	-.16	.01	-.02	.08	-.09
9 G	.000	.08	.06	.03	.11	.40 (.001)	-.44 (.001)	-.36 (.001)	–	.11	.09	-.24 (.004)	-.54 (.001)	.001	.52 (.001)	-.37 (.001)	-.42 (.001)	.05	-.01	-.01	-.07	.07	.17
10 H	-.04	.02	.36 (.001)	-.09	.34 (.001)	-.28 (.001)	.06	-.03	.14	–	-.15	-.39 (.001)	-.11	-.34 (.001)	.13	-.20 (.01)	-.49 (.001)	.78 (.001)	.23 (.03)	-.02	-.16	-.10	.18 (.04)
11 I	-.02	-.01	-.21 (.01)	-.04	-.14	-.29 (.001)	-.48 (.001)	-.58 (.001)	.35 (.001)	-.11	–	.02	-.22 (.008)	.17 (.04)	.16 (.04)	-.11	-.03	-.33 (.001)	.35 (.002)	-.21 (.02)	-.04	-.24 (.01)	.03
12 J	.16	-.20* (.02)	-.29 (.001)	-.11	-.27 (.001)	.44 (.001)	.12	.19 (.02)	-.25 (.002)	-.32 (.001)	-.03	–	.33 (.001)	.21 (.01)	-.39 (.001)	.29 (.001)	.50 (.001)	-.43 (.001)	-.19	.25 (.007)	.11	.13	-.13
13 N	.11	-.19* (.04)	-.08	-.13	-.19 (.02)	.52 (.001)	.32 (.001)	.46 (.001)	-.35 (.001)	-.17 (.03)	-.34 (.001)	.20 (.01)	–	-.02	-.51 (.001)	.40 (.001)	.44 (.001)	-.04	-.22 (.03)	.02	.08	.14	-.13
14 O	.04	-.19 (.02)	-.28 (.001)	.01	-.41 (.001)	.30 (.001)	-.07	-.13	-.20 (.01)	-.34 (.001)	.19 (.02)	.29 (.001)	.18 (.02)	–	-.17 (.04)	.16 (.04)	.56 (.001)	-.48 (.001)	-.15	-.04	.02	-.05	-.05
15 Q3	.01	.19 (.02)	.08	.19 (.02)	.16 (.03)	-.35 (.001)	-.33 (.001)	-.40 (.001)	.50 (.001)	.18 (.02)	.34 (.001)	-.27 (.001)	-.57 (.001)	-.17 (.03)	–	-.55 (.001)	-.68 (.001)	.11	.25	.14	-.15	-.12	.17
16 Q4	-.05	-.12	-.11	.02	-.16 (.04)	.34 (.001)	.20 (.001)	.37 (.001)	-.45 (.001)	-.26 (.002)	-.25 (.002)	.28 (.001)	.44 (.001)	.11	.49 (.001)	–	.76 (.001)	-.13	-.001	.05	.05	-.06	.06
17 ANX	.00	-.18 (.02)	-.31 (.001)	-.001	-.47 (.001)	.70 (.001)	.27 (.001)	.34 (.001)	-.53 (.001)	-.54 (.001)	-.18 (.02)	.49 (.001)	.60 (.001)	.61 (.001)	-.69 (.001)	.69 (.001)	–	-.45 (.001)	-.20	.14	.15	.07	-.06
18 EXT	-.08	.06	.69 (.001)	-.10	.40 (.001)	.04	.33 (.001)	.55 (.001)	-.11	.66 (.001)	-.50 (.001)	-.20 (.01)	.14	-.39 (.001)	-.10	.03	-.23 (.005)	–	.14	-.09	-.11	-.14	.14
19 NEW TRS G	-.24 (.01)	.04	.11	.35 (.002)	-.07	-.28 (.005)	-.12	-.14	.09	.08	.06	-.17	-.24 (.01)	-.07	.17	-.13	-.22 (.02)	.02	–	-.34 (.002)	-.38 (.001)	-.43 (.001)	.11
20 E	-.03	.09	.05	.11	.15	.21 (.01)	.06	-.03	.09	.03	.12	-.01	-.07	.02	.19 (.03)	-.21 (.02)	-.08	.02	-.34 (.001)	–	.28 (.002)	.55 (.001)	.12
21 N	.09	.07	-.12	.06	.10	.17 (.03)	.06	-.01	.07	-.01	-.07	.06	-.02	.08	.06	-.12	.01	-.07	-.32 (.001)	.40 (.001)	–	.47 (.001)	.24 (.010)
22 P	.02	.03	.04	-.06	-.05	.22 (.01)	-.03	.05	.10	.003	.01	.06	.04	.05	.01	-.04	.08	.05	-.48 (.001)	.63 (.001)	.60 (.001)	–	.21 (.04)
23 AGE*	-.33 (.002)	.03	-.01	.26 (.004)	-.15	.21 (.016)	.03	-.10	-.09	.02	.03	-.02	-.09	.27 (.002)	.15	-.01	.12	-.05	-.03	.13	.05	.17	–

(* = two-tailed test) (unmarked and underlined coefficients = one-tailed test)
Female subjects at upper right hand side and male subjects at lower left-hand side.
Number of subjects in each cell is the number of the variable with the smaller number of subjects except for the correlation cells between NEW TRS and CPQ variables. For male subjects, the number of subjects in cells with TRSG = 86, TRSE = 102, TRSN = 115, TRSP = 102.
For female subjects, TRSG = 70, TRSE = 96, TRSN = 111, TRSP = 96.

Next, we consider tables 150 and 151 which show the correlation results of the second sample, or sample C. There were 128 children in this sample who were tested on the MFFT. The number of subjects with scores on the different personality measures varied. The means and standard deviations of the variables are presented in Appendices 36 and 37.

The correlation between MFFT error and latency was r=-.50 (p=.001). This was higher than that obtained from the previous sample, and more similar to the correlation obtained by Salkind (1978) for children of the same age. The MFFT error-latency correlation was r=-.49 for the boys and r=-.52 for the girls.

In the entire sample, MFFT error correlated significantly with NTRS-G (r=-.25, p=.02), which confirmed the hypothesis and replicated the correlation obtained with the last sample. It correlated negatively with JEPI-E (r=-.25, p=.04, two-tailed). The negative correlations with Age and reading quotient (RQ) were in line with prediction. None of the CPQ variables correlated significantly with MFFT errors, and apart from Intelligence, no other variables were related to MFFT latency.

When sex is taken into account, it can be seen that MFFT errors for the girls correlated with CPQ Factors C (r=-.20, p=.05), a low score on which indicates emotional instability, E (r=-.22) which suggests submissiveness, and G (r=.22) which reflects a conscientious and persevering character. The last two correlations were in the opposite direction to that predicted, and they were not significant on a two-tailed test. The correlation with Factor F (r=-.32, p=.006) suggests that desurgency is negatively correlated with MFFT errors. Some mixed results were also obtained, as MFFT errors negatively correlated with two measures of extraversion, namely, teacher-rated extraversion on the NTRS-E, and self-rated EPQ-E. The former was not significant on a two tailed test, but the latter reached a .01 significance level. It is somewhat similar to the correlation between MFFT error and a low CPQ Factor A score in the DRL experiment in Chapter Nine (Experiment 5), which suggested that more errors were produced by those who were reserved and detached. The positive correlation with teacher-rated neuroticism (NTRS-N) (r=.43, p=.003) supports the prediction that high anxiety is related to high error scores. The negative correlation with self-rated neuroticism was not significant on a two-tailed test. Reading quotient was negatively correlated with errors among the girls. MFFT response time failed to correlate significantly with any variables on a one-tailed test of significance when the direction of the correlation was in the predicted direction, or on a two-tailed test of significance when the direction was opposite to that predicted.

Results among the boys showed that MFFT errors related with Factor O (r=.25, p=.03) indicating that children who are apprehensive and worrying are prone to make more errors. The correlation with NTRS-G (r=-.46, p=.009) was also in accord with prediction. EPQ-P was positively related with error (r=.20, p=.04), and the negative correlations with Age and RQ also reached significant levels. MFFT latency among the boys correlated more highly with personality variables than it did among the girls. Latency was related to Factor B, intelligence (r=.32, p=.007). In accordance with prediction, it also correlated with Factors D (r=-.22, p=.04), a low score on which suggests phlegmatic and inactive behaviour, E (r=-.22, p=.05) which reflects obedience and submissiveness in a low score, and G (r=-.25, p=.03) which indicates conscientiousness and perseverance. Other significant findings included a positive correlation with NTRS-G and RQ, and a negative correlation with EPQ-P.

Coming to the intercorrelations among the various personality measures, the interpretation of the CPQ factors presents problems, for reasons already mentioned. Notice, however, that the CPQ EXT and ANX correlated significantly for the entire sample (r=-.54, p=.001) as well as for the female subjects (r=-.69, p=.001) and the male subjects (r=-.51, p=.001).

Standardization data are available for comparison with the Eysenckian measures, which are presented in Appendix 19b. In general, the subjects in the present sample tended to have a slightly higher EPQ-P, a higher EPQ-E, a lower EPQ-N and a lower EPQ-lie socre than the nine-year old subjects in the standardization sample (Eysenck & Eysenck, 1975). On the JEPI, the present sample were higher than the standardization sample on JEPI-E, slightly higher on JEPI-N and very much lower than the norm on the lie scale.

As for the intercorrelations among the Eysenckian measures, the negative relationship between Extraversion and Neuroticism on the EPQ and JEPI found by Eysenck & Eysenck (1975) and Eysenck, S.B.G. (1965) is confirmed by the correlations in this sample . The negative correlation between Psychoticism and the lie-scale on the EPQ is also in accord with the standardization data. The relationship between neuroticism and the lie scale on both the EPQ and the JEPI was negative and reached statistical significance. This supported the findings of the standardization data.

Taking the subjects separately by sex, E and N on both the EQP and the JEPI are negatively related, (r=-.36, p=.001) and (r=-.32, p=.02) respectively among the girls. This is in agreement with the findings obtained in adult populations. As for the boys, although only the E and N correlation on the EPQ was significant (r=-.27, p=.009), the direction of the correlation between E and N on the JEPI was also a negative one. The lie scale and N scores were negatively correlated for both sexes. Looking at the P score, it is hardly related to E (r=-.001). However, it is positively related with N (r=.26, p=.007) and with the lie scale (r=0.30, p=.004) among the girls. Among the boys, it is negatively related with the lie scale (r=-.28) and positively related to E (r=.04) and N (r=.07). The direction of the correlation confirmed that of the standardization sample (Eysenck & Eysenck, 1975).

Measures of extraversion, neuroticism and the lie scale derived from the JEPI and the EPQ correlated significantly. The extraversion correlation was r=.51 (p=.001), while the Neuroticism correlation and the lie scale correlation were in the region of .70. The lower correlation between the extraversion scales could be due to the fact that there is a difference in the balance of items related to impulsivity and sociability. Eysenck & Eysenck (1969) suggested that there may be more items loaded on sociability on the JEPI.

Among all the subjects, EPQ-P did not correlate with any of the JEPI scales. Among the girls, EPQ-N correlated positively with JEPI-N and negatively with JEPI-L. EPQ-E correlated negatively with JEPI-N (r=-.41, p=.003) and JEPI-E and EPQ-N correlated in the same direction (r=-.37, p=.007). The negative correlation between JEPI-L and EPQ-N also reached a significant level. On the other hand, intercorrelation results among the male subjects indicated significant correlations between JEPI-E and EPQ-N, and the E, N and Lie measures between the two scales. On the whole, the correlations were consistent with those found in the standardization sample.

The next comparison is between the CPQ factors and the Eysenckian measures. It has been suggested that the CPQ second order factors Anxiety and Extraversion (Exvia) correspond to the dimensions of Neuroticism and Extraversion-introversion in Eysenck's paradigm. The correlation in the entire sample between CPQ ANX and JEPI-N and EPQ-N was significant, the correlation coefficients being r=.44 and r=.59 respectively. Exvia also correlated significantly with JEPI-E (r=.41, p=.001) and EPQ-E (r=.43, p=.001). There was in addition the negative relationship between Exvia and the EPQ neuroticism measures, and between Anxiety and the EPQ extraversion measure. The pattern of correlation among the female and male subjects appeared to conform to the pattern in the whole sample.

There were several significant correlation between Eysenck's scales and the primary factors on the CPQ. In the entire sample, EPQ-P is positively correlated with high scores of Factors D (r=.33, p=.001), E (r=.44, p=.001), F (r=.36, p=.001), H (r=.17, p=.03), J (r=.20, p=.01) and N (r=.36, p=.001). Significant negative correlations between EPQ-P and CPQ factors included those with G (r=-.25, p=.003) and Q3 (r=-.27, p=.001). Hence the child who scores high on Psychoticism can be described in terms of Cattellian factors as impatient and excitable, aggressive and impulsive, lacking in control, in addition to being unwilling to act with the group, relatively insensitive and shrewd.

The E scales on the EPQ and JEPI correlated with the Cattell factors that contributed to the calculation of the Exvia score, namely factors A, F and H. In addition, there was a positive correlation between Factor E and EPQ-E (r=.23, p=.005), which suggests that EPQ-E may have some items loading on dominance or assertiveness. EPQ-E was related negatively to Factors I, J and G, and a low score on these factors suggests that a child is expedient, vigorous and self-reliant. This conforms to the description of an extravert child. The pattern of correlations involving JEPI-E and Cattellian factors was also in accordance with prediction. In addition to correlating with those factors which also were correlated with EPQ-E (namely, Factors A, C, F, H, I, J and O) in the predicted direction, JEPI-E also correlated negatively with Q4, on which a low score reflected a relaxed disposition.

As for the neuroticism measure, EPQ-N correlated with most of the Cattellian factors related to Anxiety in the predicted direction, i.e., Factors C (r=-.51, p=.001), D (r=.40, p=.001), H (r=-.64, p=.001), O (r=.50, p=.001) and Q4 (r=.33, p=.001). It was negatively related to Factors J and I, a low score on which suggested tough-mindedness and a vigorous character. EPQ-N was also related in the negative direction to some of the factors which load on Exvia, such as Factor A and Factor F. JEPI-N is related to CPQ factors in a similar fashion, indicating that there is some agreement between these various measures of personality. Factor H is used in the formulae for the calculation of both Anxiety and Exvia. According to the correlation with the Eysenck's scales, Factor H appeared to be related more to Neuroticism than to Extraversion on the EPQ. In the entire sample, Factor H was correlated with EPQ-N (r=-.64, p=.001) and EPQ-E (r=.43, p=.001). With JEPI-N, the correlation of Factor H was r=-.44, (p=.001) and with JEPI-E, the correlation was similar to that with JEPI-N (r=.42, p=.001).

When it comes to the lie-scale, EPQ-L is negatively correlated with ANX (r=-.22, p=.014), but the correlation of JEPI-L and ANX did not reach significance although it was in the negative direction. Both lie scales correlated with ANX negatively and significantly for the girls, but only the EPQ-lie scale correlated significantly for the boys (r=-.25, p=.04). In the overall sample, EPQ-L was also further related to factors loaded on Anxiety, such as Factors D, Q3 and Q4. There were also correlations with Factor G (r=.36, p=.002) which suggests an awareness of the values of the adult world. On the other hand, there were significant correlations with Factor E (r=.35, p=.002) and F (r=-.31, p=.002).

According to the direction of these correlations, lying is thus related to aggressiveness and a self-deprecating attitude respectively. The negative correlations with Factors J and N in turn imply that the tendency to lie is associated with being zestful and naive. These apparently contradictory results may be due to the different reasons which may lead to a high lie score (see discussion in Chapter Ten). For example, the child may either deliberately or unconsciously be lying to present an inaccurate picture of himself, and this could by prompted by his awareness of adult value or by his self-deprecating attitude. Another possibility reflected by the results is that a bold and aggressive child would score highly on the lie scale. There were fewer CPQ factors that correlated with the JEPI-lie scale, but one factor which produced a significant correlation with both scales, and for both female and male subjects, was Factor G (Super ego weakness vs Super ego strength). This means that the tendency to lie is associated with being bound by rules, and the extent to which a child has incorporated the norms of the adult world. This apparent paradox perhaps means that one of the more consistent motives for lying is that the child is trying to present himself in a way he thinks would gain adult approval.

Finally, we come to the correlation between Age and Reading Quotient and the other variables. As with the previous sample, age is negatively and significantly correlated to MFFT errors. It is also correlated positively with Factors E and F and negatively with Factor G, NTRS-P, NTRS-N and the two lie scales of EPQ and JEPI. The correlations in the female and male subjects generally conforms to the pattern in the entire sample. In the girls, increasing age is linked with the tendency to bypass rules and greater expediency (Factor G, r=-.35, p=.002), becoming less neurotic (NTRS-N, r=-.44, p=.004), and lying less (JEPI-L, r=-.47, p=.002). With increasing age, the boys become more happy-go-lucky (Factor F, r=.33, p=.012), and more expedient (Factor G, r=-.33, p=.01). There was also an increase in EPQ-P (r=.25, p=.04) but a decrease in lying. It would seem that as children grow older, they become bolder about breaking rules. Perhaps Factor G reflects not so much the degree to which they adopt adult norms, as how concerned they are with them. As they grow older, they are more inclined to disregard rules, not even bother to lie and less inclined to think it necessary to deny doing so by lying.

From the positive correlation between age and self-rated anxiety it seems that children tend to rate themselves as more anxious as they grow older, but the correlation did not reach statistical significance. On the other hand, teacher-rated anxiety decreased with increasing age in the children. It is therefore difficult to propose any conclusive interpretation of the relationship between age and neuroticism, especially as there is also a finding in the present analysis that with increase in age, there is an increase in self-rated psychoticism scores and the tendency to break rules.

The reading quotient was originally intended to provide an alternative measure of the children's intellectual ability to complement Factor B of the CPQ. However, the two factors

Table 150 Intercorrelations between MFFT, Personality and Developmental Variables in Second Sample (C)

		1	2	3	4*	5	6	7	8	9	10	11	12	13	14	15	16
1	MFFT ERRORS	—	−.50 (.001)	−.14	−.12	−.11	−.04	−.07	−.10	.11	−.001	.04	−.13	−.13	.04	.09	−.06
2	MFFT TIME		—	.10	.16 (.03)	−.002	−.03	.01	.10	.08	.04	−.04	.03	.003	−.11	−.08	−.08
3	CPQ A			—	.25 (.004)	.49 (.001)	−.36 (.001)	.06	.13	.18 (.02)	.47 (.001)	.29 (.001)	−.41 (.001)	−.27 (.001)	−.56 (.001)	.19 (.01)	−.25 (.003)
4	B				—	.40 (.002)	−.32 (.002)	−.02	−.000	.022	.29 (.002)	−.003	−.26 (.004)	−.21 (.02)	−.31 (.002)	.15	−.21 (.02)
5	C					—	−.38 (.001)	.23 (.005)	.25 (.002)	.06	.62 (.001)	−.36 (.001)	−.45 (.001)	−.14	−.44 (.001)	.19 (.02)	−.40 (.001)
6	D						—	.29 (.001)	.23 (.004)	−.40 (.001)	−.26 (.001)	−.05	.39 (.001)	.49 (.001)	.44 (.001)	−.38 (.001)	.39 (.001)
7	E							—	.63 (.001)	−.42 (.001)	.37 (.001)	−.53 (.001)	−.10	.46 (.001)	−.04	−.40 (.001)	.11
8	F								—	−.35 (.001)	.49 (.001)	−.68 (.001)	−.10	.40 (.001)	−.17 (.03)	−.22 (.007)	−.02
9	G									—	−.02	.25 (.002)	−.18 (.02)	−.46 (.001)	−.17 (.03)	.40 (.001)	−.41 (.001)
10	H										—	−.49 (.001)	−.54 (.001)	−.05	−.61 (.001)	.03	−.40 (.001)
11	I											—	.22 (.006)	−.36 (.001)	.19 (.02)	.17 (.03)	.18 (.02)
12	J												—	.44 (.001)	.44 (.001)	−.18 (.02)	.50 (.001)
13	N													—	.29 (.001)	−.47 (.001)	.34 (.001)
14	O														—	−.11	.40 (.001)
15	Q3															—	−.37 (.001)
16	Q4																—

		17	18	19	20	21	22	23	24	25	26*	27	28	29*	30*	31*
1	MFFT ERRORS	−.02	−.10	−.25 (.02)	−.04	.17	.07	.14 (.04)	−.07	−.01	.15	−.25* (.04)	.01	.20	−.19 (.002)	−.14
2	MFFT TIME	.05	.10	·.15	.05	−.03	.07	−.10	−.05	−.01	−.06	.06	−.01	−.05	−.01	.004
3	CPQ A	−.56 (.001)	.66 (.001)	.16	.16	−.15	.11	−.14	.31 (.001)	−.46 (.001)	.08	.29 (.007)	−.38 (.001)	.04	−.01	.02
4	B	−.39 (.002)	.23 (.010)	.47 (.002)	.04	−.08	.10	−.21 (.02)	.16	−.22 (.016)	.13	.20	.01	−.03	.03	.11
5	C	.65 (.001)	.59 (.001)	.23 (.03)	.14	−.04	.05	−.13	.34 (.001)	−.51 (.001)	.12	.38 (.001)	−.27 (.01)	.11	.09	.16 (.040)
6	D	.74 (.001)	−.15 (.05)	−.47 (.001)	.27 (.02)	.34 (.003)	.22 (.04)	.33 (.001)	−.09	.40 (.001)	−.32 (.002)	−.19	.27 (.009)	−.17	.08	−.02
7	E	.11	.48 (.001)	−.01	.30 (.007)	−.05	.12	.44 (.001)	.23 (.005)	−.13	.35 (.002)	.15	−.21 (.04)	−.19	.18 (.04)	.01
8	F	−.05	.75 (.001)	−.18	.42 (.001)	−.03	.18	.36 (.001)	.25 (.003)	−.19 (.02)	−.31 (.002)	.22 (.04)	−.21 (.04)	−.21	.19 (.04)	−.05
9	G	−.39 (.001)	−.11	.11	−.09	.12	.22 (.04)	−.25 (.003)	−.20 (.01)	−.09	.36 (.002)	−.04	−.09	.38 (.002)	−.32 (.002)	−.06
10	H	−.65 (.001)	.86 (.001)	.21 (.05)	.28 (.03)	−.07	.11	.17 (.03)	.43 (.001)	−.64 (.001)	−.06	.42 (.001)	−.44 (.001)	.05	.09	.02
11	I	.18 (.02)	−.65 (.001)	.04	−.30 (.007)	.09	−.18	−.25 (.003)	−.16 (.04)	.31 (.001)	.10	−.32 (.003)	.29 (.007)	.06	−.09	.03
12	J	.60 (.001)	−.45 (.001)	−.31 (.006)	.02	.21 (.05)	−.02	.20 (.01)	−.36 (.001)	.46 (.001)	−.19 (.04)	−.48 (.001)	.30 (.006)	−.07	−.06	.08
13	N	48 (.001)	.06	−.14	.10	.02	−.08	.36 (.001)	.01	.10	−.30 (.002)	−.12	−.01	−.17	.13	−.02
14	O	.76 (.001)	−.58 (.001)	−.28 (.01)	.19	.08	−.20 (.05)	.08	−.27 (.001)	.50 (.001)	−.06	−.44 (.001)	.48 (.001)	−.10	.03	−.04
15	Q3	−.53 (.001)	−.02	.03	−.10	−.15	.001	−.27 (.001)	−.02	−.13	.17	.11	−.08	.09	−.09	.05
16	Q4	.72 (.001)	−.28 (.001)	−.15	−.16	.11	−.21 (.05)	.03	−.03	.33 (.001)	−.22 (.014)	−.23 (.02)	.26 (.01)	−.14	.09	.14
17	ANX	—	−.54 (.001)	−.35 (.002)	−.06	.21 (.05)	−.08	.19 (.02)	−.24 (.003)	.59 (.001)	−.22 (.014)	−.41 (.001)	.44 (.001)	−.16	.05	−.02
18	EXT		—	.07	.40	−.11 (.001)	.19	.19	.43 (.001)	−.56 (.001)	−.14 (.001)	.41 (.001)	−.45 (.001)	−.06 (.001)	.13	−.01
19	NEWTRS G			—	−.47 (.001)	−.47 (.001)	−.44 (.001)	−.23 (9.001)	.16	−.07	.04	.11	−.20	−.01	.07	.53 (.002)
20	E				—	.46 (.001)	.72 (.001)	.27 (.02)	.18	−.18	−.14	.32 (.004)	−.21 (.05)	−.002	.02	.002
21	N					—	.63 (.001)	.09	−.20	−.007	.13	−.05	.09	.24	−.39 (.002)	−.08
22	P						—	.21 (.05)	−.08	−.04	−.001	.11	−.08	.10	−.29 (.014)	−.08
23	EPQ P							—	.02	.05	−.34 (.002)	−.03	.001	−.15	.17	−.06
24	E								—	−.32 (.001)	−.01	.51 (.001)	−.34 (.002)	−.02	.07	.09
25	N									—	−.02	−.39 (.001)	.74 (.001)	−.24 (.04)	.08	−.10
26	L										—	−.02	−.12	.71 (.002)	−.37 (.002)	.08
27	JEPI E											—	−.30 (.005)	.01	.21	.12
28	N												—	−.26 (.04)	.22	.03
29	L													—	−.49 (.002)	.05
30	AGE														—	.02
31	RQ															—

(* = two-tailed test)(unmarked and underlined coefficients = one-tailed test.)

Number of subjects are as indicated in the tables of means and standard deviations except for correlations between:
CPQ variables and EPQ variables N = 126; EPQ & JEPI N = 70;
TRS variables and EPQ variables, CpQ variables and JEPI variables = 68;
For correlation, the smaller number of subjects applies.

Table 151 Intercorrelations between MFFT, Personality and Developmental Variables in Second Sample (C) - by Sex

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	MFFT	ERRORS	—	−.52 (.001)	−.17	−.10	−.20 (.05)	−.12	−.22*	−.32 (.006)	−.22*	−.08	.16	.11	−.17	−.11	.06	−.13
2	MFFT	TIME	−.49 (.001)	—	.10	.10	.11	.12	.19	.24*	−.04	.16	−.06	.13	.15	.02	−.12	.08
3	CPQ	A	−.12	.10	—	.24 (.02)	.45 (.001)	−.42 (.001)	.12	.21 (.04)	.22 (.03)	.54 (.001)	−.32 (.002)	−.48 (.001)	−.32 (.003)	−.65 (.001)	.28 (.01)	−.36 (.001)
4		B	* −.18	.32 (.007)	.24	—	.46 (.002)	−.24	.10	.26 (.04)	−.04	.35 (.004)	−.14	−.22	−.04	−.30 (.012)	.12	−.20
5		C	.06	−.20	.45 (.001)	.27 (.04)	—	−.44 (.001)	.18	.43 (.001)	.06	.74 (.001)	−.44 (.001)	−.46 (.001)	−.24 (.03)	−.50 (.001)	.29 (.008)	−.42 (.001)
6		D	.09	−.22 (.04)	−.37 (.002)	−.43 (.002)	−.41 (.001)	—	.16	.02	−.32 (.003)	−.34 (.002)	.17	.42 (.001)	.39 (.001)	.52 (.001)	−.54 (.001)	.48 (.001)
7		E	.05	−.22 (.05)	.06	.05	.44 (.001)	.19	—	.30 (.006)	−.44 (.001)	.20 (.05)	−.31 (.005)	−.18	.14	.08	−.34 (.002)	.23 (.03)
8		F	−.03	−.20	.19	.02	.38 (.002)	.21	.40 (.001)	—	−.11	.48 (.001)	−.45 (.001)	−.25 (.02)	.10	−.15	−.04	−.16
9		G	.11	.25 (.03)	.15	.10	.07	−.42 (.001)	−.09	−.34 (.004)	—	.20 (.05)	.13	−.19	−.48 (.001)	−.43 (.001)	.40 (.001)	−.47 (.001)
10		H	.04	−.18	.49 (.001)	.30 (.018)	.49 (.001)	−.33 (.005)	.24 (.04)	.33 (.005)	−.08	—	−.49 (.001)	−.68 (.001)	−.23 (.03)	−.67 (.001)	.08	−.56 (.001)
11		I	−.01	.14	−.52 (.001)	.03	−.44 (.001)	.13	−.28 (.02)	−.42 (.001)	−.03	−.43 (.001)	—	.42 (.001)	−.21 (.04)	.27 (.01)	−.03	.30 (.006)
12		J	−.14	−.03	−.41 (.001)	−.42 (.002)	−.63 (.001)	.54 (.001)	−.14	−.10	−.18	−.57 (.001)	.30 (.01)	—	.49 (.001)	.52 (.001)	−.13	.54 (.001)
13		N	−.01	−.20	−.17	−.31 (.018)	−.13	.54 (.001)	.36 (.003)	.33 (.005)	−.31 (.008)	−.12	−.31 (.009)	.43 (.001)	—	.34 (.002)	−.58 (.001)	.33 (.003)
14		O	.25 (.03)	−.23	−.53 (.001)	−.39 (.002)	−.33 (.006)	.52 (.001)	.05	−.003	.03	−.46 (.001)	−.01	.39 (.001)	.35 (.003)	—	−.32 (.004)	.54 (.001)
15		Q3	.21*	−.11	.06	.14	.09	−.18	−.18	.17	.07	.27 (.02)	−.04	−.27 (.02)	−.21 (.05)	.05	—	−.35 (.002)
16		Q4	−.03	−.08	−.04	−.23	−.40	.46 (.001)	.003	.29	−.40 (.001)	−.18	.04	.47 (.001)	.38 (.002)	.16	−.31 (.008)	—
17		ANX	.03	−.08	−.48 (.001)	−.47 (.002)	−.62 (.001)	.80 (.001)	.02	−.01	−.26	−.64 (.001)	.21	.71 (.001)	.50 (.001)	.67 (.001)	−.44 (.001)	.67 (.001)
18		EXT	−.04	−.13	.74 (.001)	.26	.59 (.001)	−.22 (.05)	.31 (.008)	.68 (.001)	−.12	.82 (.001)	−.61	−.48 (.001)	.02	−.44 (.001)	.23 (.04)	.03
19	NEWTRS	G	−.46 (.009)	.38 (.03)	−.01	.74 (.002)	.23	−.60 (.001)	.11	−.21	.09	.12	.15	−.43 (.02)	−.35 (.04)	−.48 (.008)	.15	−.27
20		E	−.05	−.13	.26	.19	.02	.22	.11	.07	−.19	.19	−.19	−.001	−.06	−.29	−.10	−.11
21		N	−.22	.06	.17	.20	.31	.22	.33	.29	.03	−.05	−.16	−.13	−.14	.02	−.06	−.29
22		P	−.17	.16	.16	.31	−.07	.25	.17	−.004	.16	−.02	−.08	.13	.03	−.12	−.25	−.17
23	EPQ	P	.20 (.04)	−.20 (.04)	−.15	−.28 (.04)	−.15	.31 (.009)	.19	.03	−.06	.16	.10	.33 (.005)	.20	.10	−.14	−.004
24		E	.13	−.17	.27 (.02)	.24	.42 (.001)	−.07	.36 (.002)	.40	−.24 (.03)	.54 (.001)	−.14	−.42 (.001)	−.02	−.31	.18	.15
25		N	.12	−.01	−.59 (.001)	−.33 (.010)	−.39 (.001)	.51 (.001)	.01	−.06	−.05	−.64 (.001)	.44 (.001)	.53 (.001)	.20	.38 (.001)	−.35 (.004)	.31 (.009)
26		L	* .21*	.07	.10	.14	.12	−.34 (.004)	−.18	−.13	.42 (.001)	.02	−.17	−.30 (.01)	−.15	−.07	.08	−.25
27	JEPI	E	−.21	.13	.31	.40 (.04)	.38 (.02)	−.21	.06	.02	−.33 (.05)	.37 (.03)	−.10	−.39 (.02)	−.15	−.55 (.002)	.06	−.13
28		N	.09	.05	−.37 (.03)	−.16	−.20	.41 (.02)	−.03	.02	−.06	−.35 (.04)	.24	.33 (.05)	.12	.27	−.49 (.005)	.29
29		L	* .23	−.08	.004	.01	.08	−.17	−.10	−.24	.38	−.10	−.04	−.11	−.08	.13	.11	−.21
30	AGE		* −.20	−.09	−.06	−.30 (.02)	.11	.19	.13	.32 (.012)	−.33 (.010)	.16	−.12	.16	.21	−.09	−.16	.11
31	RQ		* −.42 (.002)	.33 (.004)	.13	.28 (.031)	.13	−.28 (.031)	−.05	−.18	.04	.01	.10	−.18	−.32 (.016)	−.27 (.040)	−.06	−.19

			17	18	19	20	21	22	23	24	25	26 *	27	28	29 *	30 *	31 *
1	MFFT	ERRORS	−.08	−.20*	−.12	−.03	.43 (.003)	.24	.07	−.28* (.010)	−.14	.11	−.27*	−.04	.18	−.19	−.16
2	MFFT	TIME	.05	.20*	−.03	.22	−.13	−.03	−.04	.09	.003	−.17	−.02	.02	−.07	.05	−.02
3	CPQ	A	−.61 (.001)	.76 (.001)	.32 (.02)	.03	−.29 (.03)	.02	−.27 (.01)	.38 (.001)	−.39 (.001)	.04	.27 (.04)	−.14 (.002)	.07	.002	−.01
4		B	−.35 (.014)	.37 (.002)	.28	.00	−.23	−.08	−.03	.11	−.14	.11	.08	.12	−.03	.16	.12
5		C	−.69 (.001)	.71 (.001)	.22	.23	−.17	.11	−.20 (.05)	.29 (.007)	−.60 (.001)	.15	.36 (.008)	−.33 (.01)	.21 (.014)	.10	.26 (.032)
6		D	.80 (.001)	−.35 (.002)	−.39 (.006)	.23	.34 (.02)	.12	.40 (.001)	−.15	.46 (.001)	−.28 (.02)	−.20	.32 (.01)	−.19	.02	−.01
7		E	.14	.25 (.02)	.08	.06	−.31 (.03)	−.04	.31 (.006)	.19	−.09	−.29 (.016)	.09	−.04	−.33	.05	.08
8		F	−.19 (.05)	.66 (.001)	−.07	.52 (.001)	−.25	.26	.06	.31 (.005)	−.20	−.16	.31	−.09	−.21	.04	.08
9		G	−.46 (.001)	.16	.13	.10	.24	.32 (.02)	−.35 (.002)	−.22 (.04)	−.19	.34 (.004)	.14	−.27 (.04)	.47 (.002)	−.35 (.002)	−.12
10		H	−.71 (.001)	.91 (.001)	.35 (.01)	.20	−.13	.12	−.18	.36 (.001)	−.64 (.001)	.006	.42 (.002)	−.43 (.002)	.18	.03	.06
11		I	.35 (.002)	−.54 (.001)	−.16	−.30 (.03)	.20	−.18	−.02	−.39 (.001)	.36 (.002)	−.11	−.45 (.001)	.25 (.05)	−.01	.02	−.02
12		J	.61 (.001)	−.64 (.001)	−.27 (.05)	.01	.28 (.04)	−.09	.06	−.40 (.001)	.54 (.001)	−.13	−.56 (.001)	.35 (.01)	−.14	−.16	−.06
13		N	.48 (.001)	−.22 (.04)	.04	−.001	−.03	−.17	.18	.04	.31 (.04)	−.17	−.26 (.04)	.25 (.05)	−.24	−.05	.06
14		O	.82 (.001)	−.67 (.001)	−.25	−.04	.12	−.23	.35 (.002)	−.22 (.04)	.54 (.001)	−.13	−.41 (.003)	.51 (.001)	−.25	.09	−.05
15		Q3	−.50 (.001)	.14	−.06	.10	.003	.09	−.27 (.01)	−.03	−.11	.30	.18	−.16	.16	.06	−.005
16		Q4	.77 (.001)	−.49 (.001)	−.19	−.14	.10	−.12	.20	−.23 (.03)	.45 (.001)	−.26 (.04)	−.26 (.05)	.42 (.002)	−.34 (.02)	.08	.22
17		ANX	—	−.69 (.001)	−.32 (.02)	−.06	.21	−.12	.38 (.001)	−.26 (.02)	.61 (.001)	−.25 (.04)	−.39 (.004)	.50 (.001)	−.31 (.04)	.03	−.003
18		EXT	−.51 (.001)	—	.30 (.03)	.31 (.03)	−.28 (.04)	.17	−.19	.45 (.001)	−.56 (.001)	−.03	.41 (.003)	−.43 (.002)	.06	.03	.05
19	NEWTRS	G	−.50 (.005)	−.04	—	−.52 (.001)	−.52 (.001)	−.46 (.001)	−.25	.20	−.13	.15	.02	.39 (.007)	.11	.02	.46 (.002)
20		E	−.06	.24	−.43 (.008)	—	.30 (.03)	.65 (.001)	.31 (.03)	.16	−.11	−.26	.19	−.07	−.07	.03	−.16
21		N	−.04	.19	−.43 (.009)	.63 (.001)	—	.50 (.001)	.11	−.58 (.001)	.08	.18	−.28 (.05)	.27 (.05)	.28	−.44 (.004)	−.19
22		P	.07	.06	−.41 (.01)	.80 (.001)	.75 (.001)	—	.28	−.19	−.01	−.07	.07	.01	.10	−.28	−.17
23	EPQ	P	.16	.02	−.26	.21	.06	.24	—	−.001	.36 (.007)	−.30 (.004)	−.08	.37 (.007)	−.40 (.008)	.07	−.01
24		E	−.29 (.01)	.54 (.001)	.11	.23	.33	.10	.04	—	−.36 (.001)	−.10	.51 (.001)	−.41 (.003)	−.13	.18	.12
25		N	.64 (.001)	−.57 (.001)	−.02	−.22	−.10	−.06	.07	−.27 (.009)	—	−.14	−.37 (.007)	.71 (.001)	−.32 (.04)	.15	−.13
26		L	−.25 (.03)	−.01	−.15	.03	.08	.10	−.28	.09	.06	—	.02	−.16	.61 (.002)	−.28	.08
27	JEPI	E	−.40 (.02)	.32 (.05)	.24	.44 (.01)	.25	.16	−.09	.51 (.003)	−.40 (.02)	−.05	—	−.32 (.02)	−.02	.23	.14
28		N	.51 (.003)	−.32 (.05)	−.05	−.21	−.08	−.14	.05	−.27	.79 (.001)	−.10	−.24	—	−.32 (.04)	.27	.01
29		L	−.11	−.16	−.19	.11	.23	.12	−.10	.12	−.16	.84 (.002)	.05	−.21	—	−.47 (.002)	.06
30	AGE		.06	.19	.15	−.01	−.36	−.35	.25 (.04)	−.07	−.01	−.53 (.002)	.19	.20	−.58 (.002)	—	.04
31	RQ		−.25	−.02	.60 (.002)	.15	.03	.01	−.17	−.001	−.18	−.07	.50 (.006)	−.12	.07	−.002	—

(* = two-tailed; underlined or unmarked coefficients = one-tailed)

Female subjects at upper right hand side and male subjects at lower left hand side.
Number of subjects in the cells are as shown in the tables of means and standard deviations.
For correlations, the smaller number of subjects applies.
The exceptions are:
CPQ variables with EPQ variables : Male = 58 Female = 67
TRS variables with EPQ variables, CPQ variables and JEPI variables: Male= 25 Female = 40
JEPI variables with EPQ variables : Male = 27 Female = 43

correlated only amongst the boys (r=.28, p=.031). On the other hand, RQ did correlate with NTRS-G (r=.53, p=.002) in the total sample. It was also related to MFFT errors, both in the entire sample and among the boys.

As for the personality variables, Factor C correlated with RQ in the entire sample and among the girls, suggesting that a calm and stable personality is linked with a higher reading quotient. Among the boys, there is also a suggestion that emotional placidity (Factor D), self-assurance (Factor O) and astuteness (Factor N) correlated with better reading quotient.

Discussion

It is not easy to summarize correlation matrices involving such an enormous battery of tests, but several trends will be discussed.

First of all, the correlations between the various personality measures suggest that they may be measuring very similar aspects of the constructs they are designed to measure. There is satisfactory correspondence between the CPQ and Eysenck's personality questionnaires. As has already been discussed in Chapter Six, the New Teacher's Rating Scale appears a useful additional source of information about children's personality. At various points in the present investigation, the Teacher's Rating Scale has illuminated the relationship between behavioural and personality variables.

A major concern has been the relationship between the MFFT variables and personality and developmental variables. The hypothesis that cognitive impulsiveness as revealed by a high error and short latency score would be related to impulsiveness as conceptualized by personality theories has been only partially supported. According to the personality theories outlined in Chapter Seven, impulsiveness corresponds to high scores on extraversion and anxiety; in the present data, only the correlations with some anxiety measures meet the prediction. Where secondary traits are involved, only those which load on anxiety seem to be related to MFFT errors and latency, and by no means always so. Conflicting results were produced regarding the correlation with measures of extraversion, though age and to some extent RQ were also found to correlate significantly with MFFT errors.

So far as previous studies which have attempted to link performance on the MFFT to measures of personality are concerned, the present results seem to offer some support for Block, et al.'s (1974) suggestion that high anxiety is related to high error responses on the MFFT. They contradict the results of Cairns (1973, 1975), who failed to find any significant correlations at all between MFFT and JEPI variables. Similarly, the present finding of a significant correlation between the teacher rating subscale NTRS-G, which contains items describing reflective behaviour, does not agree with Bjorklund & Butter's (1973) finding that the MFFT did not relate with teacher's rating of impulsivity. However, this discrepancy may be attributed to the fact that different items of behaviour were being rated by the teachers in the two studies.

As far as Gray's ideas of impulsiveness are concerned, the failure to find any relation between extraversion and impulsive responding on the MFFT suggests either that Gray is wrong to postulate that extraversion is connected with impulsiveness, or that there is a distinction between impulsiveness as it is revealed in conceptual tempo and as he locates it in the Eysenckian framework. There is, however, some indication that Eysenck's Psychoticism is positively related to MFFT errors.

Gray's notion of impulsiveness involves both the extraversion and the neuroticism dimensions, but the present results suggest that only the neuroticism dimension is involved. We clearly cannot conclude that there is a single concept of impulsiveness which underlies both MFFT performance and the combination of neurotic extraversion as measured by personality tests, so we cannot employ the psychological mechanisms that have been postulated to underlie the more stable aspects of individual differences in personality to explain the mechanisms that underlie cognitive impulsivity.

However, it may still be possible to improve our understanding of the psychological processes underlying cognitive impulsiveness by establishing which other empirical measures are most useful when it comes to predicting performance on the MFFT. To this we shall now turn.

Predicting Impulsivity

Having examined in the last section how personality and developmental variables correlated with MFFT performance, the next step is to find out out to what extent the MFFT errors and latency measures can be predicted by the other variables. This is a form of post-hoc analysis, but it produces some interesting results.

The methods chosen for the analysis were multiple correlation and multiple regression analysis.* They were performed by the computer programme in the SPSS (Nie,et al., 1975). The procedures can be summarized as follows. After the correlation matrix for all the variables has been generated, variables are selected and included in the multiple regression equation one-by-one in a series of regression steps. The criterion for selection is determined by the F value and the tolerance level. The F value refers to the F ratio computed in a test of significance of a regression coefficient, and the tolerance level is the proportion of the individual variable not explained by the independent variables already in the regression equation. At each step, one variable is chosen from among those that are eligible for entry in the equation. The variable selected is the one which explains the greatest amount of variance unexplained by those variables already in the equation, that is, the variable

---

*Regarding the treatment of the data, factor analysis was used initially. The programme adopted was the principal component method with Kaiser adjustment on the SPSS program. The same orthogonal method was used in the factor analysis study of the NEW TRS. The initial aim was to produce a factor which could be labelled as "impulsiveness", but the results obtained suggested a problem in that although several apparently meaningful factors were found, they appeared to be "instrumental factors", which means that measures from certain type of task, e.g., rating scales, behavioural tasks, etc. tended to cluster among themselves.

It was suggested that either an oblique method -- the Promax method -- or multiple correlation analysis could be used instead (Eysenck, personal communication, 1979). As the Promax programme was not accessible, multiple correlation analysis was the method adopted.

which, if added, will bring the greatest reduction in the residual sums of squares.

The summary tables of the multiple correlations in the regression analysis are presented in Tables 152 to 157. The correlation matrices from which the results were obtained are shown in Appendices 39 and 41.

Three groups of analysis were performed. The criterion variables were MFFT error and MFFT time, while the predictor variables included all the personality measures and measures of the behavioural tasks reported in Chapters Eight and Nine. In view of the limitation presented by the number of subjects who completed the DRL experiment in Chapter Nine, the variables were separated into task variables and personality variables in the analysis. Also due to the small number of subjects available in the second DRL experiment (Chapter Ten), the task variables were not analysed, and only subjects with personality measures similar to the first sample were combined with the first sample for the third analysis, which can be used as a replication of the first analysis.

Referring to summary tables 152 and 153 which show the multiple correlation and regression analysis of MFFT variables and the task variables in the twenty children who participated in the games "Simon Says" and "Do and Don't" and completed the DRL training, one of the indices -- variables entered -- indicates the importance of each variable in contributing to the prediction of the MFFT variables. The order in which the variables are entered reflects the F ratio each eligible variable would have if it alone was added to the regression equation at that step. With more steps being added, the correlation of the variables in the equation and the dependent variable is indicated by the multiple correlation coefficient (Multiple R) and the overall accuracy of the prediction of the equation is represented by R^2, i.e., the proportion of the variance explained by the variables included in the regression equation. The overall F test is used to test the goodness of fit of the equation, or the null hypothesis that the multiple correlation is zero in the population from which the sample was drawn.

According to Table 152, the task variable that was "entered" into the equation to predict MFFT errors was the omission score in the game "Do and Don't" (DDOMI). The ratio (F=13.28) was significant at .002 level and this variable by itself explained 42% of the variance in the equation. The F ratio of the next variable, Efficiency Index 1 of DRL-2 (DA2EF1) was also significant at .05 level. By the inclusion of the second variable, the explained variance has increased by 11%, so that half of the variance in the equation has already been accounted for. Subsequent variables that were entered into the equation did not have F-ratios that were significant. Their increase to the explained variance fell below 10% in each case, and although the amount of predicted variance gradually increased with each variable entered, the F-ratio which indicated the goodness of fit of the equation suggested that after the ninth or tenth step, the probability was that the inclusion of further variables would reduce the predictive power of the equation. Therefore, only two variables would strictly speaking contribute to the predictability of MFFT errors.

When MFFT time was used as the dependent variable, the results suggested that the task variables had rather low predictive utility in the regression equation. Only one variable, DA2EF2, the efficiency index 2 in DRL-2, which was entered in the ninth step has a significant F value. Judged by the amount of variance explained, DRLABA, DA6TSC, DRLALRN and DA2EF2 increased the variance by between 11% to 15%. The F-ratio of the goodness of fit of the multiple regression equation was most significant after the ninth step, with F=4.44 (p=.015). At this stage, about 80% of the variance has been accounted for.

It appeared that the relationships between the task variables and the two MFFT measures were very different ones. Whereas two task variables could explain over half of the variance of the regression equation, and further inclusion of variables might be detrimental to the goodness of fit of the equation for MFFT error, a combination of variables which did not individually contribute much to the prediction of the MFFT latency was required to make up an equation that could predict MFFT latency to a significant level. The variables that predicted either MFFT error or time were also different from one another. The two most important variables in predicting MFFT errors -- DDOMI and DA2EF1 -- reflect accuracy, but variables such as DRLABA, the time score of DRL-6 and the learning index that predicted MFFT latency were all derived measures of time.

Table 152 Multiple correlation summary table of MFFT errors with task variables (N = 20)

STEP	VARIABLE ENTERED	F	(Sig)	MULTIPLE R	R^2	R^2 CHANGE	SIMPLE R	OVERALL F	(Sig)
1	DDOM1	13.29	(.002)	.652	.425	.425	.652	13.28	(.002)
2	DA2EF1	4.43	(.050)	.737	.544	.119	.110	10.12	(.001)
3	SSACC	2.77	(.115)	.782	.611	.067	-.556	8.38	(.001)
4	DA12TSC	1.98	(.179)	.810	.656	.045	-.070	7.17	(.002)
5	SSOMI	1.62	(.223)	.832	.692	.036	.394	6.29	(.003)
6	DA6EF1	3.38	(.089)	.869	.756	.063	-.141	6.70	(.002)
7	DA2T8C	1.28	(.280)	.883	.779	.024	.008	6.05	(.003)
8	DA6EF2	.95	(.351)	.893	.797	.018	.155	5.39	(.006)
9	DRLABA	.78	(.398)	.901	.811	.015	-.078	4.78	(.011)
10	DDCOM	2.78	(.130)	.925	.856	.045	.273	5.35	(.009)
11	DRLALRN	1.38	(.273)	.937	.877	.021	.026	5.19	(.014)
12	DA6TSC	.16	(.701)	.938	.880	.003	.048	4.28	(.032)
13	DA2EF2	.07	(.802)	.938	.881	.001	-.034	3.43	(.070)
14	DA12EF2	.29	(.612)	.942	.888	.006	-.107	2.83	(.128)
15	DA12EF1	.28	(.625)	.946	.895	.007	.009	2.28	(.221)

Table 153 Multiple correlation summary tables of MFFT time with task variables (N = 20)

STEP	VARIABLE ENTERED	F (Sig)	MULTIPLE R	R^2	R^2 CHANGE	SIMPLE R	OVERALL F (Sig)
1	DRLABA	2.30 (.147)	.336	.113	.113	.336	2.30 (.147)
2	DA6TSC	3.33 (.086)	.508	.258	.145	-.298	2.96 (.079)
3	DDACC	1.83 (.195)	.578	.334	.076	.086	2.68 (.082)
4	SSOMI	.99 (.336)	.613	.376	.041	-.077	2.26 (.111)
5	DA6EF1	1.26 (.280)	.654	.427	.052	.246	2.09 (.128)
6	SSACC	1.21 (.292)	.690	.476	.049	.003	1.98 (.144)
7	DRLALRN	4.14 (.064)	.781	.610	.134	-.112	2.69 (.064)
8	DA2EF1	1.12 (.313)	.804	.646	.036	-.128	2.51 (.079)
9	SA2EF2	7.65 (.020)	.894	.800	.153	-.061	4.44 (.015)
10	DA6EF2	.53 (.486)	.900	.810	.011	-.007	3.85 (.027)
11	DA12TSC	.07 (.796)	.901	.812	.002	-.009	3.15 (.057)
12	DA12EF2	.36 (.567)	.906	.821	.009	.109	2.69 (.098)
13	DA2TSC	1.13 (.329)	.922	.850	.028	-.299	2.61 (.123)
14	DDCOM	.50 (.509)	.929	.864	.014	.012	2.26 (.188)
15	DA12EF1	.22 (.662)	.933	.871	.007	-.001	1.80 (.302)

It can be seen in the simple correlation indices that the magnitude of most of the correlation was small. Some of them were in the opposite direction: e.g., DRLALRN correlated negatively with MFFT time. However, these correlations would not be significant on a two-tailed test.

In the second analysis (Tables 154 and 155), the personality variables were used to predict MFFT errors and time. MFFT error again appeared to be predictable by two variables to a marked degree of statistical significance. NTRS-G was the first variable entered with F=11.46 and p=.003. 39% of the variance was accounted for. With the inclusion of NTRS-P, the explained variance increased to 60% and the equation had the overall F of 12.85, which was significant at .0001. Beyond this step, further variables contributed little to the variance change and also reduced the goodness of fit of the equation.

With MFFT time, the goodness of fit of the equation reached the highest overall F ratio after the sixth step (F=6.92, p=.002). The first three variables, CPQ Factor D, Factor Q4 and NTRS-P had F ratios that reached statistical significance, and each of them contributed to between 17% and 19% of the change of variance. In total, the three variables explained over half of the variance of the equation. With all six variables, 76% of the variance has been accounted for.

Measures of the teacher rating scale seem to be useful predictors of MFFT performance. NTRS-G, which measures reflection and the qualities of a "good" pupil, was the most important variable

Table 154 Multiple correlation summary table of MFFT errors with personality variables (N = 20)

STEP	VARIABLE ENTERED	F	(Sig)	MULTIPLE R	R^2	R^2 CHANGE	SIMPLE R	OVERALL F	(Sig)
1	NTRS-G	11.46	(.003)	.624	.389	.389	-.624	11.46	(.003)
2	NTRS-P	9.09	(.008)	.776	.602	.213	-.108	12.85	(.0001)
3	NTRS-N	1.58	(.227)	.799	.638	.036	.047	9.38	(.001)
4	NTRS-E	1.01	(.330)	.813	.661	.023	.065	7.30	(.002)
5	D	.44	(.520)	.819	.671	.010	.297	5.71	(.004)
6	Q4	.72	(.411)	.830	.688	.017	-.140	4.78	(.009)
7	Q3	.71	(.415)	.840	.706	.017	-.293	4.11	(.016)
8	E	.96	(.348)	.854	.729	.024	.321	3.70	(.024)
9	I	.83	(.382)	.866	.750	.021	-.394	3.33	(.037)
10	H	.76	(.406)	.877	.770	.019	-.224	3.01	(.056)
11	AGE	1.06	(.333)	.893	.797	.027	-.121	2.85	(.074)
12	J	1.50	(.260)	.912	.833	.036	-.105	2.90	(.083)
13	B	.32	(.593)	.917	.841	.008	-.479	2.44	(.140)
14	G	.16	(.704)	.920	.846	.005	-.078	1.96	(.235)
15	P	.41	(.559)	.927	.860	.014	.282	1.64	(.338)
16	ANX	.16	(.719)	.931	.867	.007	.148	1.22	(.497)
17	N	.27	(.653)	.940	.883	.016	.228	.89	(.652)
18	EXT	.10	(.803)	.945	.894	.011	.136	.49	(.839)

Table 155 Multiple correlation summary table of MFFT time with personality variables (N = 20)

STEP	VARIABLE ENTERED	F (Sig)	MULTIPLE R	R^2	R^2 CHANGE	SIMPLE R	OVERALL F (Sig)
1	D	4.29 (.053)	.439	.192	.192	-.439	4.29 (.053)
2	Q_4	4.75 (.044)	.607	.369	.177	.177	4.97 (.020)
3	NTRS-P	6.47 (.022)	.742	.551	.182	.089	6.54 (.004)
4	E	3.53 (.080)	.798	.636	.086	-.209	6.56 (.003)
5	Q_3	3.64 (.077)	.843	.711	.075	.141	6.90 (.002)
6	N	2.73 (.122)	.873	.762	.050	-.010	6.92 (.002)
7	EXT	1.47 (.249)	.887	.788	.026	-.122	6.36 (.003)
8	G	2.45 (.146)	.909	.826	.039	-.215	6.54 (.003)
9	NTRS-G	2.46 (.148)	.928	.861	.034	.124	6.86 (.003)
10	F	1.70 (.224)	.939	.883	.022	-.139	6.78 (.004)
11	I	3.93 (.083)	.960	.921	.039	-.070	8.53 (.003)
12	A	.83 (.393)	.964	.930	.008	-.003	7.72 (.006)
13	NTRS-E	2.91 (.139)	.976	.953	.023	-.210	9.30 (.006)
14	J	5.17 (0.72)	.988	.977	.024	.270	15.00 (.004)
15	AGE	1.97 (.233)	.992	.984	.008	-.073	16.84 (.007)
16	C	9.43 (.059)	.998	.996	.012	-.297	49.66 (.004)
17	NTRS-N	.43 (.577)	.998	.997	.001	-.189	37.96 (.026)
18	ANX	.03 (.891)	.999	.997	.000	-.117	18.46 (.181)

in predicting MFFT errors. However, it is not useful for predicting MFFT time. NTRS-P was among the most important variables as far as predicting both MFFT errors and time were concerned.

Before going into further discussion of this finding, the third analysis, in which the ability of personality variables to predict MFFT performance in a larger subject sample was examined, will be presented. It can be seen from Tables 156 and 157, that Factor B of the CPQ topped the summary table as the best predictor of MFFT errors. Its F ratio (F=38.56) was highly significant and it explained about 15% of the variance of the equation. The next most important variables were Age and NTRS-G respectively. The three variables altogether explained about 22% of the variance of the equation, but the individual contribution of 15% by Factor B was much higher than the 4% and 3% contributed by Age and NTRS-G respectively. Moreover, it seemed that the inclusion of the second and third variables reduced the goodness of fit of the equation, as judged by the decrease of the overall F ratio, despite the fact that the F value was still significant statistically.

Four entirely different variables from those that predicted MFFT errors in this analysis have significant F ratios and were entered as the variables that predicted MFFT latency. They were, in the order of entry into the equation, Factors I (Harria vs Premsia), Q3 (Weak self-sentiment vs Strong self-sentiment), H (Threctia vs Parmia) and O (Unperturbed adequacy vs Guilt proneness) of the CPQ. The last three of these factors are all loaded on Anxiety. Altogether they explained about 10% of the total variance

Table 156 Multiple correlations summary table of MFFT error with personality variables (N = 221)

STEP	VARIABLE ENTERED	F	(Sig)	MULTIPLE R	R^2	R^2 CHANGE	SIMPLE R	OVERALL F	(Sig)
1	B	38.56	(.001)	.387	.149	.149	-.387	38.50	(.0001)
2	AGE	9.75	(.002)	.431	.186	.036	-.351	24.92	(.0001)
3	NTRS-G	8.64	(.004)	.466	.217	.031	-.305	20.08	(.0001)
4	NTRS-E	2.23	(.137)	.475	.225	.008	-.041	15.70	(.0001)
5	Q4	2.18	(.141)	.483	.233	.008	-.024	13.06	(.0001)
6	A	2.24	(.136)	.491	.241	.008	-.144	11.32	(.0001)
7	G	1.03	(.312)	.495	.245	.004	-.057	9.85	(.0001)
8	F	1.53	(.217)	.500	.250	.005	-.022	8.84	(.0001)
9	EXT	1.34	(.248)	.505	.255	.005	-.116	8.02	(.0001)
10	N	.34	(.558)	.506	.256	.001	.124	7.23	(.0001)
11	E	.19	(.662)	.507	.257	.001	-.061	6.56	(.0001)
12	D	.23	(.631)	.507	.258	.001	.022	6.01	(.0001)
13	C	.21	(.647)	.508	.258	.001	-.047	5.54	(.0001)
14	I	.23	(.634)	.509	.259	.001	-.040	5.14	(.0001)
15	J	.02	(.886)	.509	.259	.000	.129	4.78	(.0001)
16	NTRS-P	.02	(.901)	.509	.259	.000	-.020	4.46	(.0001)
17	O	.02	(.896)	.509	.259	.000	.066	4.18	(.0001)

Table 157 Multiple correlations summary table of MFFT time with personality variable (N = 221)

STEP	VARIABLE ENTERED	F	(Sig)	MULTIPLE R	R^2	R^2 CHANGE	SIMPLE R	OVERALL F	(Sig)
1	I	5.95	(.015)	.163	.026	.026	-.163	5.59	(.015)
2	Q3	4.94	(.027)	.219	.048	.022	.069	5.50	(.005)
3	H	5.74	(.017)	.269	.072	.025	-.101	5.66	(.001)
4	O	6.69	(.010)	.317	.100	.028	-.151	6.03	(.0001)
5	O	3.26	(.073)	.337	.114	.013	-.049	5.52	(.0001)
6	EXT	2.67	(.104)	.353	.125	.011	.077	5.09	(.0001)
7	D	.80	(.371)	.358	.128	.003	-.005	4.47	(.0001)
8	Q4	1.12	(.290)	.364	.133	.005	.047	4.05	(.0001)
9	NTRS-N	1.25	(.265)	.371	.138	.005	.058	3.75	(.0001)
10	G	.87	(.352)	.376	.141	.004	-.036	3.45	(.0001)
11	NTRS-P	.58	(.448)	.379	.144	.002	.044	3.19	(.001)
12	E	.48	(.490)	.382	.146	.002	.073	2.96	(.001)
13	NTRS-E	.34	(.556)	.383	.147	.001	.032	2.75	(.001)
14	NTRS-G	.23	(.629)	.385	.148	.001	-.022	2.56	(.002)
15	J	.27	(.603)	.386	.149	.001	.027	2.40	(.003)
16	AGE	.15	(.696)	.387	.150	.001	-.048	2.25	(.005)
17	B	.22	(.691)	.388	.151	.001	.016	2.12	(.008)
18	F	.19	(.664)	.389	.152	.001	.156	2.00	(.011)
19	H	.05	(.821)	.390	.152	.000	.045	1.89	(.016)

and contributed about 2% individually to the increase of the variance.

Discussion

Only one analysis involved task variables, and the results implied that MFFT errors could be predicted fairly accurately by two of the task variables employed in the experiments discussed earlier. By contrast, the extent to which MFFT time could be predicted by task variables was limited.

Although in the analysis involving personality variables, the variables predicting MFFT error and time were not exactly the same, there is some overlap. NTRS-G was one of the most important predictors in the analyses on MFFT errors, involving the smaller sample as well as the larger sample. Although NTRS-P did not share the same importance in the third analysis as in the second, and the explanation was somewhat difficult, the combination of Intelligence, Age and NTRS-G in the final analysis was consistent with the fact that MFFT errors could be significantly predicted from measures of behavioural tasks. The connection between intelligence and age and MFFT errors has been documented in previous studies (see Messer, 1976), and NTRS-G is also related to Factor B (see Chapter Six). Moreover, the items on the NTRS-G included adjectives such as careful, thoughtful, systematic, etc., which were task-oriented variables.

Personality variables which measure such qualities as a phlegmatic and relaxed disposition (Factors D and G) predicted MFFT time in the second study. Although they were not the high ranking ones in the third study, the variables that best predicted MFFT time in the larger sample also reflected fairly similar traits, e.g., Factor Q3, which measures self-control; Factor I, which measures self-assurance and social precision; and Factor H, which measures stability and feeling secure.

At this point in the discussion, we must incorporate the results reported in the previous section on the correlations between the MFFT variables and measures of personality and developmental variables. When the MFFT measures are related individually with personality and developmental measures, there was a tendency for MFFT errors to be related to age and intelligence and a few personality variables, but fewer significant correlations which involved MFFT latency. The interpretation in the first section was based primarily on the magnitude and the direction of the simple correlation, in which the relationship between separate pairs of variables was investigated. In the analysis employed in this section, the variables involved were considered as a group and the object was to assess the degree to which several variables could predict MFFT performance. Despite the low and insignificant simple correlations between MFFT time and personality variables, the present analysis suggested that MFFT time could be predicted by personality measures of emotionality and self-control, whereas the prediction of MFFT errors tended to involve variables that were either task oriented or measures of intelligence and age.

The conclusion reached in the previous section, that there is little in common between cognitive impulsivity and personality impulsiveness, is strengthened by the present analysis. The finding that MFFT latency is more closely linked with personality than MFFT errors is contrary to Block,et al.'s (1974) proposal. They based their discussion on simple correlation results and suggested that MFFT error is the only useful measure in MFFT performance.

The present investigation suggests that MFFT errors and MFFT latency are related to different domains of a child's behaviour. As long as the present practice of using both measures to classify the conceptual styles of children continues to be adopted, it is important to be aware of this difference.

Summary

The first section of this chapter reported the inter-correlations of the MFFT, personality and developmental measures on two samples of children. The results indicated that measures of cognitive reflection-impulsivity had relatively little in common with measures of impulsiveness derived from self-rated and teacher-rated personality inventories. There was however some support for the hypothesis that impulsive behaviour on the MFFT is related to neuroticism or anxiety, but the corresponding hypothesis that impulsiveness is also related to high extraversion was not supported. It is therefore difficult to interpret cognitive impulsiveness in terms of individual differences in personality within Gray's or Eysenck's framework, and illegitimate to attempt to explain cognitive reflection-impulsivity in terms of the physiological mechanisms which Gray has suggested might underpin the more stable aspects of personality.

Age and intelligence seemed to correlate significantly with MFFT errors. Age also seemed to be related to changes in several personality variables; for example, there was an increase in psychoticism and expediency with advancing age, and a decrease in lying. The relationship between age and neuroticism was more complicated. Generally the correlation was positive but insignificant, but there was a significant negative correlation between age and teacher-rated neuroticism in one sample.

The second section reported results from multiple correlation and multiple regression analyses designed to find out which variables could best predict performance on the two MFFT variables. The results suggested that MFFT error could be predicted significantly by the errors of omission in the game "Do and Don't" and the efficiency index 1 of DRL-2, while MFFT response time did not seem to be as easy to predict by measures of the behavioural tasks used in the present investigation. The variables selected in the equation could be defined as either measures of time or derived measures of time. Where personality is concerned, MFFT latency scores are predicted by personality measures reflecting self-control and emotionality, while MFFT errors are significantly predicted by intelligence, age and the teacher-rated measure of a "good" pupil. These results do not support Block,et al.'s argument that MFFT error is a more important measure than MFFT latency, which was based on their finding that MFFT error was correlated more with personality variables. The simple correlation study in the present investigation supported Block,et al.partially, since it pointed to a connection between MFFT error and measures of anxiety. However, it would be premature to reject MFFT latency on the grounds suggested by Block,et al. (1974).

CHAPTER TWELVE

CONCLUSIONS

This study has been concerned with two different aspects of the investigation of behavioural self-restraint in children. The first is the role of verbal self-instruction in affecting behavioural self-restraint, and the second, individual differences in self-restraint and in the verbal control of behaviour.

The theoretical basis of the first concern was Luria's account of the verbal regulation of behaviour, and this provided the starting point for the first series of experiments (Part I). It was outlined and evaluated in Chapter One, where the possible mechanisms which might underlie verbal behavioural control were examined, and it was suggested that the phenomenon of the verbal regulation of behaviour could be scrutinized at different levels of abstraction. The most elementary level is represented by the execution and inhibition of simple motor responses such as those described in Luria's own experiments (Luria, 1961a), where the verbal self-instructions are short and terse ones like "Go", "No Go", "Press" or "Don't press". The second level of abstraction applies to experiments carried out by Meichenbaum & Goodman (1969b) and by Toner & Smith (1978), who deal with the verbal regulation of more complicated and broader behavioural categories. Longer and more detailed verbal self-instructions were used in experiments to specify the desired behaviour. The highest level refers to the idea which Luria shares with Vygotsky, that language is the highest mode of human behaviour which plays an important role in the social and historic-cultural development of the species. Luria includes all three levels of abstraction in his theorizing, which creates problems for investigators trying to understand his work or to replicate his experiments.

The experiments reported in Part I (Chapters Two to Four) provide data which suggest that the concept of the verbal regulation of behaviour may not be tenable at the elementary level of behaviour. Verbal accompaniment of motor responding in fact turns out to be detrimental to the performance of motor responses in tasks adapted from the ones reported by Luria (1961a, 1961b). There was also no evidence to support the assumption that verbal responses were superior to motor responses, whether it was in terms of being either a faster or a more accurate response in reaction time experiments. The results lent themselves more easily to interpretation by a "load" hypothesis similar to the Limited Capacity Theory, and the data also suggested that verbal and motor response co-ordinated with each other temporally -- motor responses tended to be delayed in latency when they occurred in conjunction with verbal ones. These observations and their interpretation have obvious relevance to the experiment involving DRL training described in Chapter Nine. DRL is a schedule which requires subjects to respond by pressing a lever in such a way that the responses must occur at or longer than a specified interresponse time if they are to be reinforced. It was found that verbal accompaniment in the form of counting enabled the children to learn to criterion faster, and that they were also more efficient in obtaining reinforcement than children who did not use verbal self-instruction. Further data (Chapter Ten) demonstrated that verbal self-instruction does not improve performance on DRL training by allowing subjects to plan more efficiently. The content of the instruction was not important, though how it was said was. So verbal self-instruction seems to be more akin to collateral or mediating behaviour: it fills in the time period between responses and helps to regulate the occurrence of the responses. Verbal self-instruction can produce responses with long interresponse times, hence achieving the aim of restraining or delaying behaviour, but it often does so at the expense of temporal discrimination, thus reducing the proportion of reinforcement obtained in relation to those available, especially when the DRL schedule is a relatively short and undemanding one. Two of Lurian assumptions therefore seem to be misguided. Speech is not necessarily an aid to the regulation of behaviour, and even when it is, it is misleading to talk of planning action, when the actions required are only the execution or inhibition of simple motor responses.

In the study on individual differences in behavioural self-restraint, the aim was to find out if such individual differences were related to individual differences in personality, and hence explicable in terms of the physiological mechanisms which have been postulated to underlie some of the more stable aspects of an individual's personality. Behavioural self-restraint was therefore examined in the light of some of the personality theories in which impulsive behaviour plays an important role, and with reference to psychometric tests which have been devised to measure impulsivity.

This contradicted the findings of the experiments described in Part I, which suggested a correlation between errors of commission and extraversion as measured by the teacher's rating scale. The discrepancy may have been due to a difference in the two procedures. The much faster intertrial intervals in the two games may have made much greater demands on the attention span, particularly of the younger children, who may have reacted to the situation by omitting more responses. However, it is not clear why they responded by omitting responses rather than by committing impulsive errors. It was suggested that it may be significant that impulsiveness is not a unitary concept. Eysenck, S.B.G. & Eysenck (1977) have reported that the trait impulsiveness can be factorized into several factors called nonplanning, risk-taking, liveliness and a pathological impulsiveness factor, and it may be that under different circumstances, different aspects of impulsiveness can influence behaviour.

The studies on DRL (Chapters Nine and Ten) provided some support for the prediction that behavioural restraint is related to neuroticism, but little indication that it is related to extraversion. This was in line with the findings of the experiment involving the two games. Taken together, these findings seem to undermine Gray's idea that impulsiveness is equivalent to a high score on both neuroticism and extraversion. Similarly, the correlation between behavioural measures of self-restraint did not support Eysenck's findings that impulsiveness and extraversion are correlated (Eysenck, S.B.G. & Eysenck, 1978), although the correlations between neuroticism, psychoticism and behavioural impulsiveness were in agreement with Eysenck's findings.

When subjects were encouraged to use verbal self-accompaniment in the DRL tasks, individual difference in personality or conceptual tempo became much less important. There were no consistent correlations between the behavioural measures and the conceptual tempo or personality variables. The only exception to this was described in Chapter Ten, in which data from conditions using repetition of instructions revealed that children rating themselves as stable and high on extraversion in personality in terms of the CPQ Factors performed better on the DRL task.

It is not clear to what -- if any -- extent cognitive impulsiveness overlaps with the personality theorists' notion of impulsivity as a general behavioural trait. Correlations between personality and developmental variables and the MFFT measures indicate a link between anxiety or neuroticism and cognitive impulsiveness, but there is no support from the correlation data for any connection between extraversion and the MFFT variables. The data partially support Block,et al.'s (1974) view that impulsiveness was underpinned by anxiety, and that the cognitively impulsive child can be described as anxious and ill-adaptable. But the data do not support Block,et al.'s (1974) suggestion that MFFT error is the more important of the two MFFT variables, or the reasons he put forward for this claim -- that MFFT error is more closely related to personality variables than is MFFT time. When multiple correlation and regression analysis were performed in the present study, it appeared that personality variables relating to anxiety and neuroticism were quite successful at predicting scores on the MFFT time measure, whereas the MFFT error score was best predicted by intelligence and age, and a teacher's rating of a "good" pupil. Moreover, MFFT error was more closely related than MFFT latency to task variables derived from the DRL and the experiment using "Simon Says" and "Do and Don't". These data suggest that MFFT error and latency may belong to different domains of a child's behaviour.

One of the major problems in the present study is a psychometric one. There is no generally accepted instrument to measure impulsiveness. The MFFT was used as an indication of cognitive impulsivity, but workers in the field are still critical about the construction of the scale (see Chapter Seven). There are also recognized difficulties in obtaining measures of individual differences in personality among younger children, which led to the construction of a teachers' rating scale (see Chapters Five and Six). The teachers' rating scale seemed to be a useful source of information about both the younger and the older children, but its value is uncertain, given that the number of children so far tested on the scale is insufficient to provide detailed standardization norms. There is an urgent need for a satisfactory measure of impulsiveness, to replace the present method of measuring it indirectly, by combining the neuroticism and extraversion scores on Eysenck's questionnaires. The position should be greatly improved by the Impulsivity Scale at present being developed by Eysenck (Eysenck, S.B.G. & Eysenck, 1977; 1978), because this scale will allow for clearer specification of the various facets of impulsivity. A direct measure of impulsiveness would clearly provide a fairer test of Gray's theory.

With hindsight, there seem to be several technical improvements which might have led to better understanding of the relationship between verbal factors, impulsivity and behavioural self-restraint. For example, in the reaction time experiments described in Chapter Two, some direct recording of the reaction time of the verbal responses might have reduced variances which could be introduced by the method adopted in the study.

The unexpected finding reported in Chapter Ten regarding the positive correlation between measures of extraversion and better performance at a series of graded DRL tasks with the accompaniment of multiple utterance of a self-instruction suggests that a recording of the length of the verbalization or the number of times a subject repeats the instructions could throw light on individual differences in the use of verbal self-instructions. It might also give weight to the suggestion that children scoring high on extraversion are less persistent, and by being unwilling to repeat instructions at length, come to accept what has turned out to be an advantageous strategy - by verbalizing "just enough", they can maximize the number of reinforcement proportionate to those available.

Although the correlation between behavioural measures of self-restraint and personality and cognitive variables of impulsivity has provided data to test Gray's suggestion that impulsiveness is a combined measurement of extraversion and neuroticism, the present study has not provided a test of Gray's explanation of impulsiveness, which is based on a subject's reactions to punishment and reinforcement. In future research, this might be tested by asking the children what they thought was the contingency in a DRL task, and what they considered to be their preferred contingency given the choice of being given a reinforcement, being able to avoid punishment, etc.

In further studies of behavioural self-restraint and the use of verbalization to monitor self-restraint in children, it will be desirable to augment artificial laboratory experiments with situations closer to children's real life experience. The games "Simon Says" and "Do and Don't" have already demonstrated their value in this respect. Another area of research into the more general aspects of self-restraint which needs to be extended is suggested by the resistance to temptation experiments carried out by Mischel and his co-workers (see p.61). Verbal self-instruction appears to be an important factor in delayed gratification. Patterson & Mischel (1975) have used procedures that require subjects overtly to verbalise their plans or strategies in coping with resistance to temptation. Fry (1979) had also reported an experiment the results of which seem to tie in with the findings of the DRL experiment reported here in Chapter Ten. He found that children who spontaneously verbalized or repeated their instruction a lot tended to perform better in resistance to temptation situations than those who did not verbalize or were less inclined to repeat the self-instruction. Furthermore, the treatment programme devised by Meichenbaum and his team, who regard the role of self-instruction as crucial in promoting behavioural change (Meichenbaum, 1977) (see p.289) may point to an area in which the study of individual differences and the use of self-instruction could be put to practical use.

Finally, throughout the investigation, one encounters a fundamental problem in psychological research. The inclusion of different tasks and different measures of behaviour in the present investigation, and corresponding differences in the results obtained, highlight the importance of situation specificity in the effects of verbal self-regulation and behavioural restraint. This suggests that, ideally, research should be of such a kind that sampling of situations can be taken into account before any statement is made about the generality of a finding. This is a problem recognized by psychologists (e.g., Mischel, 1968; Harré, 1974), and Petronovich (1979) has suggested the use of multiple regression and correlation as an alternative to factorial designs and analysis when sampling involves both subjects and situations. The present writer shares the view of these writers, although a random sampling of situations are impossible in this investigation, due to limitations on time and resources.

REFERENCES

ACHENBACH, T.M.,& WEISZ, J.R. Impulsivity-reflectivity and cognitive development in preschoolers: a longitudinal analysis of developmental trait variance. Developmental Psychology, 1975, 11(3), 413-414.

ADAMS, W.V. Strategies differences between reflective and impulsive children. Child Development, 1972, 43(4), 1076-1080.

ALLPORT, G.W.,& ODBERT, H.S. Trait-names: a psycho-lexical study. Psychological Monograph, 1936, 47, 171.

ALLSOPP, J.F.,& FELDMAN, M.P. Extraversion, Neuroticism, Psychoticism and antisocial behavior in school-girls. Social Behavior and Personality, 1974, 2, 184-190.

ANGER, D. The dependence of interresponse times upon the relative reinforcement of different interresponse times. Journal of Experimental Psychology, 1956, 52, 145-161.

ANGER, D. The role of temporal discrimination in the reinforcement of Sidman avoidance behavior. Journal of Experimental Analysis of Behavior, 1963, 6, 423-428.

ANNETT, J. Feedback and Human Behaviour. Harmondsworth: Penguin, 1969.

ANOKHIN, P.K. Features of the afferent apparatus of the conditioned reflex. Voprosy Psikhologi (Problems of Psychology), 1955, No.6.

AULT, R.L. Problem-solving strategies of reflective, impulsive, fast-accurate and slow-inaccurate children. Child Development, 1973, 44, 259-266.

AULT, R.L., CRAWFORD, D.E., & JEFFREY, W.E. Visual scanning strategies of reflective, impulsive, fast-accurate, and slow-inaccurate children of the MFF test. Child Development, 1972, 43, 1412-1417.

AULT, R.L., MITCHELL, C., & HARTMANN, D.P. Some methodological problems in reflection-impulsivity research. Child Development, 1976, 47, 227-231.

BAIN, B. Verbal regulation of cognitive processes: a replication of Luria's procedures with bilingual and unilingual infants. Child Development, 1976, 47, 543-546.

BANDURA, A. Principles of Behavior Modification. New York: Holt, Rinehart & Winston, 1969.

BANDURA, A., & MISCHEL, W. Modification of self-imposed delay of reward through exposure to live and symbolic models. Journal of Personality and Social Psychology, 1965, 2, 698-705.

BANTA, T.J. Tests for the evaluation of early childhood education: The Cincinnati Autonomy Test Battery (CATB). In J. Hellmuth (Ed.), Cognitive Studies. Vol.1. New York: Brunner-Mazel, 1970.

BARNARD, J.W., ZIMBARDO, P.G., & SARASON, S.B. Teachers' ratings of student personality traits as they relate to IQ and social desirability. Journal of Educational Psychology, 1968, 59, 128-132.

BARRATT, E.S. Anxiety and impulsiveness related to psychomotor efficiency. Perceptual and Motor Skills, 1959, 9, 191-198.

BARRETT, D.E. Reflection-impulsivity as a predictor of children's academic achievement. Child Development, 1977, 48, 1443-1447.

BARTIS, S.W., & FORD, L.H.Jr. Reflection-impulsivity, conservation and the development of ability to control cognitive tempo. Child Development, 1977, 48, 953-959.

BECKER, L.D. Conceptual tempo and the early detection of learning problems. Journal of Learning Disabilities, 1976, 9(7), 39-47.

BECKER, L.D., BENDER, N.N., & MORRISON, G. Measuring impulsivity-reflection: a critical review. Journal of Learning Disabilities, 1978, 11(10), 626-632.

BEHAR, L.B. The Preschool Behavior Questionnaire. Journal of Abnormal Child Psychology, 1977, 5(3), 265-275.

BEISWENGER, H. Luria's model of verbal control of behavior. Merrill-Palmer Quarterly, 1968, 14, 267-284.

BEISWENGER, H. Linguistic and psychological factors in speech regulation of behavior in young children. Journal of Experimental Child Psychology, 1971, 11, 63-75.

BEM, S.L. Verbal self-control: the establishment of effective self-instruction. Journal of Experimental Psychology, 1967, 74(4), 485-491.

BENDER, N.N. Self-verbalization versus tutor verbalization in modifying impulsivity. Journal of Educational Psychology, 1976, 68(3), 347-354.

BENNETT, S.N. A re-evaluation of the Junior Eysenck Personality Inventory. British Journal of Educational Psychology, 1973, 43, 131-139.

BENNETT, S.N. & YOUNGMAN, M.B. Personality and behaviour in school (children). British Journal of Educational Psychology, 1973, 43, 228-233.

BIJOU, S.W.,& BAER, D.M. Operant methods in child behavior and development. In W.K. Honig (Ed.), Operant Behavior: Areas of Research and Application. New York: Appleton-Century-Crofts, 1966.

BINDRA, D.,& WAKSBERG, H. Methods and terminology in studies of time estimation. Psychological Bulletin, 1956, 53(2), 155-159.

BIRCH, D. Verbal control of nonverbal behavior. Journal of Experimental Child Psychology, 1966, 4, 266-275.

BIRCH, D. Evidence for competition and co-ordination between vocal and manual responses in preschool children. Journal of Experimental Child Psychology, 1971, 12, 10-26.

BJORKLUND, D.F.,& BUTTER, E.J. Can cognitive impulsivity be predicted from classroom behavior? Journal of Genetic Psychology, 1973, 123, 185-194.

BLOCK,J. Studies in the phenomenology of emotions. Journal of Abnormal and Social Psychology, 1957, 54, 358-363.

BLOCK, J.,& BLOCK, J.H. Ego development and the provenance of thought. NIMH Progress Report (Grant No. M.H. 16080) University of California, Berkeley, 1973.

BLOCK, J., BLOCK, J.H., & HARRINGTON, D.M. Some misgivings about the Matching Familiar Figures Test as a measure of reflection-impulsivity. Developmental Psychology, 1974, 10(5), 611-632.

BLOCK, J., BLOCK, J.H., & HARRINGTON, D.M. Comments on the Kagan-Messer reply. Developmental Psychology, 1975, 11(2), 249-252.

BLOCK, J.,& PETERSON, P. Some personality correlates of confidence, caution, and speed in a decision situation. Journal of Abnormal and Social Psychology, 1955, 51, 34-41.

BLOOR, D. The regulatory function of language: an analysis and contribution to the current controversy over the Soviet theory. In J. Morton & J.C. Marshall (Eds.), Psycholonguistics Series 1 - Developmental and Pathological. London: Elek Scinece, 1977.

BLOUGH, D.S. Interresponse time as a function of continuous variables: a new method and some data. Journal of Experimental Analysis of Behavior, 1963, 6, 237-246.

BLUNDEN, D., SPRING, C., & GREENBERG, L.M. Validation of the Classroom Behavior Inventory. Journal of Consulting and Clinical Psychology, 1974, 42(1), 84-88.

BLURTON-JONES, N.G. (Ed.), Ethological Studies of Child Behaviour. London: Cambridge University Press, 1974.

BORNSTEIN, P.H., & QUEVILLON, R.P. The effects of a self-instructional package on overactive preschool boys. Journal of Applied Behavior Analysis, 1976, 9, 179-188.

BOURNE, L.E. The Psychology of Thinking. Englewood Cliffs, New Jersey: Prentice Hall, 1971.

BOWER, E.M. Early Identification of Emotionally Handicapped Children in School. 2nd ed. Springfield, Illinois: Charles C. Thomas, 1969.

BOWER, E.M., & LAMBERT, N.M. Behavior ratings of pupils. In A Process for in-school screening of Emotionally Handicapped Children. Princeton, New Jersey: Educational Testing Service.

BOYDEN, J.G., & GILPIN, A.R. Matching Familiar Figures Tests and Stroop Test performance in adults. Perceptual and Motor Skills, 1978, 46, 854.

BRAND, M. (Ed.), The Nature of Human Action. Illinois: Scott, Foresman, 1970.

BRANNIGAN, G.G., & ASH, T. Cognitive tempo and WISC-R performance. Journal of Clinical Psychology, 1977, 33(1), 212.

BROADBENT, D. Perception and Communication. Oxford: Pergamon, 1958.

BRODZINSKY, D.M. The role of conceptual tempo and stimulus characteristics in children's humor development. Developmental Psychology, 1975, 11, 843-850.

BRODZINSKY, D.M., & DEIN, P. Short-term stability of adult reflection-impulsivity. Perceptual and Motor Skills, 1976, 43, 1012-1014.

BRODZINSKY, D.M., FEUER, V., & OWENS, J. Detection of linguistic ambiguity by reflective, impulsive, fast-accurate and slow-inaccurate children. Journal of Educational Psychology, 1977, 69(3), 237-243.

BRONCKART, J.P. Le role regulateur du langage chez l'enfant: critique experimentale des travaux d'A.R. Luria. (French) Neuropsychologia, 1970, 8, 451-463.

BRONCKART, J.P. The regulating role of speech: a cognitivist approach. Human Development, 1973, 16, 417-439.

BROOKS, C.H. The Practice of Autosuggestion by the Method of Emile Coué. Forward by E. Coue. London: Allen & Unwin, 1960.

BROWN, G., & LAWSON, T.W. Sex differences in the stability of reflectivity/impulsivity in infant school pupils. Educational Studies, 1975, 1(2), 99-104.

BROWN, R. A First Language:The Early Stages. Massachusetts: Harvard University Press, 1973.

BROWN, R., & BELLUGI, U. Three processes in the acquisition of syntax. Harvard Educational Review, 1964, 34, 133-151.

BRUNER, A., & REVUSKY, S.H. Collateral behavior in human. Journal of Experimental Analysis of Behavior, 1961, 4, 349-350.

BRUNER, J.S. Organization of early skilled action. Child Development, 1973, 44, 1-11.

BRUNER, J.S. From communication to language--a psychological perspective. Cognition, 1974/75, 3(3), 255-287.

BRUNER, J.S. The ontogenesis of speech act. Journal of Child Language, 1975, 2, 1-19.

BRYAN, T.S., & MCGRADY, H.J. Use of a teacher rating scale. Journal of Learning Disabilities, 1972, 5(4), 199-206.

BUCKY, S.F., BANTA, T.J., & GROSS, R.S. Development of motor impulse control and reflectivity. Perceptual and Motor Skills, 1972, 34, 813-814.

BURLAND, R. The development of the verbal regulation of behaviour in cerebral palsied (multiply handicapped) children. Journal of Mental Subnormality, 1969, 15, 85-89.

BURRON, D., & BUCHER, B. Self-instructions as discriminative cues for rule-breaking or rule-following. Journal of Experimental Child Psychology, 1978, 26, 46-57.

BUSH, E.S., & DWECK, C.S. Reflections on conceptual tempo: relationship between cognitive style and performance as a function of task characteristics. Developmental Psychology, 1975, 11(5), 567-574.

BUSS, A.H., & PLOMIN, R. A Temperament Theory of Personality Development. New York: Wiley, 1975.

BUTCHER, H.J., AINSWORTH, M., & NESBITT, J.E. Personality factors and school achievement. British Journal of Educational Psychology, 1963, 33, 276-285.

CAIRNS, E. Extraversion-introversion and conceptual tempo. Perceptual and Motor Skills, 1973, 37, 470.

CAIRNS, E. Impulsivity: self-report and performance measures. British Journal of Educational Psychology, 1975, 45, 327-329.

CAIRNS, E. The development of a more reliable version of the Matching Familiar Figures Test. Developmental Psychology, 1978a, 14(5), 555-560.

CAIRNS, E. Age and conceptual tempo. Journal of Genetic Psychology, 1978b, 133, 13-18.

CAMP, B., & ZIMET, S.G. The relationship of teacher rating scales to behavior observations and reading achievement of 1st grade children. Journal of Special Education, 1974, 8(4), 353-359.

CAMPBELL, S.B., & DOUGLAS, V.I. Cognitive styles and responses to the threat of frustration. Canadian Journal of Behavioral Science, 1972, 4, 30-42.

CARRIGAN, P.M. Extraversion-introversion as a dimension of personality: a reappraisal. Psychological Bulletin, 1960, 57, 329-360.

CATTELL, R.B. The Scientific Analysis of Personality. Harmondsworth: Penguin, 1965.

CATTELL, R.B. The scree test for the number of factors. Multivariate Behavioral Research, 1966, 1(1), 245-276.

CATTELL, R.B., & COAN, R.W. Child personality structure as revealed in teacher's behavior ratings. Journal of Clinical Psychology, 1957, 13, 315-327.

CATTELL, R.B., EBER, H.W., & TATSUOKA, M.G. Handbook for the Sixteen Personality Questionnaire (16PF). Champaign, Illinois: Institute for Personality and Ability Testing, 1970.

CAUTELA, J.R. Covert sensitization. Psychological Reports, 1967, 20, 459-468.

CHILD, D. The Essentials of Factor Analysis. London: Holt, Rinehart & Winston, 1970.

CLARK, H.H., & CLARK, E.V. Psychology and Language. New York: Harcourt, 1977.

COHEN, S., & PRZYBYCIEN, C.A. Some effects of sociometrically selected peer models on the cognitive styles of impulsive children. Journal of Genetic Psychology, 1974, 124, 213-220.

COLE, P.M., & HARTLEY, D.G. The effects of reinforcement and strategy training on impulsive responding. Child Development, 1978, 49, 381-384.

COMREY, A.L. A First Course in Factor Analysis. New York: Academic Press, 1973.

COMREY, A.L. Common methodological problems in factor analytic studies. Journal of Consulting and Clinical Psychology, 1978, 46(4), 648-659.

COOKSON, D. The Junior Eysenck Personality Inventory and teacher's ratings: an investigation of unexpected results. British Journal of Educational Psychology, 1973, 43, 52-57.

COSTANTINI, A.F., CORSINI, D.A., DAVIS, J.E. Conceptual tempo, inhibition of movement and acceleration of movement in 4, 7- and 9-year-old children. Perceptual and Motor Skills, 1973, 37, 779-784.

COSTANTINI, A.F., & HOVING, K.L. The relationship of cognitive and motor response inhibition to age and IQ. Journal of Genetic Psychology, 1973a, 123, 309-319.

COSTANTINI, A.F., & HOVING, K.L. The effectiveness of reward and punishment contingencies on response inhibition. Journal of Experimental Child Psychology, 1973b, 16, 484-494.

COTTON, E. & PARNWELL, M. Conductive education: with special reference to severe athetoids in a non-residential centre. Journal of Mental Subnormality, 1968, 14, 50-56.

COUÉ, E. The Practice of Autosuggestion. New York: Doubleday, 1922.

CRANE, V., & BALLIF, B. Effects of black or white adult modeling with rule structure on adopting a standard for self-control in black boys. Journal of Educational Research, 1976, 70(2), 96-101.

CROMER, R.E. The development of language and cognition: the cognitive hypothesis. In B.M. Foss (Ed.), New Perspectives in Child Development. Hammondsworth: Penguin, 1974.

CRONBACH, L.J. Essentials of Psychological Testing. New York: Harper & Row, 1970.

DANCE, F.E.X. Toward a theory of human communication. In F.E.X. (Ed.), Human Communication Theory. New York: Holt, Rinehart & Winston, 1967.

DAS, J.P. Verbal Conditioning and Behaviour. Oxford: Pergamon Press, 1969.

DATTA, L.E., SCHAEFER, E., & DAVIS, M. Sex and scholastic aptitude as variables in teacher's ratings of the adjustment and classroom behavior of Negro and other seventh grade students. Journal of Educational Psychology, 1968, 59, 94-101.

DEITZ, S.M., & REPP, A.C. Differentially reinforcing low rates of misbehavior with normal elementary school children. Journal of Applied Behavior Analysis, 1974, 7, 622.

De Laguna, T. The Factors of Social Evolution. New York: F.S. Crofts, 1926.

DENNY, D.R. Modeling effects upon conceptual style and cognitive tempo. Child Development, 1972a, 43, 105-119.

DENNY, D.R. Modeling and eliciting effects upon conceptual strategies. Child Development, 1972b, 43, 810-823.

DENNY, D.R. Reflection-impulsivity as determinants of conceptual strategy. Child Development, 1973, 44, 614-623.

DIELMAN, T.E., CATTELL, R.B., & LEPPER, C. Dimensions of problem behavior in the early grades. Journal of Consulting and Clinical Psycholgy, 1971, 37(2), 243-249.

DIGMAN, J.M. Principle dimensions of child personality as inferred from teacher's judgments. Child Development, 1963, 34, 43-60.

DIGMAN, J.M. Child behavior ratings: further evidence of a multiple-factor model of child personality. Educational and Psychological Measurement, 1965, 25(3), 787-799.

DOUGLAS, V.I. Stop, look and listen: the problem of sustained attention and impulse control in hyperactive and normal children. Canadian Journal of Behavior Science, 1972, 4(4), 259-282.

DOUGLAS, V.I., PARRY, P., MARTON, P., & GARSON, C. Assessment of a cognitive training program for hyperactive children. Journal of Abnormal Child Psychology, 1976, 4, 389-410.

DUCKWORTH, S.V., RAGLAND, G.G., SOMMERFELD, R.E., & WYNE, M.D. Modification of conceptual impulsivity in retarded children. American Journal of Mental Deficiency, 1974, 79(1), 59-63.

EDWARDS, A.L. Experimental Designs in Psychological Research. 3rd ed. London: Holt, Rinehart & Winston, 1968.

EDWARDS, D.D., & DART, G.A. Some functions of collateral behavior. Psychonomic Science, 1967, 9(2), 101-102.

EGELAND, B. Training impulsive children in the use of more efficient acanning techniques. Child Development, 1974, 45, 165-171.

EGELAND, B., & WEINBERG, R.A. The M.F.F. Test: a look at its psychometric credibility. Child Development, 1976, 47, 483-493.

EL'KONIN, D.B. The problem of instruction and development in the works of L.S. Vygotsky. Soviet Psychology, 1966-1967, 5(3), 34-41.

ELMORE, P.B., & BEGGS, D.L. Consistency of teachers ratings of pupil personality traits in a classroom setting. Measurement and Evaluation in Guidance, 1975, 8(2), 70-73.

ENTWISTLE, N.J. Academic motivation of school attainment, British Journal of Educational Psychology, 1968, 38, 181-188.

ERIKSON, L., & OTTO, W. Effects of intra-list similarity and reflection-impulsivity on kindergarten children's work recognition. Journal of Educational Research, 1973,66(10), 466-470.

EYSENCK, H.J. The Dynamics of Anxiety and Hysteria. London: Routledge & Kegan Paul, 1957.

EYSENCK, H.J. The Biological Basis of Personality. Springfield, Illinois: Charles C. Thomas, 1967.

EYSENCK, H.J. The Structure of Human Personality. 3rd ed. London: Menthuen, 1970.

EYSENCK, H.J. Human typology, higher nervous activity, and factor analysis. In V.D. Nebylitsyn, & A.J. Gray (Eds.), The Biological Bases of Individual Behavior. New York: Academic Press, 1972a.

EYSENCK, H.J. Primaries or second-order factors: a critical consideration of Cattell's 16PF battery. British Journal of Social and Clinical Psychology, 1972b, 11, 265-269.

EYSENCK, H.J. Personality and factor analysis: a reply to Guilford. Psychological Bulletin, 1977, 84(3), 405-411.

EYSENCK, H.J., & COOKSON, D. Personality in primary school children: 2. teachers' ratings. British Journal of Educational Psychology, 1969, 39(2), 123-130.

EYSENCK, H.J., & EYSENCK, S.B.G. Personality Structure and Measurement. London: Routledge & Kegan Paul, 1969.

EYSENCK, H.J., & EYSENCK, S.B.G. Manual of the Eysenck Personality Questionnaire (Junior and Adult) . London: Hodder & Stoughton, 1975.

EYSENCK, H.J., & EYSENCK, S.B.G. Psychoticism: as a Dimension of Personality. London: Hodder & Stoughton, 1976.

EYSENCK, H.J., & LEVY, A. Conditioning, introversion-extraversion and the strength of the nervous system. In V.D. Nebylitsyn, & J.A. Gray (Eds.), Biological Bases of Individual Behavior. New York: Academic Press, 1972.

EYSENCK, H.J., & RACHMAN, S. The Causes and Cures of Neurosis. London: Routledge & Kegan Paul, 1965.

EYSENCK, H.J., & WILSON, G. Know Your Own Personality. Harmondsworth: Penguin, 1976.

EYSENCK, S.B.G. Manual of the Junior Eysenck Personality Inventory. London: University of London Press, 1965.

EYSENCK, S.B.G., & EYSENCK, H.J. On the dual nature of extraversion. British Journal of Social and Clinical Psychology, 1963, 2, 46-55.

EYSENCK, S.B.G., & EYSENCK, H.J. The place of impulsiveness in a dimensional system of personality description. British Journal of Social and Clinical Psychology, 1977, 16, 57-68.

EYSENCK, S.B.G., & EYSENCK, H.J. Impulsiveness and venturesomeness: their position in a dimensional system of personality description. Psychological Reports, 1978, 43, 1247-1255.

EYSENCK, S.B.G., & PICKUP, A.J. Teachers ratings of extraversion and neuroticism and children's inventory responses. British Journal of Educational Psychology, 38, 94-96.

FARLEY, F.H. Individual differences in free response-speed. Perceptual and Motor Skills, 1966, 22, 557-558.

FERSTER, C.B., & SKINNER, B.F. Schedules of Reinforcement. New York: Appleton-Century-Crofts, 1957.

FESHBACH, N.D. Student teacher preference for elementary school pupils varying in personality characteristics. Journal of Educational Psychology, 1969, 60, 126-132.

FINCH, A.J.Jr., CRANDELL, C., & DEARDORFF, P.A. Reflection-impulsivity and need for achievement in emotionally disturbed children. Journal of Genetic Psychology, 1976, 129, 329-331.

FINCH, A.J.Jr., DEARDORFF, P.A., & MONTGOMERY, L.E. Reflection-impulsivity: reliability of the Matching Familiar Figures Test with emotionally disturbed children. Psychological Reports, 1974, 35, 1133-1134.

FINCH, A.J.Jr., KENDALL, P.C., DEARDORFF, P.A., ANDERSON, J., & SITARZ, A.M. Reflection-impulsivity, persistence behavior, and locus of control in emotionally disturbed children. Journal of Consulting and Clinical Psychology, 1975, 43(5), 748.

FINCH, A.J.Jr., & MONTGOMERY, L.E. Reflection-impulsivity and information seeking in emotionally disturbed children. Journal of Abnormal Child Behavior, 1973, 1, 358-362.

FINCH, A.J.Jr., & NELSON, W.M.III. Reflection-impulsivity and behavioral problems in emotionally disturbed boys. Journal of Genetic Psychology, 1976, 128, 271-274.

FINCH, A.J.Jr., WILKINSON, M., NELSON, W.M.III, & MONTGOMERY, L.E. Modification of an impulsive cognitive tempo in emotionally disturbed boys. Journal of Abnormal Child Psychology, 1975, 3, 45-52.

FIRESTONE, P., & DOUGLAS, V.I. The effects of verbal and material rewards and punishers on the performance of impulsive and reflective children. Child Study Journal, 1977, 7(2), 71-78.

FLAVELL, J.H. The Developmental Psychology of Jean Piaget. Princeton, New Jersey: Van Nostrand, 1963.

FLAVELL, J.H. Cognitive Development. Englewood Cliffs, New Jersey: Prentice Hall, 1977.

FLETCHER, S.G. Speech as an element in organization of a motor response. Journal of Speech and Hearing Research, 1962, 5, 292-300.

FLYNN, W.E., & TEDFORD, W.H.Jr. Stereotyped behavior during spaced responding: mediation vs superstition. Psychological Record, 1976, 26, 553-556.

FRAISSE, P. The Psychology of Time. New York: Harper & Row, 1963.

FREUD, S. Psychopathology of Everyday Life. Trans. by A.A. Brill, 1914. London : Ernest Beun, 1935.

FRY, P.S. Resistence to temptation as a function of the duration of self-verbalization. British Journal of Social and Clinical Psychology, 1978, 17, 111-116.

FRY, P.S., & PRESTON, J. Resistance to temptation as a function of internalization and three modes of self-verbalization. Journal of Clinical Psychology, 1979, 35(1), 121-129.

FUQUA, R.W., BARTSCH, T.W., & PHYE, G.D. An investigation of the relationship between cognitive tempo and creativity in preschool-age children. Child Development, 1975, 46, 779-782.

FURTH, H.G. Thinking Without Language -- Psychological Implications of Deafness. New York: Free Press, 1966.

GAINES, P.D. The modification of attentional strategies in children. Report 1, Developmental Program, Department of Psychology, University of Michigan, Ann Arbor, Michigan, 1971.

GAN'KOVA, Z.A. The interrelationship of action, image and speech in the thinking of pre-school children. Problems of Psychology, 1960, 1, 26-35.

GELLERMANN, L.W. Chance orders of alternating stimuli in visual discrimination experiments. Journal of Genetic Psychology, 1933, 42, 206-208.

GENSHAFT, J.L., & HIRT, M. Race effects in modifying cognitive impulsivity through self-instruction and modeling. Journal of Experimental Child Psychology, 1979, 27, 185-194.

GIBSON, H.B. A lie scale for the Junior Maudsley Personality Inventory. British Journal of Educational Psychology, 1964, 34, 120-124.

GIBSON, H.B. Teacher's ratings of schoolboys' behaviour related to patterns of scores on the New Junior Maudsley Inventory. British Journal of Educational Psychology, 1967, 37, 347-355.

GLASS, G.V. Factors in teacher's perceptions of students. Journal of Educational Measurement, 1967, 4, 87-93.

GLENWICK, D.S. Some interpersonal correlates of cognitive impulsivity in fourth-graders. Journal of School Psychology, 1976, 14(3), 212-221.

GLENWICK, D.S., & BURKA, A.A. Cognitive impulsivity and role-taking skills in elementary school children. Perceptual and Motor Skills, 1975, 41, 547-552.

GOLDEN, M., MONTARE, A., & BRIDGER, W. Verbal control of delay behavior in two-year-old boys as a function of social class. Child Development, 1977, 48, 1107-1111.

GOLDFRIED, M.R., & MERBAUM, M. (Eds.) Behavior Change Through Self-control. New York: Holt, Rinehart & Winston, 1973.

GOLLIN, E.S. A developmental approach to learning and cognition. In L.P. Lipsitt, & C.C. Spiker (Eds.), Advances in Child Behavior and Development. Vol. 2, New York: Academic Press, 1965.

GOLLIN, E.S., & SAROVO, A. A developmental analysis of learning. In J. Hellmuth (Ed.), Cognitive Studies, Vol. 1. New York: Brunner/Mazel, 1970.

GRANT, R.A. The relation of perceptual activity to MFF Test accuracy. Developmental Psychology, 1976, 12(6), 534-539.

GRAY, J.A. Strength of the nervous system, introversion-extraversion, conditionability and arousal. Behaviour Research and Therapy, 1967, 5, 151-170.

GRAY, J.A. The psychophysiological basis of introversion-extraversion. Behaviour Research and Therapy, 1970, 8, 249-266.

GRAY, J.A. The Psychology of Fear and Stress . London: Weidenfeld & Nicolson, 1971.

GRAY, J.A. The psychophysiological nature of introversion-extraversion: a modification of Eysenck's theory . In V.D. Nebylitsyn, & J.A. Gray (Eds.), The Biological Bases of Individual Behavior. New York : Academic Press, 1972a.

GRAY, J.A. Learning theory, the conceptual nervous system and personality. In V.D. Nebylitsyn, & J.A. Gray (Eds.), Biological Bases of Individual Behavior. New York: Academic Press, 1972b.

GRAY, J.A. Causal theories of personality and how to test them. In J. Royce (Ed.), Multivariate Analysis and Psychological Theory. London: Academic Press, 1973.

GRAY, J.A. The neuropsychology of anxiety: The Myers Lecture, 1977. Also in British Journal of Psychology, 1978, 69,417.

GRAY, V.A. Stimulus control of differential-reinforcement-of-low-rate responding. Journal of Experimental Analysis of Behavior, 1976, 25, 199-207.

GREENFIELD, P.M., & SMITH, J.H. The Structure of Communication in Early Language Development. New York: Academic Press, 1976.

GUILFORD, J.P. Will the real factor of extraversion-introversion please stand up? A reply to Eysenck. Psychological Bulletin, 1977, 84(3), 412-416.

GUTTMAN, L. Some necessary conditions for common-factor analysis. Psychometrika, 1954, 19, 149-161.

HALL,V., & RUSSELL, W. Multitrait-multimethod analysis of conceptual tempo. Journal of Educational Psychology, 1974, 66, 932-939.

HALLAHAN, D.P., KAUFFMAN, J.M., & BALL, D.W. Selective attention and cognitive tempo of low-achieving and high-achieving 6th grade males. Perceptual and Motor Skills, 1973, 36, 579-583.

HALLWORTH, H.J. Perception of children's personalities by experienced teachers. Educational Review, 1966, 19, 3-12.

HARRÉ, R. Blueprints of a new science. In N. Armistead, Reconstructing Social Psychology. Hammondsworth: Penguin, 1974.

HARRIS, W.J., & DRUMMOND, R.J., & SCHULTZ, E.W. An investigation of relationships between teachers' ratings of behavior and children's personality traits. Journal of Abnormal Child Psychology, 1977, 5(1), 43-52.

HARRISON, A., & NADELMAN, L. Conceptual tempo and inhibition of movement in black preschool children. Child Development, 1972, 43, 657-668.

HARTIG, M., & KANFER, F.H. The role of verbal self-instructions in children's resistance to temptation. Journal of Personality and Social Psychology, 1973, 25(2), 259-267.

HARZEM, P., LOWE, C.F., & BAGSHAW, M. Verbal control in human operant behavior. Psychological Record, 1978, 28, 405-423.

HASKIN, R., & MCKINNEY, J.D. Relative effects of response tempo and accuracy on problem solving and academic achievement. Child Development, 1976, 47, 690-696.

HATANO, G., & INAGAKI, K. Reflection-impulsivity in perceptual and conceptual matching tasks among kindergarten children. Japanese Psychological Research, 1976, 18(4), 196-203.

HAYES, C.S., & PRINZ, R.J. Teacher's rated impulsivity and achievement among mildly retarded youth. Psychology in the Schools, 1975, 12(1), 100-102.

HAYES, C.S., PRINZ, R.J., & SIDERS, C. Reflection-impulsivity and reading recognition ability among mildly retarded children. American Journal of Mental Deficiency, 1976, 81(2), 194-196.

HEARST, E. Some persistent problems in the analysis of conditioned inhibition. In R.A. Boakes & M.S. Halliday (Ed.), Inhibition and Learning . London: Academic Press, 1972.

HEIDER, E.R. Information processing and the modification of an "impulsive conceptual tempo". Child Development, 1971, 42, 1276-1281.

HEINS, E.D., HALLAHAN, D.P., TARVER, S.G., KAUFFMAN, J.M. Relationship between cognitive tempo and selective attention in learning disabled children. Perceptual and Motor Skills, 1976, 42, 233-234.

HEMRY, F.P. Effect of reinforcement conditions on a discrimination learning task for impulsive versus reflective children. Child Development, 1973, 44, 657-660.

HERBERT, G.W. Teacher's ratings of classroom behaviour: factorial structure. British Journal of Educational Psychology, 1974, 44, 233-240.

HIGA, W.R., THARP, R.G., & CALKINS, R.P. Developmental verbal control of behavior: implications for self-instructional training. Journal of Experimental Child Psychology, 1978, 26(4), 489-497.

HIMMELWEIT, H.T. Speed and accuracy of work as related to temperament. British Journal of Psychology, 1946, 36, 132-144.

HODOS, W., ROSS, G.S., & BRADY, J.V. Complex response patterns during temporally spaced responding. Journal of Experimental Analysis fo Behavior, 1962, 5, 473-479

HOOD, J., & KENDALL, J.R. A qualitative analysis of oral reading errors of reflective and impulsive second graders: a follow up study. Journal of Reading Behavior, 1975, 7(3), 269-281.

HOWARTH, E. What Cattell's "Personality sphere" factors correctly identified in the first instance? British Journal of Psychology, 1976, 2, 213-230.

ISRAEL, A.C., & O'LEARY, K.D. Developing correspondence between children's words and deeds. Child Development, 1973, 44, 575-581.

IVANOV-SMOLENSKII, A.G. Developmental paths of experimental research into the work and interaction of the first and second signalling systems. Works of the Institute of Higher Nervous Activity, Pathological Series, Vol. II, 1-31. Washington D.C.: National Science Foundation, 1960.

JARVIS, P.E. Verbal control of sensory-motor performance: a test of Luria's hypotheses. Human Development, 1968, 11, 172-183.

JEFFREY, W.E. The effects of verbal and nonverbal responses in mediating an instrumental act. Journal of Experimental Psychology, 1953, 45(5), 327-333.

JOHNSON, O.G. Test and Measurement in Child Development: Handbook II. Vol.i. San Francisco: Jossey Bass, 1976.

JONES, R.R., & COBB, J.A. Teachers versus observers as classroom data collectors. Paper presented at the meeting of the Western Psychological Association, Anaheim, California, April, 1973.

JOYNT, D., & CAMBOURNE, B. Psycholinguistic development and the control of behaviour. British Journal of Educational Psychology, 1968, 38, 249-260.

JULIANO, D.B. A developmental study of conceptual tempo, concept learning and abstraction. Journal of Psychology, 1977a, 96, 243-249.

JULIANO, D.B. Reflection-impulsivity and concept learning in disadvantaged and middle class children. Journal of Psychology, 1977 96, 103-110.

KAGAN, J. Impulsive and reflective children: significance of conceptual tempo. In J.D. Krumboltz (Ed.), Learning and the Educational Process. Chicago: Rand McNally, 1965a.

KAGAN, J. Reflection-impulsivity and reading ability in primary grade children. Child Development, 1965b, 36, 609-628.

KAGAN, J. Reflection-impulsivity: the generality and dynamics of conceptual tempo. Journal of Abnormal Psychology, 1966a, 71(1), 17-24.

KAGAN, J. Developmental studies in reflection and analysis. IN A.H. Kidd, & J.L. Rivoire (Eds.), Perceptual Development in Children. London: University of London Press, 1966b.

KAGAN, J. Biological aspects of inhibition system. American Journal of Disease of Children, 1967, 114, 507-512.

KAGAN, J., & KOGAN, N. Individual variation in cognitive processes. In P.H. Mussen (Ed.), Carmichael's Manual of Child Psychology. 3rd ed. Vol.1. New York: Wiley, 1970.

KAGAN, J., & MESSER, S.B. A reply to "Some misgivings about the Matching Familiar Figures Test as a measure of reflection-impulsivity". Developmental Psychology, 1975, 11(2), 244-248.

KAGAN, J., PEARSON, L., & WELCH, L. Conceptual impulsivity and inductive reasoning. Child Development, 1966a, 37(3-4), 583-594.

KAGAN, J., PEARSON, L., & WELCH, L. Modifiability of an impulsive tempo. Journal of Educational Psychology, 1966b, 57, 359-365.

KAGAN, J., ROSMAN, B.L., DAY, D., ALBERT, J, & PHILIPS,W. Information processing in the child: significance of analytic and reflective attitudes. Psychological Monograph (General & Applied), 1964, 78(1). Whole No. 578.

KANFER, F.H. & PHILLIPS, J.S. Learning Foundations of Behavior Therapy. New York: Wiley.

KAROLY, P., & BRIGGS, N.Z. Effects of rules and directed delays on components of children's inhibitory self-control. Developmental Psychology, 1978, 26, 267-279.

KATZ, J.M. Reflection-impulsivity and color-form sorting Child Development, 1971, 42, 745-754.

KATZ, M.M. The effects of aging on the verbal control of motor behavior. International Journal of Aging and Human Development , 1974, 5(2), 141-156.

KELLEHER, R.T. Chaining and conditioned reinforcemnt. In W.K. Honig (Ed.), Operant Behavior: Areas of Research and Application. New York: Appleton-Century-Croft, 1966.

KENDALL, P.C., & FINCH, A.J.Jr. A cognitive-behavioural treatment for impulsivity: a group comparison study. Journal of Consulting and Clinical Psychology, 1978, 46(1), 110-118.

KENDLER, T.S., & KENDLER, H.H. Reversal and nonreversal shifts in kindergarten children. Journal of Experimental Psychology, , 1959, 58, 56-60.

KERLINGER, F.N., & PEDHAZUR, E.J. Multiple Regression in Behavioural Research. New York: Holt, Rinehart & Winston, 1973.

KLEIN, G.A., BLOCKOVICH, R.N., BUCHALTER, P.S., & HUYGHE, L. Relationship between reflection-impulsivity and problem solving. Perceptual and Motor Skills, 1976, 42, 67-73.

KLINGER, E. Utterances to evaluate steps and control attention to distinguish operant from respondent thought while thinking out loud. Bulletin of the Psychonomic Society, 1974, 4(1), 44-45.

KOGAN, N. Cognitive Styles in Infancy and Early Childhood. Hillsdale, New Jersey: Lawrence Erlbaum, 1976.

KOHLBERG, L., YAEGER, J., & HJERTHOLM, E. Private speech: four studies and a review of theories. Child Development, 1968, 39, 690-736.

KOHN, M., & ROSMAN, B.L. A social competence scale and symptom checklist for the preschool child: factor dimensions, their cross-instrument generality, and longitudinal persistence. Development Psychology, 1972, 6(3), 430-444.

KRAMER, T.J., & RILLING, M. Effects of time-out on spaced responding in pigeons. Journal of Experimental Analysis of Behavior, 1969, 12, 283-288.

KRAMER, T.J., & RILLING, M. Differential reinforcement of low rates: a selective critique. Psychological Bulletin, 1970, 74, 225-254.

KUENNE, M.R. Experimental investigation of the relation of language to transposition behavior in young children. Journal of Experimental Psychology, 1946, 36, 471-490.

KURTZ, P.D., NEISWORTH, J.T., GOEKE, K., & HANSON, M. Training verbal-nonverbal correspondence. Journal of Applied Social Psychology, 1976, 6(4), 314-321.

LAMBERT, N.M., & HARTSOUGH, C.S. Scaling behavioral attributes of children using multiple teacher judgments of pupil characteristics. Educational and Psychological Measurement, 1973, 33, 859-874.

LATIES, V.G., WEISS, B., & WEISS, A.B. Further observations on overt "mediating" behavior and the discrimination of time. Journal of Experimental Analysis of Behavior, 1969, 12, 43-57.

LEBEDINSKAIA, E.I., & POLIAKOVA, A.G. Conflict between the first and second signal system. In The Central Nervous System and Behaviour. National Institute of Health, 1960.

LENNEBERG, E.H., & LENNEBERG, E. (Eds.), Foundations of Language Development: a Multidisciplinary Approach. Vol. I & II. New York: Academic Press.

LEONTIEV, A.N. Inner speech and the process of grammatical generation of utterances. Soviet Psychology, 1968-1969, 7(3), 11.

LEONTIEV, A.N., & LURIA, A.R. The psychological ideas of L.S. Vygotskii. In B.J. Wolman (Ed.), Historical Roots of Contemporary Pscyhology. New York:Harper & Row,1968.

LEWIS, M., RAUSCH, M., GOLDBERG, S., DODD, C. Error, response time and IQ: sex differences in cognitive style of preschool children. Perceptual and Motor Skills, 1968, 26, 563-568.

LIUBLINSKAYA, A.A. The development of children's speech and thought. In B. Simon (Ed.) Psychology of the Soviet Union. London: Routledge & Kegan Paul, 1957.

LONDON, P. Behaviour Control. New York: Harper & Row, 1969.

LOO, C., & WENAR, C. Activity level and motor inhibition: their relationship to intelligence-test performance in normal children. Child-Development, 1971, 42, 967-971.

LOVASS, O.I. Interaction between verbal and nonverbal behavior. Child Development, 1961, 32, 329-336.

LOVASS, O.I. Cue properties of words: the control of operant responding by rate and content of verbal operants. Child Development, 1964a, 35, 245-256.

LOVASS, O.I. Control of food intake in children by reinforcement of relevant verbal behavior. Journal of Abnormal and Social Psychology, 1964b, 68(6), 672-678.

LURIA, A.R. The Nautre of Human Conflict. New York: Liveright, 1932.

LURIA, A.R. The role of language in the formation of temporary connections. IN B. Simon (Ed.), Psychology in the Soviet Union. London: Routledge & Kegan Paul, 1957.

LURIA, A.R. Brain disorder and language analysis. Language and Speech, 1958a, 1, 14-34.

LURIA, A.R. The role of speech in child development. Problems of Psychology, 1958b, IV(5), 3-17.

LURIA, A.R. The directive function of speech in development and dissolution: Part I. Word, 1959a, 15(3), 341-352.

LURIA, A.R. The directive function of speech in development and dissolution: Part II. Word, 1959b, 15(3), 453-464

LURIA, A.R. Experimental analysis of the development of voluntary action in children. In The Central Nervous System and Behaviour. Washington D.C.: USPHS, 1959c.

LURIA, A.R. Verbal regulation of behaviour. In A.B. Brazier (Ed.), The Central Nervous System and Behaviour. New York: Josiah May Jr. Foundation, 1960.

LURIA, A.R. The Role of Speech in the Regulation of Normal and Abnormal Behaviour. London: Pergamon, 1961a.

LURIA, A.R. Speech development and the formation of mental processes. In B.G. Anan'yev (Ed.), Psychological Science in the USSR. Washington D.C.: Office of Technical Science, U.S. Department of Commerce, 1961b.

LURIA, A.R. The Mentally Retarded Child . London: Pergamon, 1963.

LURIA, A.R. Human Brain and Psychological Processes. New York: Harper & Row, 1966.

LURIA, A.R., & VINOGRADOVA, O.S. An objective investigation of the dynamics of semantic systems. British Journal of Psychology, 1959, 50(2), 89-105.

LURIA, A.R., & YUDOVICH, F. Speech and the Developmental Process in the Child. London: Staple Press, 1959.

MACCOBY, E.E., DOWLEY, E.M., HAGEN, J.W., & DEGERMAN, R. Activity level and intellectual functioning in normal school children. Child Development, 1965, 36, 761-770.

MCCLUSKEY, K.A., & WRIGHT, J.C. Reflection-impulsivity and age as determinants of visual scanning strategies in preschool activity. Paper presented at the biennial meeting of the Society for Research in Child Development, Denver, Colorado, April, 1975.

MCKINNEY, J.D. Problem solving strategies in impulsive and reflective second graders. Developmental Psychology, 1973, 8, 145.

MCKINNEY, J.D. Teacher perceptions of the classroom behavior of reflective and impulsive children. Psychology in the Schools , 1975, 12(3), 348-352.

MAHONEY, M.J., & THORESEN, C.E. Self-control: Power to the Person. Monterey, California: Brooks/Cole, 1974.

MANN, L. Differences between reflective and impulsive children in tempo and quality of decision making. Child Development, 1973, 44, 274-279.

MANUILENKO, Z.V. The development of voluntary behaviour in preschool-age children. Soviet Psychology, 1974-1975. 13(4), 65-116.

MARGOLIS, H. Relationship between auditory-visual integration, reading readiness, and conceptual tempo. Journal of Psychology, 1976, 63, 181-189.

MASSARI, D., HAYWEISER, L., & MEYER, W. Activity level and intellectual functioning in deprived preschool children. Developmental Psychology, 1969, 1, 286-290.

MASSARI, D.J., & SCHACK, M.L. Discrimination learning by reflective and impulsive children as a function of reinforcement schedule. Developmental Psychology, 1972, 6, 183.

MEADE, E.R., & SALTZ, E. Factors in the verbal control of behavior by lower and middle social economic class children. Studies in intellectual development, technical report series No. 1. (Nov. 1972). Wayne State University, Michigan, Center for the Study of Cognitive Processes. (Sponsor agency: Office of Education, Washington D.C.)

MEICHENBAUM, D. The nature and modification of impulsive children: training impulsive children to talk to themselves. Paper presented at the Society for Research in Child development Conference, at Minneapolis, Minnesota, in April, 1971.

MEICHENBAUM, D. Theoretical and treatment implications of developmental research on verbal control of behavior. Paper presented at the meeting of the Society for Research in Child Development, Philadelphia,April, 1973.

MEICHENBAUM, D. The clinical potentials of modifying what clients say to themselves. In M.J. Mahoney, & C.E. Thoresen, (Eds.), Self-control: Power to the Person. Monterey, California: Brooks/Cole, 1974.

MEICHENBAUM, D. Towards a cognitive theory of self-control. In C. Schwartz, & D. Shapiro (Eds.), Consciousness and Self-regulation: Advance in Research. New York: Plenum Press, 1975.

MEICHENBAUM, D. Cognitive Behavior Modification: An Integral Approach. New York: Plenum Press, 1977.

MEICHENBAUM, D., & CAMERON, R. Stress inoculation: a skills training approach to anxiety management. Unpublished, 1972.

MEICHENBAUM, D., & GOODMAN, J. The developmental control of operant motor responding by verbal operants. Journal of Experimental Child Psychology, 1969a, 7, 553-565.

MEICHENBAUM, D., & GOODMAN, J. Reflectivity-impulsivity and verbal control of motor behavior. Child Development, 1969b, 40, 785-797.

MEICHENBAUM, G., & GOODMAN, J. Training impulsive children to talk to themselves: a means of developing self-control. Journal of Abnormal Psychology, 1971, 77(2), 115-126.

MESSER, S. Reflection-impulsivity: stability and school failure. Journal of Educational Psychology, 1970a, 61(6), 487-490.

MESSER, S. The effects of anxiety over intellectual performance on reflection-impulsivity in children. Child Development, 1970b, 41, 723-735.

MESSER, S. Reflection-impulsivity: a review. Psychological Bulletin, 1976, 83(6), 1026-1052.

MICHAELIS, W., & EYSENCK, H.J. The determination of personality inventory factor patterns and inter-correlations by change in real-life motivation. Journal of Genetic Psychology, 1971, 118, 223-234.

MILLER, A., & GIMPL, M.P. Operant verbal self-control in studying. Psychological Reports, 1972, 30, 495-498.

MILLER, D.T., WEINSTEIN, S.M., & KARNIOL, R. Effects of age and self-verbalization on children's ability to delay gratification. Developmental Psychology, 1978, 14(5), 569-570.

MILLER, G.A., GALANTER, E., & PRIBRAM, K.H. Plans and Structure of Behavior. New York: Holt, Rinehart & Winston, 1960.

MILLER, L.C. School behavior checklist: an inventory of deviant behavior for elementary school children. Journal of Consulting and Clinical Psychology, 1972, 38, 134-144.

MILLER, S.A., SHELTON, J., & FLAVELL, J.H. A test of Luria's hypothesis concerning the development of verbal self-regulation. Child Development, 1970, 41(3), 651-665.

MISCHEL, W. Theory and research on the antecedents of self-imposed delay of reward. In B. Maher (Ed.), Progress in Experimental Personality Research, Vol. 3, New York: Academic Press, 1966.

MISCHEL, W. Towards a cognitive social learning reconceptualization of personality. Psychological Review, 1973, 80(4), 252-283.

MISCHEL, W. Processes in delay of gratification. In L. Berkowitz, (Ed.), Advances in Experimental Social Psychology, Vol. 7. New York: Academic Press, 1974.

MISCHEL, W., & EBBESEN, E.B. Attention in delay of gratification. Journal of Presonality and Social Psychology, 1970, 16, 329-337.

MISCHEL, W., EBBESEN, E.B., & ZEISS, A.R. Cognitive and attentional mechanisms in delay of gratification. Journal of Personality and Social Psychology, 1972, 21(2), 204-218.

MISCHEL, W., & MASTERS, J.C. Effects of probability of reward attainment on responses to frustration. Journal of Personality and Social Psychology, 1966, 3, 390-396.

MISCHEL, W., & METZNER, R. Preference for delayed reward as a function of age, intelligence, and length of delay interval. Journal of Abnormal and Social Psychology, 1962, 64(6), 425-431.

MISCHEL, W., & PATTERSON, C.J. Substantive and structural elements of effective plans for self-control. Journal of Personality and Social Psychology, 1976, 34(5), 942-950.

MISCHEL, W., & STAUB, E. The effects of expectancy on waiting and working for larger rewards. Journal of Personality and Social Psychology, 1965, 2, 625-663.

MONAHAN, J., & O'LEARY, K.D. Effects of self-instruction on rule-breaking behavior. Psychological Reports, 1971, 29, 1059-1066.

MUMBAUER, C.C., & MILLER, J.O. Socioeconomic background and cognitive functioning in preschool children. Child Development, 1970, 41, 471-480.

MURRAY, J.D. Spontaneous private speech and performance on a delayed match-to-sample task. Journal of Experimental Child Psychology, 1979, 27, 286-302.

NADELMAN, L. The Matching Familiar Figures Test and conceptual tempo controversy. Report 68, Developmental Psychology Program, Department of Psychology, University of Michigan, Ann Arbor, Michigan, July, 1975.

NELSON, W.J.Jr., & BIRKIMER, J.C. Role of self-instruction and self-reinforcement in the modification of impulsivity. Journal of Consulting and Clinical Psychology, 1978, 46(1), 183.

NICHOLSON, J.N. Behavioural indices of frustration in normal and emotionally maladjusted children. Journal of Child Psychology and Psychiatry, 1975, 16(1), 19-31.

NICHOLSON, J.N., & GRAY, J.A. The Teacher's Rating Scale. Unpublished.

NICHOLSON, J.N., & GRAY, J.A. Peak shift, behavioural contrast and stimulus generalization as related to personality and development in children. British Journal of Psychology, 1972, 63(1), 47-62.

NICHOLSON, J.N., & SHAPLAND, J. The assessment of personality in British schoolchildren: an examination of the effectiveness of various tests. Unpublished.

NIE, N.H., HULL, C.H., JENKINS, J.G., STEINBRENNER, K., & BENT, D.H. Statistical Package for the Social Sciences (SPSS). 2nd ed. New York: McGraw Hill, 1975.

NORDLUND, O, & RÖNNBERG, S. Treatment of a child with disruptive behavior during his mother's social contact. Scandanavian Journal of Behavior Therapy, 1977, 6(1), 19-24.

NUESSLE, W. Reflectivity as an influence on focusing behavior of children. Journal of Experimental Child Psychology, 1972, 14, 265-276.

ODOM, R.D., MCINTYRE, C.W., & NEALE, G.S. The influence of cognitive styles on perceptual learning. Child Development, 1971, 42, 883-891.

O'KEEFE, E.J. Comparison of high- and low-impulse groups on two tests of motor inhibition. Perceptual and Motor Skills, 1973, 37, 435-441.

O'LEARY, K.D. The effects of self-instruction on immoral behavior. Journal of Experimental Child Psychology, 1968, 6, 297-301.

ORBACH, I. Impulsive cognitive styles: three madification techniques. Psychology in the Schools, 1977, 14(3), 353-359.

OSGOOD, C.E. The Measurement of Meaning. Urbana: University of Illinois Press, 1957.

PALKES, H., STEWART, M., & FREEDMAN, J. Improvement in maze performance of hyperactive boys as a function of verbal training procedures. Journal of Special Education, 1972, 5, 337-342.

PALKES, H., STEWART, M., & KAHANA, B. Porteus maze performance of hyperactive boys after training in self-directed verbal commands. Child Development, 1968, 39, 817-826.

PARAMONOVA, N.P. The formation of interaction between the two signalling systems in normal children. In Problems of higher nervous activity in the normal and abnormal child. Vol.1. Moscow:Izd. Akad. Pedag. Nauk, 1956.

PARKER, T.W. Children's strategies of problem solving: enquiry versus action. Unpublished Ph.D. thesis, University of Michigan, 1975.

PATTERSON, C.J., & MISCHEL,W. Effects of temptation-inhibition and task-facilitating plans on self-control. Jounral of Personality and Social Psychology, 1975a, 33(2), 209-217.

PATTERSON, C.J., & MISCHEL, W. Plans to resist distraction. Developmental Psychology, 1975b, 11(3), 369-378.

PAVLOV, I.P. Experimental Psychology and Other Essays. New York: Philosophical Library, 1957.

PAVLOV, I.P. Conditioned Reflexes. New York: Dover Publishing Inc., 1960.

PAWLIK, K. Right answers to the wrong questions? A re-examination of factor analytic personality research and its contribution to personality theory. In J. Royce (Ed.), Multivariate Analysis and Psychological Theory. London: Academic Press, 1973.

PETERSON, D.R. Behavior problems of middle childhood. Journal of Consulting Psychology, 1961, 25(3), 205-209.

PETERSON, D.R. Scope and generality of verbally defined personality factors. Psychological Review, 1965, 72(1), 48-59.

PETRONOVICH, L. Probabilistic functionalism: a conception of research method. American Psychologist, 1979, 34(5), 373-390.

PIAGET, J. The Language and Thought of the Child. 3rd ed. London: Routledge, & Kegan Paul, 1959.

PIAGET, J. Piaget's theory. In P.H. Mussen (Ed.), Carmichael's Manual of Child Development . Vol. 1. 3rd ed. New York: Wiley, 1970.

PLATONOV, K. The Word as a Physiological and Therapeutic Factor (The theory and practice of psychotherapy according to I.P. Pavlov). Trans. by D.A. Myshne. Moscow: Foreign Language Publishing House, 1959.

PLOMIN, R., & BUSS, A. Reflection-impulsivity and intelligence. Psychological Reports, 1973, 33, 726.

PORSHNEV, B.F. Echolalia as a stage in the formation of the second signal system. Voprosy Psikologii, 1964. Also in Soviet Psychology, 1965, 3(3), 3-9.

PORTER, R.B., & CATTELL, R.B. Manual for the Children's Personality Questionnaire (CPQ) Ages 8 through 12. Champaign, Illinois: Institute for Personality and Ability Testing, 1959 and 1968.

POWELL, R.W. Comparison of differential reinforcement of low rates (DRL) performance in pigions (Columba Livia) and crows (Corcus brachyrhynchos). Journal of Comparative and Physiological Psychology, 1974, 86, 736-746.

QUAY, H.C., MORSE, W.C., & CUTLER, R.C. Personality patterns of pupils in special classes for the emotionally disturbed. Exceptional Children, 1966, 33, 297-301.

RAZRAN, G. The observable unconscious and the inferrable conscious in current soviet psychophysiology. Psychological Review, 1961, 68(2), 81-147.

REALI, N., & HALL, V. Effects of success and failure on the reflective and impulsive child. Developmental Psychology, 1970, 3(3), 392-402.

REESE, H.W. Verbal mediation as a function of age level. Psychological Bulletin, 1962, 59(6), 502-509.

REYNOLDS, G.S. Temporally spaced responding in pigeons: development and effects of deprivation and extinction. Journal of Experimental Analysis of Behavior, 1964, 7, 415-421.

RICHARDSON, W.K. A test of the effectiveness of the differential-reinforcement-of-low-rate schedule. Journal of Experimental Analysis of Behavior, 1973, 20(3), 385-391.

RIDBERG, E.H., PARKE, R.D., & HETHERINGTON, E.M. Modification of impulsive and reflective cognitive styles through observation of film-mediated models. Developmental Psychology, 1971, 5, 369-377.

RISLEY, T.R., & HART, H. Developing correspondence between the non-verbal and verbal behavior of preschool children. Journal of Applied Behavior Analysis, 1968, 1, 287-281.

ROBIN, A.L., ARMEL, S., & O'LEARY, K.D. The effects of self-instruction on writing deficiencies. Behavior Therapy, 1975, 6, 178-187.

RODGON, M.M. Single-word usage, cognitive development, and the beginning of combinational speech: a study of 10 English speaking children. Cambridge: Cambridge University Press, 1976.

ROLLINS, H.A., & GENSER, L. Role of cognitive style in a cognitive task: a case favoring the impulsive approach to problem solving. Journal of Educational Psychology, 1977, 69(3), 281-287.

RONDAL, J.A. The role of speech in the regulation of behavior. Research Report, No. 63. Minnesota University, Research , Development, and Demonstration Center in Education of Handicapped Children, 1974.

RONDAL, J.A. Investigation of the regulatory power of the impulsive and meaningful aspects of speech. Genetic Psychology Monagraph, 1976, 94, 3-33.

ROYCE, J.R. The conceptual framework for a multi-factor theory of individuality. In J.R. Royce (Ed.), Multivariate Analysis and Psychological Theory. London: Academic Press, 1973.

RUTTER, M. A children's behaviour questionnaire for completion by teachers: preliminary findings. Journal of Child Psychology and Psychiatry, 1967, 8, 1-11.

RYAN, J. Interpretation and imitation in early language development. In R.A. Hinde, & J. Stevenson-Hinde (Eds.), Constraints on Learning. London: Academic Press, 1973.

SALKIND, N.J. The Development of Norms for the Matching Familiar Figures Test. Unpublished manuscript, University of Kansas, 1978.

SALKIND, N.J., & WRIGHT, J.C. The development of reflection-impulsivity and cognitive efficiency: an integrated model. Human Development, 1977, 20, 377-387.

SAWIN, D.B., & PARKE, R.D. Development of self-verbalized control of resistance to deviation. Developmental Psychology, 1979, 15(2), 120-127.

SCHAEFER, C., BAKER, E., & ZAWEL, D. A factor analytic and reliability study of the Devereux elementary school behavior rating scale. Psychology in the Schools, 1975, 12(3), 295-300.

SCHAEFER, E.S. Development of hierachical, configurational models for parent behavior and child behavior. In J.E. Hill (Ed.), Minnesota Symposia on Child Psychology, Vol. 5. Minneapolis: University of Minnesota Press, 1971.

SCHUBERT, J. The V.R.B. apparatus: an experimental procedure for the investigation of the development of verbal regulation of behaviour. Journal of Genetic Psychology, 1969, 114, 237-252.

SCHUBERT, J. The V.R.B. apparatus: a cross validation. Psychological Reports, 1970, 27, 571-574.

SCHUBERT, J. The V.R.B. Apparatus. University of Saskatchewan-Regina, 1973.

SCHUBERT, J., & CROPLEY, A.J. Verbal regulation of behavior and IQ in Canadian Indian and White children. Developmental Psychology, 1972, 7(3), 295-301.

SCHULTZ, E.W., MANTON, A.B., & SALVIA, J.A. Screening emotionally disturbed children in a rural setting. Exceptional Children, 1972, 39, 134-137.

SCHWEBEL, A.I., & SCHWEBEL, C.R. The relationship between performance on Piagetian tasks and impulsive responding. Journal for Research in Mathematics Education, 1974, 5(2), 98-104.

SHAPIRO, A.H. Verbalization during the preparatory intervals of a reaction-time task and development of motor control. Child Development, 1973, 44, 137-142.

SHAPLAND, J.M., NICHOLSON, J.N., RUSHTON, J.P., & GRAY, J.A. Factors influencing children's performance of a series of differential reinforcement of low rates tasks. Unpublished.

SHERMAN, J.A. Modification of nonverbal behavior through reinforcement of related verbal behavior. Child Development, 1964, 35, 717-723.

SHIPE, D. Impulsivity and locus of control as predictors of achievement and adjustment in mildly retarded and borderline youth. American Journal of Mental Deficiency, 1971, 76(1), 12-22.

SHIPMAN, V.C. Disadvantaged Children and School Experience: Structure and Development of Cognitive Competencies and Styles Prior to School. Princeton, New Jersey: Educational Testing Service, 1971.

SIDMAN, M. Time discrimination and behavior interaction in a free operant situation. Journal of Comparative and Physiological Psychology, 1956, 49, 469-473.

SIEGEL, A.W., BABICH, J.M., & KIRASIC, K.C. Visual recognition memory in reflective and impulsive children. Memory and Cognition, 1974, 2(2), 379-384.

SIEGEL, A.W., KIRASIC, K.C., & KILBURG, R.R. Recognition Memory in reflective and impulsive preschool children. Child Development, 1973, 44, 651-656.

SIEGEL, S. Nonparametric Statistics. New York: McGraw Hill, 1956.

SIEGELMAN, E. Reflective and impulsive observing behavior. Child Development, 1969, 40, 1213-1222.

SIGEL, I.E. Rationale for separate analysis of male and female samples at cognitive tasks. Psychological Record, 1965, 15, 369-376.

SINGH, D. Effects of level of manifest anxiety and type of pretraining on timing behavior. American Journal of Psychology, 1971, 84(1), 134-139.

SKINNER, B.F. Science and Human Behavior. New York: Free Press, 1953.

SMOCK, C.D. The influence of psychological stress on the "intolerance of ambiguity". Journal of Abnormal and Social Psychology, 1955, 50, 177-182.

SOKOLOV, A.N. Inner Speech and Thought. Trans. by G.T. Onischenko, Trans. ed. by D.B. Lindsley. New York: Plenum, 1972.

SPENCE, J.T., & SPENCE, K.W. The motivational components of manifest anxiety: drive and drive stimuli. In C.D. Spielberger (Ed.), Anxiety and Behavior. New York: Academic Press, 1966.

SPIVACK, G., & LEVINE, M. The Devereux Child Behavior Rating Scales: a study of symptom behaviors in latency age atypical children. American Journal of Mental Deficiency, 1964, 68(4), 700-717.

SPIVACK, G. & SPOTTS, J. The Devereux Child Behavior Scale: symptom behaviors in latency age children. American Journal of Mental Deficiency, 1965, 69(6), 839-853.

SPIVACK, G., & SWIFT, M. Devereux Elementary School Behavior Rating Scale Manual. Devon, Pennsylvania: The Devereux Foundation, 1967.

SPIVACK, G., & SWIFT, M. The classroom behavior of children: a critical review of teacher-administered rating scales. Journal of Special Education, 1973, 7(1), 55-89.

SPRING, C., BLUNDEN, D., GREENBERG, L.M., & YELLIN, A.M. Validity and norms of a hyperactivity rating scale. Journal of Special Education, 1977, 11 (3), 313-321.

STAATS, A.W. Learning, Language, and Cognition. New York: Holt, Rinehart & Winston, 1968.

STEIN, N., & FLANAGAN, S. Human DRL performance, collateral behavior and verbalization of the reinforcement contingency. Bulletin of the Psychonomic Society, 1974, 3(1A), 27-28.

STEIN, N., & LANDIS, R. Mediating role of human collateral behavior during a spaced-responding schedule of reinforcement. Journal of Experimental Psychology, 1973, 97(1), 28-33.

STEIN, N., & LANDIS, R. Differential reinforcement of low rates performance by impulsive and reflective children. Journal of Experimental Child Psychology, 1975, 19, 39-50.

STEVENSON, H.W. Learning in children. In P.H. Mussen (Ed.), Carmichael's Manual of Child Psychology. 3rd ed. New York: Wiley, 1970.

STROMMEN, E.A. Verbal self-regulation in a children's game: impulsive errors on "Simon Says". Child Development, 1973, 44, 849-853.

SUSMAN, E.S.P. An evaluation of Luria's theory of verbal vontrol of motor actions with regard to a dual response to one stimulus. Unpublished Ph. D. dissertation, University of Michigan, 1971.

SUTTON-SMITH, B., & ROSENBERG, B.G. A scale to identify impulsive behavior in children. Journal of Genetic Psychology, 1959, 95, 211-216.

SWIFT, M.S., & SPIVACK, G. Clarifying the relationship between academic success and overt classroom behavior. Exceptional Children, 1969, 36(2), 99-104.

TAYLOR, J.A. A personality scale of manifest anxiety. Journal of Abnormal and Social Psychology, 1953, 48, 285-290.

THOMAS, A., & CHESS, S. Temperament and Development. New York: Brunner/Mazel, 1977.

THOMPSON, B. Nursery teachers' perceptions of their pupils: an exploratory study. In J.M. Whitehead and course team (Eds.), Personality and Learning I. The Open University: Hodder & Stoughton, 1975.

THORESEN, C.E., MAHONEY, M.J. Behavioral Self-control. New York: Holt, Rinehart & Winston, 1974.

TIZARD, B. The application of Luria's techniques to the study of normal school children. Journal of Child Psychology and Psychiatry, 1962, 3, 175-184.

TOLOR, A., SCARPETTI, W.L., & LANE, P.A. Teachers' attitudes towards children's behavior revisted. Journal of Educational Psychology, 1967, 58(3), 175-180.

TONER, I.J., HOLSTEIN, R.B., & HETHERINGTON, E.M. Reflection-impulsivity and self-control in preschool children. Child Development, 1977, 48, 239-245.

TONER, I.J., MOORE, L.P., & KIDDER, P.J. The effect of serving as a model of self-control on subsequent resistance to deviation in children. Unpublished manuscript, 1977.

TONER, I.J., PARKE, R.D., & YUSSEN, S.R. The effects of observation of model behavior on the establishment and stability of resistance to deviation in children. Journal of Genetic Psychology, 1978, 132, 283-290.

TONER, I.J., & SMITH, R.A. Age and overt verbalization in delay maintenance behavior in children. Journal of Experimental Child Psychology, 1978, 26, 85-91.

TOPPING, J.S., PICKERING, J.W., & JACKSON, J.A. Efficiency of DRL responding as a function of response effort. Psychonomic Science, 1971, 24(3), 149-150.

TOULIATOS, J., & LINDHOLM, B.W. Relationships of children's grade in school, sex, and social class to teachers' ratings on the behavior problem checklist. Journal of Abnormal Child Psychology, 1975, 3(2), 115-126.

VYGOTSKY, L.S. Thought and Language. Trans. by E. Haafmann & G. Vakar. Cambridge, Massachusetts: M.I.T. Press, 1962.

VYGOTSKY, L.S., & LURIA, A.R. The function and fate of egocentric speech (Summary). Proceedings of the Ninth Congress of Psychology, New Haven, Connecticut, 1929. Princeton: Psychological Review Co.: 1930.

WALKER, R.N. Some temperament traits in children as viewed by their peers, their teachers and themselves. Monograph of the Society for Research in Child Development, 1967, 32(6). Serial No. 114.

WALSH, J.F., & O'CONNER, J.D. When are children disturbed? Elementary School Journal, 1968, 68, 353-356.

WARD, W.C. Reflection-impulsivity in kindergarten children. Child Development, 1968, 39, 867-874.

WARD, W.C. Disadvantaged children and their first school experience: development of self-regulatory behaviors (PR-73-18) Princeton, New Jersey: Educational Testing Service, 1973a.

WARD, W.C. Correlates and implications of self-regulatory behaviors.(PR-73-42) Princeton, New Jersey: Educational Testing Service, 1973b.

WARREN, H.B., & BROWN, R.H. Conditioning operant responses in children. Journal of Genetic Psychology, 1943, 28, 181-207.

WEINER, A.S., & ADAMS, W.V. The effect of failure and frustration on reflective and impulsive children. Journal of Experimental Child Psychology, 1974, 17, 353-359.

WEINER, A.S., & BERZONSKY, M.D. Development of selective attention in reflective and impulsive children. Child Development, 1975, 46, 545-549.

WEISBERG, P. Effects of reinforcement history on timing (DRL) performance in young children. Journal of Experimental Child Psychology, 1970, 9, 348-362.

WEISBERG, P., & TRAGAKIS, C.J. Analyses of differential reinforcement of low rates behavior in young children. Psychological Reports, 1967, 21, 709-715.

WEISMAN, R.G. Some determinants of inhibitory stimulus control. Journal of Experimental Analysis of Behavior, 1969, 12, 443-450.

WEN, S.S. Modifying children's impulsivity through redundancy and variability training. Psychology in the Schools, 1974, 11(4), 440-444.

WERRY, J.S., & QUAY, H.C. Observing the classroom behavior of elementary school children. Exceptional Children, 1969, 35, 461-470.

WERRY, J.S., & SPRAGUE, R.G. Hyperactivity. IN C.G. Costello(Ed.), Symptoms of Psychopathology: A Handbook. New York: Wiley, 1970.

WHITE, S.H. Evidence for a hierarchical arrangement of learning processes. In L.P. Lipsitt, & C.C. Spiker (Eds.), Advances in Child Development and Behavior. Vol.2. New York: Academic Press, 1965.

WHITE, S.H. Some general outlines of the matrix of developmental changes between five and seven years. Bulletin of the Orton Society, 1970, 20, 41-57.

WIENER, N. Cybernetics: or Control and Communication in the Animal and Machines. New York: Wiley, 1948.

WILDER, L. The role of speech and other extra-signal feedback in the regulation of the child's sensorimotor behaviour. Speech Monograph, 1969, 36, 426-434.

WILLIAMS, M., & BERG-CROSS, G. Handwriting characteristics and their relationship to Eysenck's extraversion-introversion and Kagan's impulsivity-reflectivity dimensions. Journal of Personality Assessment, 1977, 41(3), 291-298.

WILSON, M.P., & KELLER, F.S. On the selective reinforcement of spaced responding. Journal of Comparative and Physiological Psychology, 1953, 46, 190-193.

WINER, B.J. Statistical Principles in Experimental Design. 2nd ed. Tokyo: Mcgraw Hill-Kogakusha, 1971.

WOLFE, R., EGELSTON, R., & POWERS, J. Conceptual structure and conceptual tempo. Perceptual and Motor Skills, 1972, 35, 331-337.

WOLFF, P., & WOLFF, E.A. Correlational analysis of motor and verbal activity in young children. Child Development, 1972, 43, 1407-1411.

WOZNIAK, R.H. Verbal regulation of motor behavior-- Soviet research and non-Soviet replications. Human Development, 1972, 15, 13-57.

WRIGHT, J.C., GAUGHAN, D.J., & MCCLANAHAN, R. The KRISP: A normative evaluation. The Kansas Center for Research in Early Childhood Education, Department of Human Development, University of Kansas, 1978.

WRIGHT, J.C., & VLIETSTRA, A.G. Reflection-impulsivity and information processing from three to nine years of age. In M. Fine (Ed.), Intervention with Hyperactivity. Springfield, Illinois: Charles C. Thomas, 1977.

YAKOVLEVA, S.V. Certain features of the process of formation of voluntary behaviour in pre-school age children. In Problems of higher nervous activity in the normal and abnormal child. Vol. II. Izd. Akad. Pedag. Nauk. RSFSR, 1958.

YANDO, R.M., & KAGAN, J. The effects of teacher tempo on the child. Child Development, 1968, 39, 27-34.

ZAPOROZHETS, A.V. The origin and development of the conscious control of movement in man. In N. O'Conner (Ed.), Recent Soviet Psychology. New York: Liveright, 1961.

ZELNIKER, T., BENTLER, P.M., & RENAN, A. Speed versus accuracy as a measure of cognitive style: internal consistency and factor analysis. Child Development, 1977, 48, 301-304.

ZELNIKER, T., & JEFFREY, W.E. Reflection and impulsive children: strategies of information processing underlying differences in problem solving. Monograph of the Society for Research in Child Development, 1976, 41(5), Serial No. 168.

ZELNIKER, T., JEFFREY, W.E., AULT, R., & PEARSON, J. Analysis and modification of search strategies of impulsive and reflective children on the Matching Familiar Figures Test. Child Development, 1972, 43, 321-335.

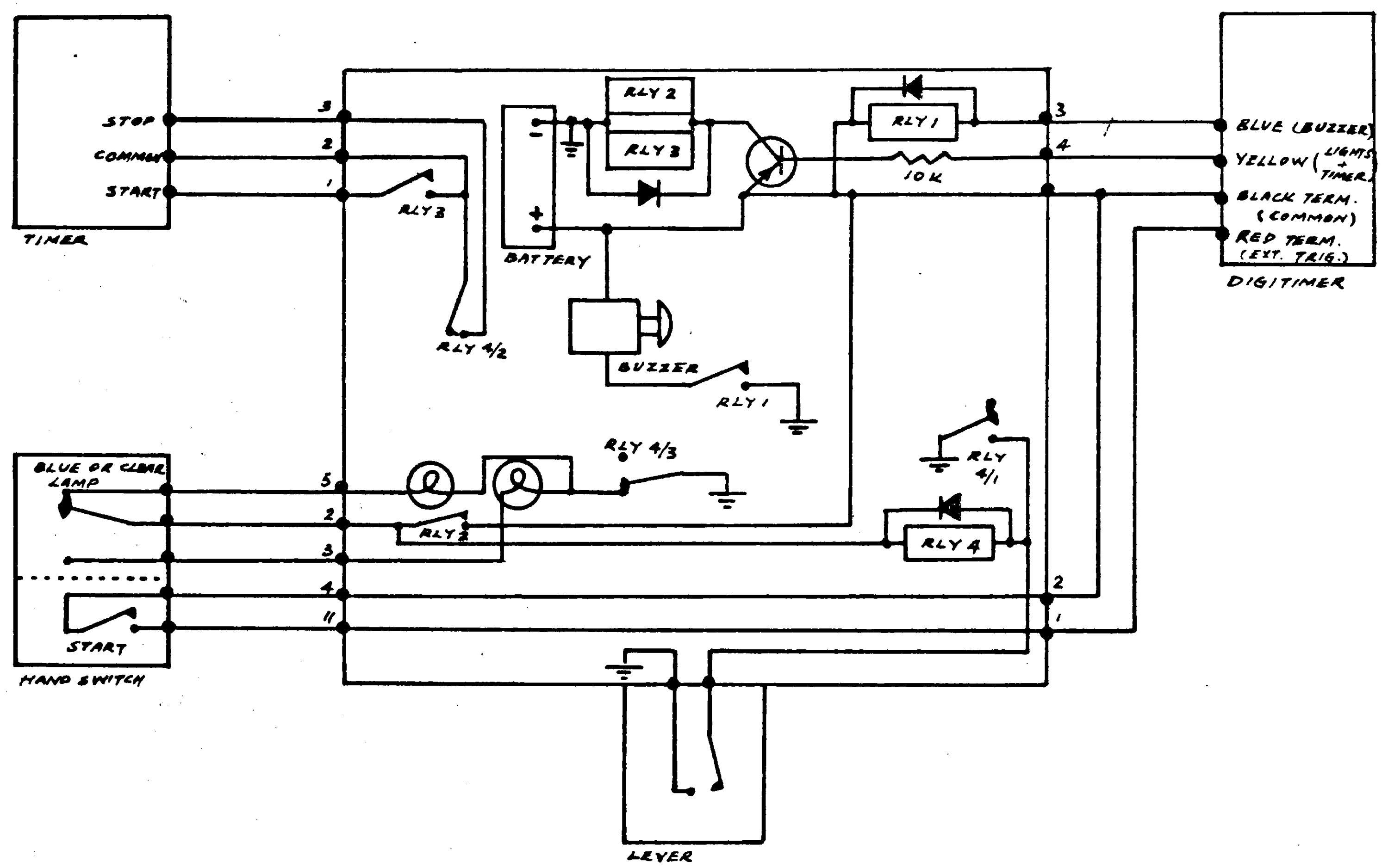
ZELNIKER, T., & OPPENHEIMER, L. Modification of information processing of impulsive children. Child Development, 1973, 44, 445-450.

ZELNIKER, T., & OPPENHEIMER, L. Effects of different training methods on perceptual learning in impulsive children. Child Development, 1976, 47, 492-497.

ZHINKIN, N.I. On ways of studying the speech mechanism. In B.G. Anan'yev (Ed.) Psychological Science in the U.S.S.R. Vol.1. Washington D.C.: U.S. Joint Publication Service, No. 11466.

APPENDICES

APPENDIX I CIRCUIT DIAGRAM OF RESPONSE UNIT IN EXPERIMENTS I TO 3



Appendix 2 Delayed Response Experiment Data

Age Group: Young

			Motor				Verbal	
Ss	CONDITION	ACC.	LAT.	OMI.	COM.		OMI.	COM.
169	NoSp-R	27	1.16	0	3		–	–
251		26	1.59	4	0		–	–
252		29	0.87	1	0		–	–
254		30	1.66	0	2		–	–
248	Sp-R	25	1.66	5	3		19	0
249		28	.92	2	0		8	0
223		28	1.77	2	0		22	0
209		21	1.35	9	2		6	0
246	NoSp-NoR	17	–	2	13		–	–
250		30	–	2	0		–	–
190		30	–	2	4		–	–
168		27	–	1	3		–	–
247	Sp-Nor	23	–	3	7		5	0
222		3	–	3	24		3	0
207		28	–	12	8		11	0
253		12	–	0	15		1	0

Age Group: Middle

164	NoSp-R	28	1.02	2	0		–	–
159		29	1.33	1	1		–	–
147		28	1.00	2	2		–	–
243		30	0.82	0	0		–	–
266	Sp-R	17	1.93	10	1		3	0
155		26	1.15	4	1		2	0
160		25	1.75	4	0		1	1
244		30	1.01	0	1		0	0
146	NoSp-NoR	28	–	1	1		–	–
163		30	–	0	0		–	–
242		29	–	0	1		–	–
245		30	–	0	0		–	–
158	Sp-NoR	28	–	4	2		0	0
150		23	–	1	6		20	20
145		25	–	1	5		10	10
156		30	–	3	0		3	4

Appendix 2 (con't)

Age Group: Old

			Motor				Verbal	
Ss	CONDITION	ACC.	LAT.	OMI.	COM.		OMI.	COM.
030	NpSp-R	28	0.67	2	2		–	–
025		29	0.59	1	2		–	–
011		30	1.20	0	0		–	–
004		30	1.09	0	0		–	–
023	Sp-R	28	0.78	4	0		4	0
241		30	0.88	0	3		23	0
006		26	1.68	4	0		0	0
008		29	1.68	1	0		0	1
026	NoSp-NoR	30	–	0	0		–	–
027		29	–	0	1		–	–
018		30	–	0	0		–	–
002		24	–	3	3		–	–
020	Sp-NoR	29	–	0	1		0	0
024		30	–	0	0		0	0
005		30	–	0	0		0	0
001		10	–	1	19		0	0

Appendix 3 Analysis of error of omission (verbal) in Experiment 1

	Young	Middle	Old	
	Age groups			
No omission	8	4	7	19
≥ 1 omission	0	4	1	5
	8	8	8	24

According to 2 x 2 contingency table:

	Middle	Others	
No omission	4	(a) 15	19 (A)
≥ 1 omission	4	(b) 1	5 (B)

p = .028 (1-tailed)

Appendix 4a

The Simultaneity Index: $\frac{S-\bar{S}}{N}$ (Experiment 1)

Age groups

Young	Middle	Old
-1	$-\frac{11}{17}$	-1
$-\frac{2}{22}$	$-\frac{2}{26}$	-1
-1	$\frac{11}{25}$	$-\frac{20}{26}$
-1	$\frac{4}{30}$	-1

$\frac{-2}{22}$ would suggest 22 total responses in which there were both a verbal and a more response. There were 10 simultaneous responses -12. Therefore, 10 - 12 = -2.

Appendix 4b

The Before/After Index: $\frac{B - A}{n_{ba}}$ (Experiment 1)

Age groups

Young	Middle	Old
$-\frac{5}{11}$	$\frac{0}{14}$	$\frac{25}{27}$
$\frac{6}{12}$	1	1
$\frac{4}{6}$	$\frac{5}{7}$	1
$\frac{19}{21}$	1	$\frac{27}{29}$

$-\frac{5}{11}$ would mean there were 8 response with M-V and 3 with V-M.

Appendix 5 Means and standard deviations of the variables in Correlation Tables 13 to 16

Table 13 NoSp-R (N = 8)

		$\bar{X}$	S.D.
NEW TRS	G	2.17	7.77
	E	-1.44	11.53
	N	-0.44	2.92
	P	-3.74	3.58
DRMACC		1.00	.66
DRMCOM		.87	.75
DRMOMI		.78	.67
DRMLAT		1.01	.26

Table 14 Sp-R (N = 7)

		$\bar{X}$	S.D.
NEW TRS	G	-0.16	5.51
	E	-6.15	6.79
	N	.40	2.72
	P	-4.26	1.74
DRMACC		1.92	.62
DRMCOM		.34	.60
DRMOMI		1.92	.62
DRMLAT		1.45	.37
DRVCOM		1.65	1.63
DRNOMI		1.45	.37

con't

Appendix 5 (con't)

Table 15 NoSp-DR (N = 8)

		$\overline{X}$	S.D.
NEW TRS	G	-1.21	4.89
	E	-0.59	10.70
	N	1.56	4.39
	P	-1.21	3.88
DRMACC		1.03	.96
DRMCOM		.93	.85
DRMOMI		.64	.73

Table 16 Sp-DR (N = 10)

		$\overline{X}$	S.D.
NEW TRS	G	3.01	4.82
	E	4.06	8.32
	N	-2.35	3.03
	P	-3.47	2.65
DRMACC		2.42	1.84
DRMCOM		1.92	1.77
DRMOMI		1.19	1.09
DRVCOM		.96	1.66
DRVOMI		1.44	1.71

Appendix 6 Reaction Time Experiment Data

Age group: 3-year

		Motor				Verbal			
SS	Condition	Acc.	Lat.	Com.	Omi.	Acc.	Lat.	Com.	Omi.
226	M	14	1.14	9	7	-	-	-	-
222		23	2.21	0	7	-	-	-	-
221		24	1.38	4	3	-	-	-	-
223		29	0.80	1	0	-	-	-	-
224		23	0.86	5	2	-	-	-	-
235		23	1.19	6	1	-	-	-	-
227		27	1.40	1	2	-	-	-	-
225		28	0.94	2	0	-	-	-	-
209	M + V	30	1.53	0	0	27	1.42	0	3
207		30	1.60	0	0	28	1.63	0	2
206		4	2.97	24	2	2	2.94	0	28
208		27	1.04	3	0	22	1.15	0	8
205		30	.93	0	0	20	1.21	0	10
210		30	1.16	0	0	30	1.17	0	0
211		30	1.26	0	0	18	1.43	0	12
204		26	1.16	1	3	22	1.19	0	8
236	V	-	-	-	-	23	.92	4	3
237		-	-	-	-	12	.90	14	4
238		-	-	-	-	22	1.18	6	2
239		-	-	-	-	20	1.11	2	8
240		-	-	-	-	24	1.50	0	6
261		-	-	-	-	23	1.12	05	2
262		-	-	-	-	20	1.07	06	4
263		-	-	-	-	18	0.97	09	3

Appendix 6 (Con't)

Age group: 4-year

SS	Condition	Motor Acc.	Motor Lat.	Motor Com.	Motor Omi.	Verbal Acc.	Verbal Lat.	Verbal Com.	Verbal Omi.
180	M	25	0.64	5	0	-	-	-	-
181		30	0.92	0	0	-	-	-	-
183		28	0.92	2	0	-	-	-	-
186		29	0.81	1	0	-	-	-	-
182		28	0.81	2	0	-	-	-	-
184		28	1.38	1	1	-	-	-	-
185		28	0.70	2	0	-	-	-	-
187		29	0.79	0	1	-	-	-	-
168	Sp-R	28	1.21	1	1	24	1.21	0	6
167		30	1.02	0	0	30	1.02	0	0
172		25	1.41	4	1	16	1.41	0	14
171		30	1.07	0	0	30	1.07	0	0
169		29	0.94	1	0	29	0.94	0	1
170		30	0.90	0	0	29	0.90	0	1
196		28	1.35	2	0	28	1.35	0	2
197		29	1.46	0	1	14	1.46	0	16
198	Sp-NoR	-	-	-	-	22	1.22	4	4
199		-	-	-	-	30	1.71	0	0
200		-	-	-	-	28	0.80	2	0
201		-	-	-	-	23	1.25	4	3
202		-	-	-	-	21	0.73	8	1
203		-	-	-	-	29	1.16	1	0
264		-	-	-	-	25	1.12	4	1
265		-	-	-	-	27	1.22	2	1

Appendix 6 (Con't)

Age group: 5-year

		Motor				Verbal			
SS	Condition	Acc.	Lat.	Com.	Omi.	Acc.	Lat.	Com.	Omi.
119		29	0.48	1	0	-	-	-	-
122		30	0.71	0	0	-	-	-	-
120		29	0.96	1	0	-	-	-	-
116		28	0.98	1	1	-	-	-	-
118		30	0.81	0	0	-	-	-	-
114		28	0.50	2	0	-	-	-	-
121		27	1.54	3	0	-	-	-	-
123		29	0.72	1	0	-	-	-	-
132	SpR	30	1.34	0	0	30	1.30	0	0
133		30	1.30	0	0	30	1.26	0	0
134		30	1.53	0	0	30	1.02	0	0
135		30	1.40	0	0	30	1.24	0	0
107		30	0.48	0	0	29	0.48	0	1
101		30	0.74	0	0	30	0.70	0	0
102		30	0.57	0	0	30	0.55	0	0
136		26	0.60	0	4	21	0.60	0	5
137		-	-	-	-	28	0.73	2	0
138		-	-	-	-	28	1.18	1	1
139		-	-	-	-	27	0.91	3	0
140		-	-	-	-	29	0.71	1	0
141		-	-	-	-	18	1.24	10	2
142		-	-	-	-	28	0.69	0	2
143		-	-	-	-	30	0.52	0	0
144		-	-	-	-	29	0.80	1	0

Appendix 6 (Con't)

Age group: 6-year

		Motor				Verbal			
SS	Condition	Acc.	Lat.	Com.	Omi.	Acc.	Lat.	Com.	Omi.
57		27	0.48	3	0	-	-	-	-
55		29	0.49	1	0	-	-	-	-
58		29	0.36	1	0	-	-	-	-
56		30	0.56	0	0	-	-	-	-
59		29	0.46	1	0	-	-	-	-
40		29	0.82	1	0	-	-	-	-
39		30	0.87	0	0	-	-	-	-
35		29	0.59	1	0	-	-	-	-
42	SpR	30	1.09	0	0	30	1.09	0	0
43		30	0.96	0	0	29	1.01	0	1
41		30	1.08	0	0	30	1.07	0	0
33		30	1.26	0	0	30	1.08	0	0
34		30	1.36	0	0	30	1.25	0	0
45		28	0.62	2	0	28	0.62	0	0
38		27	0.92	2	1	26	0.92	0	1
44		30	1.07	0	0	30	1.08	0	0
67	SpNoR	-	-	-	-	30	1.08	0	0
68		-	-	-	-	29	1.02	1	0
69		-	-	-	-	30	0.76	0	0
37		-	-	-	-	25	0.69	5	0
257		-	-	-	-	30	1.06	0	0
258		-	-	-	-	28	1.03	2	0
259		-	-	-	-	26	0.97	4	1
260		-	-	-	-	29	1.07	1	0

Appendix 7a

Simultaneity Index (Experiment 2)

AGE GROUPS			
3	4	5	6
1	$\frac{15}{19}$	$\frac{22}{30}$	1
$\frac{20}{28}$	$\frac{26}{30}$	$\frac{20}{30}$	$\frac{19}{30}$
1	$\frac{-6}{12}$	-1	1
$\frac{3}{19}$	1	0	$\frac{-18}{30}$
$\frac{6}{20}$	1	1	$\frac{-10}{30}$
$\frac{26}{28}$	$\frac{25}{29}$	$\frac{16}{30}$	$\frac{-12}{28}$
$\frac{-18}{18}$	1	$\frac{28}{30}$	1
$\frac{3}{19}$	$\frac{10}{14}$	1	$\frac{26}{30}$

Appendix 7b

Before/After Index (Experiment 2)

AGE GROUPS			
3	4	5	6
0	$\frac{-2}{4}$	1	0
-1	1	1	$\frac{-3}{5}$
0	1	1	0
$\frac{-3}{11}$	0	1	$\frac{22}{24}$
-1	0	0	1
-1	0	1	1
-1	0	1	0
-1	1	0	0

Appendix 8 Means and deviations of variables in correlation Tables 36 to 38

Table 36 (N = 32)

		$\bar{X}$	S.D.
NEW TRS	G	.12	8.34
	E	2.14	9.21
	N	.65	3.49
	P	.74	4.00
RTMACC		1.34	.90
RTMCOM		1.11	.78
RTMOMI		.43	.78
RTMLAT		.88	.38

Table 37 (N = 23)

		$\bar{X}$	S.D.
NEW TRS	G	-.42	7.25
	E	.46	8.56
	N	-.32	3.31
	P	.87	4.63
RTVACC		1.78	1.21
RTVCOM		1.36	1.09
RTVOMI		.83	.96
RTVLAT		.99	.29

Table 38 (N = 32)

		$\bar{X}$	S.D.
NEW TRS	G	2.51	8.31
	E	2.68	8.51
	N	.52	3.56
	P	.25	3.25
RTMACC		.65	1.12
RTMCOM		.50	1.02
RTMOMI		.28	.58
RTMLAT		1.17	.44
RTVACC		1.17	1.53
RTVCOM		0	0
RTVOMI		1.27	1.51
RTVLAT		1.15	.43
RTGEAL		1.39	1.58

Appendix 9 Discrimination Study

Age-group: 3-year

SS	Condition	S+ MACC	S+ MCOM	S+ MOMI	S+ VCOM	S+ VOMI	S- MACC	S- MCOM	S- VCOM	S- VOMI
204	R-NoR	15	0	0	-	-	15	0	-	-
205		15	0	0	-	-	15	0	-	-
206		5	0	10	-	-	15	0	-	-
207		9	0	6	-	-	15	0	-	-
208		7	0	8	-	-	13	2	-	-
209		13	0	2	-	-	14	1	-	-
210		15	0	0	-	-	15	0	-	-
211		13	0	2	-	-	14	1	-	-
212	SpR-NoR	2	2	11	0	9	15	0	0	-
213		7	1	7	0	14	15	0	0	-
214		0	1	14	1	11	14	1	1	-
215		15	0	0	0	3	15	0	0	-
216		8	0	7	0	13	14	1	0	-
217		6	0	9	0	10	15	0	0	-
218		8	1	6	0	8	11	4	2	-
219		8	0	7	0	5	10	5	0	-
220	SpR-SpNoR	14	0	1	0	1	11	4	0	1
221		7	0	8	0	10	9	6	2	5
222		9	0	6	0	8	12	3	3	6
223		15	0	0	0	14	1	14	0	15
224		8	0	7	0	10	4	11	1	11
225		12	0	3	0	14	12	3	0	1
226		9	6	0	0	6	3	12	0	5
227		14	0	1	0	12	12	3	1	3
228	R-SpnoR	15	0	0	0	-	14	1	0	0
229		13	0	2	0	-	15	0	0	0
230		14	0	1	1	-	8	7	1	10
231		9	0	6	3	-	9	6	3	10
255		7	0	8	0	-	15	0	0	11
232		3	0	12	4	-	14	1	4	10
233		10	0	5	0	-	15	0	0	8
234		11	0	4	0	-	15	0	0	0

Appendix 9 (con't)

Age-group: 4-year

SS	Condition	S+ MACC	S+ MCOM	S+ MOMI	S+ VCOM	S+ VOMI	S- MACC	S- MCOM	S- VCOM	S- VOMI
165	R-NoR	12	0	3	–	–	15	0	–	–
166		15	0	0	–	–	15	0	–	–
167		15	0	0	–	–	15	0	–	–
168		15	0	0	–	–	15	0	–	–
169		15	0	0	–	–	14	1	–	–
170		11	0	4	–	–	15	0	–	–
171		15	0	0	–	–	14	1	–	–
172		12	0	3	–	–	15	0	–	–
256	SpR-NoR	12	1	2	1	3	15	0	0	–
173		12	0	3	0	0	15	0	0	–
174		14	0	1	0	0	15	0	0	–
175		14	0	1	0	1	15	0	0	–
176		12	0	3	0	1	15	0	1	–
177		15	0	0	0	0	14	1	1	–
178		11	0	4	0	10	15	0	0	–
179		14	0	1	0	0	15	0	0	–
180	SpR-SpNoR	13	0	2	0	1	15	0	0	0
181		12	0	3	0	2	15	0	0	3
182		15	0	0	0	13	15	0	0	2
183		15	0	0	0	0	15	0	0	0
184		13	1	1	0	2	13	2	0	0
185		15	0	0	0	0	15	0	0	1
186		15	0	0	0	0	14	1	0	0
187		15	0	0	0	1	13	2	0	0
188	R-SpNoR	13	0	2	2	–	14	1	0	2
189		14	0	11	0	–	13	2	0	0
190		5	0	10	10	–	10	5	0	8
191		1	0	14	9	–	15	0	0	2
192		15	0	0	0	–	15	0	0	0
193		5	0	10	0	–	9	6	0	3
194		1	1	13	10	–	15	0	0	2
195		15	0	0	0	–	15	0	0	0

Appendix 9 (con't)

Age-group: 5-year

SS	Condition	S+ MACC	S+ MCOM	S+ MOMI	S+ VCOM	S+ VOMI	S- MACC	S- MCOM	S- VCOM	S- VOMI
100	R-NoR	9	1	5	-	-	13	2	-	-
101		15	0	0	-	-	15	0	-	-
102		15	0	0	-	-	14	1	-	-
103		15	0	0	-	-	15	0	-	-
104		15	0	0	-	-	15	0	-	-
105		15	0	0	-	-	13	2	-	-
106		13	0	2	-	-	14	1	-	-
107		14	0	1	-	-	14	1	-	-
108	SpR-NoR	13	0	2	0	2	14	1	0	-
109		15	0	0	0	1	15	0	0	-
110		11	0	4	0	5	15	0	0	-
111		9	0	6	0	9	13	2	0	-
112		15	0	0	0	1	15	0	0	-
113		14	0	1	0	0	15	0	0	-
114		14	0	1	0	0	15	0	0	-
115		14	0	1	0	0	13	2	0	-
116	SpR-SpNoR	15	0	0	0	0	15	0	0	2
117		12	0	3	0	0	15	0	0	0
118		15	0	0	0	2	14	1	0	0
119		15	0	0	0	0	15	0	0	1
120		15	0	0	0	0	15	0	0	1
121		15	0	0	0	0	15	0	0	0
122		14	0	1	0	1	15	0	0	0
123		15	0	0	0	1	14	1	0	0
124	R-SpNoR	13	0	2	0	-	15	0	0	1
125		15	0	0	0	-	15	0	0	0
126		14	0	1	0	-	15	0	0	1
127		15	0	0	0	-	15	0	0	4
128		14	0	1	0	-	15	0	0	0
129		15	0	0	0	-	15	0	0	0
130		13	0	2	1	-	14	1	0	1
131		13	0	2	0	-	15	0	0	2

Age-group: 6-year

SS	Condition	S+ MACC	S+ MCOM	S+ MOMI	S+ VCOM	S+ VOMI	S- MACC	S- MCOM	S- VCOM	S- VOMI
41	R-NoR	14	0	1	-	-	15	0	-	-
42		15	0	0	-	-	15	0	-	-
33		15	0	0	-	-	15	0	-	-
43		14	0	1	-	-	13	2	-	-
44		15	0	0	-	-	15	0	-	-
34		15	0	0	-	-	15	0	-	-
45		14	0	1	-	-	15	0	-	-
38		14	0	1	-	-	14	1	-	-
47	SpR-NoR	14	0	1	0	0	15	0	0	-
48		15	0	0	0	0	14	1	1	-
49		15	0	0	0	0	15	0	0	-
50		15	0	0	0	1	14	1	1	-
51		15	0	0	0	0	15	0	0	-
52		12	1	2	1	3	11	4	5	-
53		14	0	1	0	1	15	0	0	-
54		13	0	2	0	0	15	0	0	-
39	SpR-SpNoR	15	0	0	0	0	12	3	0	0
55		15	0	0	0	0	0	15	0	0
56		15	0	0	0	0	15	0	0	1
35		15	0	0	0	1	7	8	1	0
57		15	0	0	0	1	12	3	0	1
58		15	0	0	0	0	13	2	0	0
59		15	0	0	0	0	15	0	0	0
40		15	0	0	0	0	15	0	0	0
36	R-SpNoR	15	0	0	0	-	15	0	0	0
60		14	1	0	2	-	13	2	0	0
61		15	0	0	3	-	15	0	0	0
62		15	0	0	1	-	15	0	0	0
63		15	0	0	0	-	14	1	0	1
64		15	0	0	0	-	12	3	0	2
65		15	0	0	0	-	13	2	0	4
66		15	0	0	0	-	15	1	0	0

Appendix 10 Means and standard deviation of variables in correlation between discrimination behavioural measures and New TRS

Table 56 R-NoR (N = 32)

Variables		$\bar{X}$	S.D.
NEW TRS	G	1.52	8.21
	E	2.20	8.68
	N	0.10	3.43
	P	-0.05	4.04
S+MACC		.80	.99
S+MCOM		.03	.18
S+MOMI		.79	.98
S-MACC		.43	.57
S-MCOM		.43	.57
CORR		.87	.17
BIAS		-2.19	5.03

Table 57 SpR-NoR (N = 31)

Variables		$\bar{X}$	S.D.
NEW TRS	G	-1.28	7.77
	E	-1.75	8.85
	N	.70	2.86
	P	.62	3.24
S+MACC		1.41	1.14
S+MCOM		.17	.41
S+MOMI		1.37	1.10
S+VCOM		.06	.25
S+VOMI		1.33	1.33
S-MACC		.49	.72
S-MCOM		.49	.72
S-VCOM		.28	.56
CORR		.74	.29
BIAS		-5.03	7.71

Appendix 10 (con't)

Table 58 SpR-SpNoR (N = 32)

		$\overline{X}$	S.D.
NEW TRS	G	-.01	8.02
	E	1.67	9.39
	N	.56	3.45
	P	.63	3.87
S+MACC		.67	.96
S+MCOM		.11	.46
S+MOMI		.58	.90
S+VCOM		0	0
S+VOMI		1.17	1.34
S-MACC		1.17	1.26
S-MCOM		1.17	1.26
S-VCOM		.19	.47
S-VOMI		.86	1.07
CORR		.72	.37
BIAS		3.19	8.29

Table 59 R-SpNoR (N = 31)

Variable		$\overline{X}$	S.D.
NEW TRS	G	-1.30	7.11
	E	-1.40	10.81
	P	.58	4.19
	N	.52	4.25
S+MACC		1.16	1.27
S+MCOM		.06	.25
S+MOMI		1.12	1.27
S+VCOM		.66	1.03
S-MACC		.67	.89
S-MCOM		.67	.89
S-VCOM		.15	.49
S-VOMI		.94	1.09
CORR		.74	.33
BIAS		-3.35	8.77

Appendix 11a   The Teacher's Rating Scale

Instructions

The following rating scale consists of 35* adjectives. Please consider how much the child, whose name is printed on the left hand column, fits in with the epithet on the top of the scoring sheet, and put a mark under one of the five categories which you think is the most accurate description. Please mark on the point and not between the points.

For example:

Adjective: talkative

Not at all	Not very	About average	Rather	Very

Child's name

John		x			

i.e., John is not very talkative

Mary					x

i.e., Mary is very talkative

Some of the adjectives may seem similar to you. Please try to consider each of them by its own right.

Please rate the child according to what you think he/she is usually like, and not what his/her parents tell you or what you think he/she should be like. There is no need to consider each item for too long. It is your general impression that is most important.

Thank you very much for your co-operation.

---

*The figure should be 70 for the first two samples of standardization subjects.

APPENDIX 11b NEW TRS Rating Form

ADJECTIVE:

Child's Name:	Not at all	Not very	About average	Rather	Very	Child's date of birth:

Appendix 12 Correlation matrix for New Teacher's Rating Scale factor analysis: first study

	ABMIND	ACTION	AGGRES	ANALYT	ANXIO	ATTENT	BLOW	BOAST	BRIGHT
ABMIND	1.00000	-.12414	.16520	-.44212	.24058	-.51260	.07995	.08612	-.47074
ACTION	-.12414	1.00000	.33834	.26542	-.27147	.00468	.34472	.29305	.39721
AGGRES	.16520	.33834	1.00000	-.03520	-.20888	-.45237	.62525	.46676	-.06824
ANALYT	-.44212	.26542	-.03520	1.00000	-.19997	.50001	.02274	.20368	.62610
ANXIO	.24058	-.27147	-.20888	-.19997	1.00000	.04135	-.22355	-.25034	-.27784
ATTENT	-.51260	.00468	-.45237	.50001	.04135	1.00000	-.33885	-.16043	.42016
BLOW	.07995	.34472	.62525	.02274	-.22355	-.33885	1.00000	.56496	-.00026
BOAST	.08612	.29305	.46676	.20368	-.25034	-.16043	.56496	1.00000	.09998
BRIGHT	-.47074	.39721	-.06824	.62610	-.27784	.42016	-.00026	.09998	1.00000
BUBBLE	-.18633	.55674	.22716	.42671	-.30735	.09203	.35783	.25472	.50565
BULLY	.02556	.25665	.67322	.01929	-.24029	-.35187	.55785	.48270	.06067
CALM	-.32792	-.35920	-.46117	.09425	-.08222	.35621	-.47381	-.30302	.03499
CAFREE	-.00359	.42811	.33300	.03470	-.52064	-.17929	.30752	.24344	.13264
CAFUL	-.36066	-.16861	-.48783	.24526	.15203	.61222	-.40003	-.26554	.25901
CALESS	.35399	.14209	.48106	-.24958	-.18741	-.49229	.41436	.25309	-.28912
CAUTIO	.03718	-.51402	-.42010	-.18329	.47178	.17088	-.47182	-.35143	-.26560
CHANGE	.14986	.17089	.45935	.06241	-.01303	-.32830	.54296	.33110	-.04144
CHEEKY	.14285	.37981	.60704	.11749	-.18932	-.30689	.60695	.54195	.05520
CONTEM	-.27329	-.06092	-.30718	.51769	.01176	.50460	-.27925	.00105	.35028
CONTROL	-.32982	-.24077	-.51457	.21675	-.00056	.49022	-.45099	-.22756	.21183
DARING	-.13713	.64201	.41125	.23420	-.38280	-.01769	.43455	.37884	.32462
DREAMY	.52468	-.40841	-.12453	-.36266	.31093	-.31949	-.16740	-.13835	-.42990
DISOBE	.17511	.36666	.65702	-.04068	-.25339	-.50976	.60831	.51442	-.09494
DISORG	.42271	.12387	.40628	-.24319	-.05781	-.48347	.47887	.30210	-.29465
DISTRA	.36684	.27307	.49529	-.23532	-.04799	-.58600	.50824	.37743	-.21705
EASY	-.16710	.29512	.01119	.13889	-.37805	.04618	.00879	.03123	.22598
EMOTION	.14787	-.00447	.03753	.04559	.27262	-.02349	.12691	-.06145	-.07123
EVENTEM	-.14895	-.29043	-.51999	.05422	.04241	.28270	-.47894	-.23513	.08429
EXACT	-.33133	-.13513	-.39187	.36427	.10333	.52147	-.38399	-.15768	.34478
EXCITA	.09402	.61351	.43022	.19315	-.18597	-.14455	.44800	.26472	.22324
FOOLHD	.10106	.31018	.51203	-.01034	-.31689	-.34506	.62967	.45749	-.00482
HOSTILE	.28973	.16605	.49007	-.04380	-.02428	-.36451	.37689	.50470	-.08527
HYACT	.06044	.38561	.41420	.07852	-.22515	-.26249	.53241	.52238	.07348
IMPAT	.21687	.43172	.41831	.11170	-.02308	-.15213	.38905	.50858	.05857
IMPULS	.06418	.54497	.55731	.25231	-.16246	-.12766	.55182	.50297	.23399
INSENS	.22346	.19586	.47517	-.05981	-.25408	-.37057	.43970	.60678	-.10597
IRRESP	.29019	.12305	.42543	-.23029	-.11151	-.53718	.36462	.40503	-.21489
LIVE	-.14150	.66494	.36325	.30255	-.29125	-.03039	.47974	.35059	.37359
LOOK	-.13753	-.34613	-.41253	.08205	.27610	.41047	-.43728	-.25432	.03184
MOODY	.28933	-.00211	.18403	-.07304	.23321	-.16735	.14380	.28831	-.18897
MOTIVA	-.38165	.20364	-.19308	.54427	-.07881	.59477	-.14210	.00064	.54915
NAUGHTY	.23864	.42165	.65671	-.04966	-.15965	-.51001	.58674	.39401	-.06180
OPTIM	-.31706	.37034	.01748	.37891	-.39732	.23423	.11653	.22796	.49163
ORDER	-.37664	-.12856	-.36946	.33987	.23546	.52937	-.28964	-.09083	.28790
OUTGO	-.20745	.59112	.30381	.34523	-.42312	.02740	.37200	.35812	.48191
PASSIVE	.27464	-.47245	-.27056	-.36019	.27658	-.06646	-.21441	-.11307	-.43206

Appendix 12 (con't)

	ABMIND	ACTION	AGGRES	ANALYT	ANXIO	ATTENT	BLOW	BOAST	BRIGHT
PERSIST	-.33882	.19536	-.01584	.45634	-.10275	.35472	.06457	.13054	.46267
QUICK	-.38775	.40776	.09003	.56782	-.23405	.38347	.22517	.25944	.57106
QUIET	.07396	-.65451	-.45167	-.20377	.36693	.14620	-.45006	-.35804	-.30169
RASH	.01713	.53368	.55862	.14409	-.36048	-.29941	.57861	.41833	.21679
REFLEC	-.25080	-.07253	-.21037	.46226	-.03429	.42979	-.20238	.01661	.38551
RELIAB	-.36505	-.05004	-.35686	.35025	.03313	.58069	-.27955	-.11886	.33152
RESER	.11728	-.53933	-.33393	-.22470	.38921	.11255	-.31228	-.33241	-.33505
RESPON	-.39071	.28935	.00338	.50991	-.22765	.48976	.10712	.23441	.46775
RESTLS	.10600	.40136	.43101	.03968	-.15229	-.38585	.46198	.33967	.01363
RIGID	.16625	-.43232	-.00789	-.22843	.30471	-.19048	-.01928	.02657	-.29955
SELSUF	-.36388	.14128	-.04333	.44937	-.32234	.37376	-.00817	.21988	.43058
SOLIT	.36777	-.37777	-.14110	-.22680	.27341	-.08421	-.11516	.08856	-.35197
SPITE	.16953	.18524	.50336	-.00480	-.05525	-.26660	.54645	.59641	-.11636
STABLE	-.39324	-.03018	-.26653	.25848	-.28212	.40740	-.19748	-.06341	.32576
SYSTEM	-.43210	.01407	-.26200	.48970	-.11037	.58217	-.23579	.00833	.51870
TALK	-.15431	.55726	.29534	.29729	-.30337	-.02354	.37336	.36188	.35570
THINK	-.20943	-.18520	-.23723	.16792	.06417	.29963	-.32976	-.14499	.18224
THOUGHT	-.29806	.06731	-.27364	.51588	-.02741	.52175	-.28921	-.02419	.48006
TOUCHY	.06452	-.09721	.33979	-.03548	.17343	-.18567	.42796	.29068	-.18412
TROUBL	.28637	.26794	.52498	-.09241	-.06932	-.39658	.51572	.51091	-.18418
UNPRED	.24483	.26816	.42703	.02567	.03051	-.31385	.39988	.34035	-.09599
UNSOC	.32671	-.26967	.11739	-.14355	.18332	-.14624	.11209	.33415	-.37717
UNTIDY	.18919	.08210	.32241	-.19188	-.06412	-.34157	.31076	.09472	-.22327
VIGOR	-.20794	.59813	.41253	.27502	-.31680	.01057	.37648	.31186	.38108

	BUBBLE	BULLY	CALM	CAFREE	CAFUL	CALESS	CAUTIO	CHANGE	CHEEKY	CONTEM
ABMIND	-.18633	.02556	-.32792	-.00359	-.36066	.35399	.03718	.14986	.14285	-.27329
ACTION	.55674	.25665	-.35920	.42811	-.16861	.14209	-.51402	.17089	.37981	-.06092
AGGRES	.22716	.67322	-.46117	.33300	-.48783	.48106	-.42010	.45935	.60704	-.30718
ANALYT	.42671	.01929	.09425	.03470	.24526	-.24958	-.18329	.06241	.11749	.51769
ANXIO	-.30735	-.24029	-.08222	-.52064	.15203	-.18741	.47178	-.01303	-.18932	.01176
ATTENT	.09203	-.35187	.35621	-.17929	.61222	-.49229	.17088	-.32830	-.30689	.50460
BLOW	.35783	.55785	-.47381	.30752	-.40003	.41436	-.47182	.54296	.60695	-.27925
BOAST	.25472	.48270	-.30302	.24344	-.26554	.25309	-.35143	.33110	.54195	.20105
BRIGHT	.50565	.06067	.03499	.13264	.25901	-.28912	-.26560	-.04144	.05520	.35028
BUBBLE	1.00000	.22186	-.38627	.38842	-.15351	.11442	-.53433	.25464	.44839	.05500
BULLY	.22186	1.00000	-.31982	.25698	-.33987	.28869	-.34104	.41423	.52257	-.16612
CALM	-.38627	-.31982	1.00000	-.18962	.40526	-.35114	.35182	-.45117	-.48171	.35791
CAFREE	.38842	.25698	-.18962	1.00000	-.28244	.33240	-.53764	.06383	.34791	-.21409
CAFUL	-.15351	-.33987	.40526	-.28244	1.00000	-.70012	.36507	-.31776	-.43108	.45085
CALESS	.11442	.28869	-.35114	.33240	-.70012	1.00000	-.32136	.30126	.40852	-.42475
CAUTIO	-.53433	-.34104	.35182	-.53764	.36507	-.32136	1.00000	-.31893	-.53175	.21341
CHANGE	.25464	.41423	-.45117	.06383	-.31776	.30126	-.31893	1.00000	.47195	-.15262
CHEEKY	.44839	.52257	-.48171	.34791	-.43108	.40852	-.53175	.47195	1.00000	-.20708
CONTEM	.05500	-.16612	.35791	-.21409	.48085	-.42475	.21341	-.15262	-.20708	1.00000

Appendix 12 (con't)

	BUBBLE	BULLY	CALM	CAFREE	CAFUL	CALESS	CAUTIO	CHANGE	CHEEKY	CONTEM
CONTROL	-.27364	-.34837	.58503	-.20025	.57162	-.49446	.35856	-.46670	-.47827	.54734
DARING	.55261	.41104	-.29416	.42325	-.21347	.19327	-.54008	.28446	.43576	-.08191
DREAMY	-.42793	-.13327	.03802	-.24891	-.10946	.08681	.26872	-.07150	-.15014	-.14792
DISOBE	.22717	.58236	-.47394	.31476	-.55793	.52428	-.44136	.48026	.60451	-.32410
DISORG	.10703	.30898	-.41396	.22110	-.50146	.55541	-.26367	.33665	.35664	-.45382
DISTRA	.17172	.38533	-.55467	.21543	-.50312	.49053	-.28467	.44411	.38529	-.38214
EASY	.32846	-.01730	.06710	.44635	-.09399	.04301	-.31730	-.00619	.07988	.06169
EMOTION	.14096	-.05149	-.32627	-.16802	-.02930	.07283	-.03955	.26506	.14156	-.16157
EVENTEM	-.31481	-.34929	.49466	-.17843	.39510	-.38189	.34287	-.38696	-.50620	.36369
EXACT	-.03796	-.31652	.29515	-.28766	.58045	-.60652	.35406	-.24258	-.32524	.55587
EXCITA	.62797	.28773	-.55820	.40498	-.29569	.25424	-.54251	.32053	.52555	-.17599
FOOLHD	.31180	.46527	-.34672	.30992	-.37632	.46767	-.44290	.48112	.45532	-.26294
HOSTILE	.06244	.49458	-.39784	.11422	-.33751	.25230	-.15172	.40521	.49516	-.17464
HYACT	.35958	.55448	-.38940	.22243	-.29341	.20216	-.40295	.50048	.50540	-.08674
IMPAT	.31838	.34215	-.44472	.20112	-.32326	.25909	-.32471	.26652	.56804	-.13393
IMPULS	.56962	.49256	-.49690	.40324	-.29621	.27969	-.50551	.41631	.64857	-.11574
INSENS	.06120	.43054	-.27658	.27091	-.34149	.32678	-.25162	.33674	.48520	-.14750
IRRESP	-.01940	.47546	-.31960	.18858	-.48881	.41914	-.16787	.35876	.34746	-.35295
LIVE	.77224	.29913	-.44353	.46221	-.22663	.16762	-.63346	.37644	.53483	-.29239
LOOK	-.31405	-.34791	.33731	-.50002	.45089	-.41608	.52731	-.22758	-.41216	.44112
MOODY	-.06191	.09753	-.25970	-.08429	-.15426	.15297	.03908	.17155	.30869	-.09863
MOTIVA	.30218	-.09143	.17725	-.03771	.39130	-.36657	-.03593	-.17046	-.08941	.54103
NAUGHTY	.34544	.52459	-.58160	.32510	-.55955	.49336	-.46612	.44958	.66694	-.35483
OPTIM	.38757	.06553	.00030	.24801	.15790	-.11580	-.31137	-.01763	.09892	.23521
ORDER	-.12065	-.16607	.36241	-.22454	.61332	-.61132	.29305	-.24894	-.30800	.54238
OUTGO	.72505	.25429	-.30536	.51300	-.17413	.14160	-.62426	.13735	.47526	-.06918
PASSIVE	-.57971	-.24041	.15160	-.31741	.07567	-.01208	.47133	-.12292	-.24674	-.37945
PERSIST	.24719	.01130	.07385	.04962	.23560	-.24785	-.12353	.00066	.13429	.31257
QUICK	.55484	.12979	-.05389	.27190	.11737	-.07317	-.34163	.06457	.23333	.23005
QUIET	-.66692	-.34774	.42732	-.47395	.29457	-.22766	.65255	-.22922	-.52614	.15513
RASH	.55302	.50232	-.45394	.47329	-.41155	.37768	-.59673	.45565	.59095	-.24623
REFLEC	.07542	-.03983	.25469	-.13222	.40956	-.34130	.13059	-.06936	-.11754	.63010
RELIAB	.02639	-.26266	.31321	-.08280	.48035	-.40939	.13743	-.28519	-.25436	.53446
RESER	-.58058	-.24199	.25786	-.47892	.23840	-.17998	.58914	-.13524	-.42770	.08370
RESPON	.36430	.06513	.10393	.14519	.28205	-.21016	-.19131	.01407	.07560	.43156
RESTLS	.37245	.33409	-.47714	.31354	-.47294	.44719	-.46085	.44167	.42610	-.31992
RIGID	-.52176	.11948	.03324	-.39443	.04446	-.05275	.41531	.16017	-.13270	-.03793
SELSUF	.31568	.05728	.21638	.19023	.21475	-.10319	-.11363	-.16570	.09208	.39872
SOLIT	-.42858	-.17619	.01294	-.27675	-.01346	.05541	.34359	-.07758	-.04429	-.20413
SPITE	.08907	.46977	-.26523	.17623	-.26510	.32316	-.26627	.43082	.57861	-.14788
STABLE	.03757	-.10711	.43329	.07846	.38412	-.30549	.09393	-.29673	-.22024	.46522
SYSTEM	.10201	-.02696	.28997	-.05924	.45606	-.47873	.11498	-.18766	-.15814	.56766
TALK	.65633	.24422	-.38040	.44689	-.17827	.16275	-.56298	.20788	.40964	-.04439
THINK	-.15034	-.12785	.37446	-.29414	.39060	-.45461	.28851	-.21111	-.27144	.50641
THOUGHT	.17051	-.13686	.23493	-.14055	.40978	-.45285	.07679	-.27120	-.20702	.66870
TOUCHY	-.09361	.20737	-.23172	-.13517	-.09439	.08399	.00933	.51086	.20825	-.11615
TROUBL	.14640	.33057	-.43813	.20613	-.41682	.41282	-.30851	.48177	.53085	-.29573
UNPRED	.23570	.29230	-.42447	.13487	-.32805	.32900	-.33923	[illegible]	.50114	-.23524
UNSOC	-.37837	.03425	-.07646	-.21656	-.09811	.13224	-.26340	.16588	.17638	-.03560
UNTIDY	.13698	.17259	-.27719	.22461	-.47764	.56233	-.24096	.19960	.33030	-.06746
VIGOR	.55570	.39856	-.26688	.37474	-.14408	.07633	-.49345	.25648	.40138	-.03915

Appendix 12 (con't)

	CONTROL	DARING	DREAMY	DISOBE	DISORG	DISTRA	EASY	EMOTION	EVENTEM	EXACT
ABMIND	-.32982	-.13713	.52468	.17511	.42271	.36684	-.16710	.14787	-.14895	-.33133
ACTION	-.24077	.64201	-.40841	.36666	.12387	.27307	.29512	-.00487	-.29043	-.13513
AGGRES	-.51457	.41125	-.12453	.65702	.40628	.49529	.01119	.03753	-.51999	-.39187
ANALYT	.21675	.23420	-.36266	-.04068	-.24319	-.23532	.13889	.04559	.05422	.36427
ANXIO	.00056	-.38280	.31093	-.25339	-.05781	-.04799	-.37805	.27262	.04241	.10333
ATTENT	.49022	-.01769	-.31949	-.50976	-.48347	-.58600	.00618	-.02349	.28270	.52147
BLOW	-.45099	.43455	-.16740	.60831	.47887	.50824	.00879	.12691	-.47894	-.38399
BOAST	-.22758	.37884	-.13835	.51442	.30210	.37743	.03123	-.06145	-.23513	-.15768
BRIGHT	.21183	.32462	-.42990	-.09494	-.29465	-.21705	.20588	-.07123	.08429	.34470
BUBBLE	-.27364	.55261	-.42793	.22717	.10703	.17172	.32846	.14096	-.31481	-.03796
BULLY	-.34837	.41104	-.13327	.58236	.38898	.38533	-.01730	-.05109	-.34929	-.31652
CALM	.58503	-.29416	.03802	-.47394	-.41396	-.55467	.06710	-.32627	.49466	.29515
CAFREE	-.20025	.42325	-.24891	.31476	.22110	.21543	.44635	-.16822	-.17843	-.28766
CAFUL	.57162	-.21347	-.10946	-.55793	-.50146	-.50312	-.09399	-.02932	.39510	.58045
CALESS	-.49446	.19327	.08681	.52428	.55541	.49053	.04361	.07283	-.38189	-.60652
CAUTIO	.35856	-.54008	.26872	-.44136	-.26367	-.28467	-.31730	-.03955	.34287	.35406
CHANGE	-.46670	.28446	-.07150	.48026	.33645	.44411	-.02619	.26526	-.38696	-.24258
CHEEKY	-.47827	.43576	-.15014	.60451	.35664	.38529	.07988	.14156	-.50620	-.32524
CONTEM	.54734	-.08191	-.14792	-.32410	-.45382	-.38214	.26169	-.16157	.36369	.50587
CONTROL	1.00000	-.25513	-.04252	-.53628	-.52282	-.58244	.07407	-.27179	.63388	.51083
DARING	-.25513	1.00000	-.39710	.41394	.15963	.28251	.19424	-.00038	-.36193	-.22422
DREAMY	-.04257	-.39710	1.00000	.00475	.22746	.07936	-.34329	.05574	.11476	-.14190
DISOBE	-.53628	.41394	.00475	1.00000	.53009	.58542	-.02568	.05082	-.44806	-.46420
DISORG	-.52282	.15963	.22746	.53009	1.00000	.54189	-.05966	.09314	-.34707	-.54397
DISTRA	-.58244	.28251	.07936	.58542	.54189	1.00000	.01387	.12300	-.36302	-.46788
EASY	.07407	.19424	-.34329	-.02568	-.05966	.01387	1.00000	-.07353	.19841	.00373
EMOTION	-.27179	-.00038	.05574	.05082	.09314	.12300	-.07353	1.00000	-.29134	-.01651
EVENTEM	.63388	-.36193	.11476	-.44806	-.34707	-.36302	.19841	-.29134	1.00000	.39492
EXACT	.51083	-.22422	-.14190	-.46420	-.54397	-.46788	.00373	-.01651	.39492	1.00000
EXCITA	-.46597	.54432	-.29635	.36850	.22176	.34156	.26694	.23631	-.45821	-.22277
FOOLHD	-.45545	.47948	-.18763	.53404	.46372	.55065	.10037	.13671	-.36943	-.45600
HOSTILE	-.34012	.20231	.10460	.51133	.36067	.44030	-.13278	.03224	-.33210	-.26003
HYACT	-.32040	.48568	-.21528	.55404	.24269	.49843	.15557	.09163	-.31207	-.20979
IMPAT	-.37295	.35206	.05234	.51550	.31279	.33721	-.00927	.15874	-.34586	-.18738
IMPULS	-.39789	.59681	-.25956	.53466	.32342	.37035	.16628	.13795	-.44442	-.23781
INSENS	-.27072	.23206	.01163	.57820	.40610	.45725	.01051	-.20663	-.21214	-.26207
IRRESP	-.41757	.18656	.13909	.58357	.49143	.58023	.00708	-.08837	-.24743	-.45859
LIVE	-.37643	.64365	-.44699	.35822	.16533	.30047	.37180	.17883	-.38831	-.14468
LOOK	.54733	-.40845	.06847	-.49735	-.46045	-.43214	-.12492	-.03922	.44725	.48731
MOODY	-.19563	-.00440	.31036	.33452	.23379	.20358	-.22494	.29330	-.28125	-.14203
MOTIVA	.33335	.15893	-.36668	-.32730	-.46913	-.37417	.15382	-.02350	.16155	.46381
NAUGHTY	-.62506	.47138	-.01457	.74580	.51934	.57503	-.01363	.12935	-.60014	-.49336

	CONTROL	DARING	DREAMY	DISOBE	DISORG	DISTRA	EASY	EMOTION	EVENTEM	EXACT
OPTIM	.07581	.33671	-.46427	.00041	-.25714	-.03578	.25922	-.22100	-.02803	.13670
ORDER	.57672	-.11945	-.18515	-.40307	-.60969	-.41610	.01901	-.12554	.42847	.59117
OUTGO	-.18100	.57878	-.52770	.30059	.08894	.17169	.38561	.01718	-.31137	-.05637
PASSIVE	.14881	-.44609	.57307	-.13765	.08199	-.01939	-.29542	-.08176	.29384	.00487
PERSIST	.19224	.13970	-.37809	-.07667	-.31402	-.24879	.07702	.23862	-.05588	.35741
QUICK	.11323	.36388	-.51716	.04428	-.18117	-.16831	.32814	.05645	-.05975	.24976
QUIET	.37104	-.61708	.43932	-.42565	-.18803	-.30093	-.28265	-.08543	.42359	.22391
RASH	-.50068	.57386	-.31845	.59762	.33250	.45352	.20305	.10925	-.48553	-.34167
REFLEC	.43144	-.10104	-.12052	-.30574	-.42114	-.41329	.04279	.22782	.24317	.51814
RELIAB	.54905	-.09559	-.28615	-.45728	-.52240	-.50588	.11072	-.09615	.31369	.49962
RESER	.29547	-.49441	.39766	-.29755	-.14166	-.25705	-.38643	.10149	.25001	.18111
RESPON	.26689	.24645	-.49212	-.13052	-.26954	-.24307	.21343	-.13164	.02867	.34438
RESTLS	-.54445	.39322	-.16113	.54393	.37676	.55299	.12794	.17012	-.43728	-.35727
RIGID	.09633	-.34811	.29879	.06550	.09028	.08887	-.38625	-.00363	.17371	.04459
SELSUF	.27883	.22815	-.34616	-.10740	-.28393	-.24928	.17084	-.17328	.07248	.30777
SOLIT	.04422	-.41809	.50306	-.00618	.13658	.06089	-.33618	.03793	.18111	.00682
SPITE	-.29249	.26348	.05987	.56625	.37600	.39991	-.05448	.06756	-.30719	-.28931
STABLE	.51496	-.00392	-.25220	-.35658	-.39846	-.39162	.23501	-.37885	.37066	.35827
SYSTEM	.52755	-.00446	-.30235	-.33965	-.54704	-.44050	.13539	-.11652	.32848	.54981
TALK	-.28207	.47697	-.42572	.28696	.11465	.28799	.30980	.05291	-.29393	-.09786
THINK	.49522	-.16808	-.05412	-.35248	-.43749	-.47058	-.06890	-.23711	.24294	.42065
THOUGHT	.46508	.04477	-.18741	-.36643	-.44734	-.42490	.02327	-.10792	.23750	.49139
TOUCHY	-.21753	.00825	.05670	.31990	.23055	.33623	-.14778	.32793	-.21268	-.16083
TROUBL	-.45311	.29470	.03087	.67940	.49525	.60658	.02462	.10083	-.35151	-.34237
UNPRED	-.51623	.22488	.11085	.43555	.40022	.45289	-.22886	.27282	-.44358	-.32549
UNSOC	-.02547	-.22361	.39453	.25213	.27097	.20693	-.25846	.04933	.01163	-.06114
UNTIDY	-.44722	.11930	.11082	.38083	.48355	.33991	-.01288	.16023	-.37646	-.54134
VIGOR	-.24261	.55238	-.44244	.34756	.06741	.18184	.37146	.02121	-.25886	-.05116

	EXCITA	FOOLHD	HOSTILE	HYACT	IMPAT	IMPULS	INSENS	IRRESP	LIVE	LOOK
ABMIND	.09402	.10106	.28973	.06044	.21887	.06418	.22346	.29019	-.14150	-.13753
ACTION	.61351	.31018	.16605	.38561	.43172	.54497	.19586	.12325	.66494	-.34613
AGGRES	.43022	.51203	.49007	.41420	.41831	.55731	.47517	.42503	.36325	-.41253
ANALYT	.19315	-.01034	-.04380	.07852	.11170	.25231	-.05981	-.23029	.30255	.08205
ANXIO	-.18597	-.31689	-.02428	-.22515	-.02308	-.16246	-.25408	-.11151	-.29125	.27610
ATTENT	-.14455	-.34506	-.36451	-.26249	-.15213	-.12766	-.37057	-.53718	-.03039	.41047
BLOW	.44800	.62967	.37689	.53241	.38905	.55182	.43970	.36462	.47974	-.43728
BOAST	.26472	.45749	.50470	.52238	.50858	.50297	.60078	.40503	.35059	-.25432
BRIGHT	.22324	-.00482	-.08527	.07348	.05857	.23399	-.10597	-.21489	.37359	.08184
BUBBLE	.62797	.31180	.06244	.35958	.31838	.56962	.06120	-.01900	.77224	-.31405
BULLY	.28773	.46527	.49458	.55448	.34215	.49256	.43054	.47566	.29913	-.34791
CALM	-.55820	-.34672	-.39784	-.38940	-.44472	-.49690	-.27658	-.31960	-.44353	.33731
CAFREE	.40498	.30992	.11422	.22243	.20112	.43324	.27391	.18058	.46221	-.50002
CAFUL	-.29569	-.37632	-.33751	-.29341	-.32326	-.29621	-.34149	-.48881	-.22663	.45089
CALESS	.25424	.46767	.25230	.20216	.25909	.27969	.32678	.41914	.16762	-.41608

Appendix 12 (con't)

	EXCITA	FOOLHD	HOSTILE	HYACT	IMPAT	IMPULS	INSENS	IRRESP	LIVE	LOOK
CAUTIO	-.54251	-.44290	-.15172	-.40295	-.32471	-.50551	-.25162	-.16787	-.63046	.52731
CHANGE	.32053	.48112	.40501	.50040	.26650	.41631	.33674	.35876	.37644	-.22758
CHEEKY	.52555	.45532	.49516	.50540	.56804	.64857	.48520	.34746	.53483	-.41216
CONTEM	-.17899	-.26294	-.10484	-.08674	-.10303	-.11574	-.14750	-.35295	-.09239	.44112
CONTROL	-.46597	-.45545	-.34012	-.32049	-.37295	-.39789	-.27072	-.41757	-.37643	.54733
DARING	.54432	.47948	.20231	.48568	.35206	.59681	.23206	.18656	.64365	-.40845
DREAMY	-.29635	-.18763	.10460	-.21528	.05234	-.25956	.01163	.13929	-.44699	.06847
DISOBE	.36850	.53404	.51133	.55404	.51550	.53466	.57820	.58357	.35822	-.49735
DISORG	.22176	.46372	.36067	.24069	.31279	.32342	.40610	.49143	.16533	-.46045
DISTRA	.34156	.55065	.44030	.49843	.33721	.37035	.45725	.58223	.30047	-.43214
EASY	.26694	.10037	-.13278	.15557	-.00927	.16628	.01051	.00708	.37180	-.12492
EMOTION	.23831	.13601	.03220	.09163	.15874	.13795	-.20663	-.08637	.17883	-.03922
EVENTEM	-.45821	-.36943	-.33210	-.31207	-.34586	-.44442	-.21214	-.24743	-.38831	.44725
EXACT	-.22277	-.45600	-.26003	-.20979	-.18738	-.23781	-.26207	-.45659	-.14468	.48731
EXCITA	1.00000	.44248	.18025	.47010	.44203	.66066	.16166	.10217	.73813	-.45385
FOOLHD	.44248	1.00000	.26273	.53026	.20579	.46678	.35098	.42353	.44062	-.50578
HOSTILE	.18025	.26273	1.00000	.47831	.48266	.30132	.56930	.58549	.10837	-.20049
HYACT	.47010	.53026	.47831	1.00000	.47888	.53688	.47257	.50268	.52484	-.37385
IMPAT	.44203	.20579	.48266	.47888	1.00000	.54680	.40365	.27258	.46207	-.26968
IMPULS	.66066	.46678	.30132	.53688	.54680	1.00000	.33114	.25399	.67556	-.43574
INSENS	.16166	.35098	.56930	.47257	.40365	.33114	1.00000	.60441	.15157	-.30262
IRRESP	.10217	.42353	.58549	.50268	.27258	.25399	.60441	1.00000	.08017	-.42748
LIVE	.73813	.44062	.10837	.52484	.46207	.67556	.15157	.08017	1.00000	-.43669
LOOK	-.45385	-.50578	-.20049	-.37385	-.26968	-.43574	-.30262	-.42748	-.43669	1.00000
MOODY	.04209	-.05293	.40764	.16552	.52167	.19164	.31304	.23279	-.00515	-.05611
MOTIVA	.11114	-.22446	-.16902	-.09912	.02165	.05466	-.18228	-.46268	.20625	.25939
NAUGHTY	.52707	.54373	.43891	.49843	.50268	.57470	.47917	.49762	.46371	-.54132
OPTIM	.29160	.11275	-.10048	.21758	.02398	.25427	.05706	-.13611	.38490	-.09224
ORDER	-.31495	-.35837	-.19010	-.12861	-.24365	-.21696	-.19030	-.41279	-.17429	.47389
OUTGO	.61742	.34622	.05325	.39193	.33173	.60565	.22133	.04849	.74828	-.41568
PASSIVE	-.53620	-.21759	.06296	-.29341	-.12871	-.45804	.05522	.06519	-.60003	.31137
PERSIST	.17142	-.12899	-.08138	.00223	.12805	.23221	-.03437	-.33364	.29801	.12108
QUICK	.38544	.06102	-.03756	.24915	.25545	.38694	-.01147	-.21637	.53988	-.06862
QUIET	-.69666	-.39015	-.19801	-.47923	-.43745	-.61364	-.29872	-.19968	-.77307	.49377
RASH	.59703	.60305	.31146	.59211	.43532	.67732	.36468	.34886	.67672	-.59096
REFLEC	-.10462	-.26059	-.10100	-.07241	-.07067	-.07067	-.15399	-.41220	-.01625	.36535
RELIAB	-.10207	-.38430	-.30714	-.20979	-.15613	-.12747	-.29600	-.59486	-.03175	.40023
RESER	-.52754	-.31926	-.17269	-.37611	-.30346	-.48612	-.30856	-.17643	-.60087	.43969
RESPON	.16493	.00440	-.10162	.10955	.05709	.19123	.04786	-.22843	.30140	.08332
RESTLS	.52119	.52279	.31706	.55456	.45823	.46928	.27670	.40973	.53023	-.55297
RIGID	-.43282	-.05290	.21769	.00497	-.20819	-.21413	.14982	.28621	-.47811	.23623
SELSUF	.11106	-.11555	.01362	.04911	.10166	.14546	.03734	-.24074	.21656	.07393
SOLIT	-.33304	-.19527	.21012	-.13581	.13581	-.20696	.18123	.10322	-.43915	.15129
SPITE	.24969	.44290	.53904	.56206	.54359	.44340	.60011	.50765	.26142	-.31280
STABLE	-.12011	-.22922	-.21998	-.18138	-.25357	-.15324	-.12721	-.36668	-.04887	.34082
SYSTEM	-.08682	-.30352	-.11919	-.06800	-.13684	-.06229	-.17632	-.38566	-.01084	.38420
TALK	.59109	.32783	.06702	.42584	.38912	.52482	.20217	.03653	.71111	-.32965
THINK	-.29721	-.39176	-.05648	-.19476	-.26954	-.26288	-.20430	-.32457	-.25182	.46160
THOUGHT	-.03123	-.30657	-.11439	-.16776	-.07646	-.02920	-.23818	-.37899	.00259	.32398
TOUCHY	.02149	.37245	.34882	.31634	.12370	.18311	.27487	.35546	.03085	-.09918

Appendix 12 (con't)

	EXCITA	FOOLHD	HOSTILE	HYACT	IMPAT	IMPULS	INSENS	IRRESP	LIVE	LOOK
TROUBL	.31545	.50065	.47985	.57959	.48111	.46178	.59848	.58035	.33661	-.42032
UNPRED	.33902	.36617	.34550	.32392	.44184	.37498	.31857	.33686	.32911	-.38795
UNSOC	-.26185	.03260	.41090	.11834	.19500	-.00573	.47210	.36336	-.30537	.[illegible]457
UNTIDY	.23960	.40006	.06769	.13800	.20205	.27464	.14721	.28187	.21630	-.43327
VIGOR	.56244	.34775	.14003	.48277	.33716	.55421	.24221	.12552	.67351	-.32647

	MOODY	MOTIVA	NAUGHTY	OPTIM	ORDER	OUTGO	PASSIVE	PERSIST	QUICK	QUIET
ABMIND	.28933	-.38165	.23864	-.31706	-.37664	-.20745	.27464	-.33882	-.38775	.07396
ACTION	-.00211	.20364	.42165	.37034	-.12856	.59112	-.47245	.19536	.40776	-.65451
AGGRES	.18403	-.19308	.65671	.01748	-.36946	.30381	-.27056	-.01584	.09003	-.45167
ANALYT	-.07304	.54427	-.04966	.37891	.33987	.34523	-.36019	.45634	.56782	-.20377
ANXIO	.23321	-.07881	-.15965	-.39732	.03546	-.42312	.27658	-.10275	-.23405	.36693
ATTENT	-.16735	.59477	-.51001	.23423	.52937	.02740	-.06646	.35472	.38347	.14620
BLOW	.14380	-.14210	.58674	.11653	-.28964	.37200	-.21441	.06457	.22517	-.45306
BOAST	.28831	.00064	.59401	.20796	-.09083	.35812	-.11307	.13054	.25944	-.35804
BRIGHT	-.18897	.54915	-.06180	.49163	.28790	.48191	-.43206	.46267	.57106	-.32169
BUBBLE	-.06191	.30218	.34544	.38757	-.12065	.72505	-.57971	.24719	.55484	-.66692
BULLY	.09753	-.09143	.52459	.06553	-.16607	.25429	-.24041	.01130	.12979	-.34774
CALM	-.25970	.17725	-.58160	.00030	.36241	-.30536	.15160	.07385	-.05389	.42732
CAFREE	-.08429	-.03771	.32510	.24801	-.22454	.51300	-.31741	.04962	.27190	-.47395
CAFUL	-.15426	.39130	-.55955	.15790	.61332	-.17413	.07567	.23560	.11737	.29457
CALESS	.15297	-.36657	.49336	-.11580	-.61132	.14160	-.01208	-.24785	-.07317	-.27766
CAUTIO	.03908	-.03593	-.46612	-.31137	.29305	-.62426	.47133	-.12353	-.34103	.65255
CHANGE	.17155	-.17046	.44950	-.01783	-.24894	.13735	-.12292	.00066	.06457	-.22922
CHEEKY	.30869	-.08941	.66694	.09892	-.30800	.47526	-.24674	.13429	.23333	-.52614
CONTEM	-.09863	.54103	-.35483	.23321	.54238	-.06918	-.07945	.31257	.23005	.15513
CONTROL	-.19563	.33335	-.62506	.07581	.57672	-.18100	.14881	.19224	.11323	.37104
DARING	-.00440	.15893	.47138	.33671	-.11945	.57878	-.44609	.13972	.36388	-.61708
DREAMY	.31036	-.36668	-.01457	-.46427	-.18515	-.52770	.57307	-.37809	-.51716	.43932
DISOBE	.33452	-.32730	.74580	.00041	-.40307	.30059	-.13765	-.07667	.04428	-.42565
DISORG	.23379	-.46913	.51934	-.25714	-.60969	.08894	.08199	-.31402	-.18117	-.18803
DISTRA	.20358	-.37417	.57503	-.03578	-.41610	.17169	-.01939	-.24879	-.16831	-.30093
EASY	-.22494	.15382	-.01303	.25922	.01901	.38561	-.29542	.07782	.32814	-.28265
EMOTION	.29330	-.02350	.12935	-.20100	-.12554	.01718	-.08176	.03862	.05645	-.00543
EVENTEM	-.28125	.16155	-.60814	-.02803	.42847	-.31137	.29384	-.05588	-.05975	.42359
EXACT	-.14203	.46081	-.49336	.13670	.59117	-.05637	.00487	.35701	.24978	.22391
EXCITA	.04209	.11114	.52707	.29160	-.31495	.61742	-.53620	.17142	.38544	-.69666
FOOLHD	-.05293	-.22446	.54373	.11275	-.35837	.34622	-.21759	-.12899	.06102	-.39015
HOSTILE	.40764	-.16902	.43891	-.10048	-.19010	.05325	.46296	-.08135	-.03756	-.19801
HYACT	.16552	-.09912	.49843	.21758	-.12861	.39193	-.29341	.00223	.24915	-.47923
IMPAT	.52167	.02165	.50268	.02398	-.24365	.33173	-.12871	.12805	.25545	-.43705
IMPULS	.19164	.05466	.57470	.25427	-.21696	.60565	-.45864	.23221	.38694	-.61364
INSENS	.31304	-.18228	.47917	.05706	-.19030	.22133	.05522	-.03437	-.01147	-.29872
IRRESP	.23279	-.46268	.49762	-.13611	-.41079	.04849	.08519	-.33364	-.21637	-.19968
LIVE	-.00515	.20625	.46371	.38490	-.17429	.74828	-.60003	.29841	.53988	-.77307

Appendix 12 (con't)

	MOODY	MOTIVA	NAUGHTY	OPTIM	ORDER	OUTGO	PASSIVE	PERSIST	QUICK	QUIET
LOOK	-.05611	.25939	-.54132	-.09224	.47389	-.41568	.31137	.12108	-.06862	.49377
MOODY	1.00000	-.08389	.28453	-.22059	-.16267	-.06762	.27455	.08637	-.08464	-.01399
MOTIVA	-.08389	1.00000	-.24848	.42853	.43618	.26453	-.36065	.60040	.58138	-.14556
NAUGHTY	.28453	-.24848	1.00000	-.01935	-.51406	.40411	-.26040	-.04701	.01490	-.54439
OPTIM	-.22059	.42853	-.01935	1.00000	.23213	.48252	-.40059	.32247	.43689	-.37781
ORDER	-.16267	.43618	-.51406	.23213	1.00000	-.13326	.05755	.26325	.19993	.23209
OUTGO	-.06762	.26453	.40411	.48252	-.13326	1.00000	-.66295	.33697	.54690	-.80430
PASSIVE	.27455	-.36065	-.26040	-.40059	.05755	-.66295	1.00000	-.37069	-.52007	.64022
PERSIST	.08637	.60040	-.04701	.32247	.26325	.33697	-.37069	1.00000	.55243	-.22700
QUICK	-.08464	.58138	.01490	.43689	.19993	.54690	-.52007	.55243	1.00000	-.40525
QUIET	-.01399	-.14556	-.54439	-.37781	.23209	-.80430	.64022	-.22700	-.40525	1.00000
RASH	.04896	-.02653	.64639	.29645	-.34013	.61549	-.52408	.09408	.30388	-.70267
REFLEC	-.06697	.53775	-.34910	.23902	.48225	.02316	-.13792	.44443	.36993	.10353
RELIAB	-.18764	.54239	-.46771	.26667	.52469	.01865	-.13982	.43937	.41866	.12210
RESER	.02292	-.16787	-.38265	-.39386	.14869	-.68723	.55640	-.20154	-.38267	.73066
RESPON	-.18643	.54590	-.10748	.38180	.33704	.36053	-.38326	.47861	.62378	-.28561
RESTLS	.13676	-.17429	.57853	.08722	-.40220	.39315	-.33459	.01828	.15781	-.50923
RIGID	.05439	-.35516	-.12672	-.29906	.12515	-.48983	.43918	-.26644	-.38236	.45097
SELSUF	-.05556	.52487	-.08918	.37084	.36069	.36188	-.30607	.42702	.52224	-.23830
SOLIT	.07297	-.24482	-.11138	-.33875	-.03971	-.45788	.66778	-.22338	-.35198	.45490
SPITE	.41587	-.22274	.51178	-.04273	-.19356	.17972	.05499	-.02989	.05812	-.22075
STABLE	-.35500	.44417	-.38584	.35112	.41914	.08753	-.10583	.27372	.30262	.03448
SYSTEM	-.21331	.56152	-.39596	.37347	.64432	.07146	-.18410	.44423	.43895	.09095
TALK	-.08410	.20539	.36764	.42833	-.10093	.70158	-.59929	.27778	.51435	-.70320
THINK	-.06833	.32700	-.38688	.06123	.41386	-.15939	.03333	.18031	.06083	.26395
THOUGHT	-.11516	.65454	-.32456	.25614	.51725	.10299	-.17567	.36151	.35691	.01161
TOUCHY	.20568	-.21728	.19169	-.20152	-.06004	-.13762	.06465	-.06153	-.06131	.07190
TROUBL	.40622	-.30910	.59924	-.03910	-.32870	.21381	-.04064	-.12091	-.04633	-.29967
UNPRED	.38950	-.13058	.54036	-.07868	-.33245	.14982	-.04572	-.02092	.01127	-.23126
UNSOC	.46835	-.29716	.10593	-.30026	-.26981	-.32143	.51033	-.24321	-.29005	.27776
UNTIDY	.23029	-.27757	.47718	-.15349	-.60123	.14517	-.06673	-.09732	-.10301	-.17814
VIGOR	-.03862	.28783	.40323	.40511	-.03160	.61199	-.59476	.30825	.49520	-.66834

	RASH	REFLEC	RELIAB	RESER	RESPON	RESTLS	RIGID	SELSUF	SOLIT	SPITE
ABMIND	.01713	-.25080	-.36505	.11728	-.39071	.10600	.16625	-.36388	.36777	.16953
ACTION	.53368	-.07253	-.05004	-.53933	.28935	.40136	-.43232	.14128	-.37777	.18524
AGGRES	.55862	-.21037	-.35686	-.33393	.00338	.43101	-.00789	-.04333	-.14110	.50336
ANALYT	.14409	.46226	.35025	-.22470	.50991	.03968	-.22843	.44937	-.22680	-.60080
ANXIO	-.36048	-.03429	.03313	.38921	-.22765	-.15229	.30471	-.32234	.27341	-.65525
ATTENT	-.29941	.42979	.58069	.11255	.48976	-.38585	-.19848	.37376	-.08421	-.26660
BLOW	.57861	-.20238	-.27955	-.31208	.10712	.46190	-.01928	-.00817	-.11516	.54645
BOAST	.41833	.01661	-.11886	-.33241	.23401	.33967	.02657	.21988	.00856	.59641
BRIGHT	.21679	.38551	.33152	-.33505	.46745	.01363	-.29955	.43058	-.35197	-.11836
BUBBLE	.55302	.07542	.02639	-.58058	.36430	.37245	-.52176	.31568	-.42858	.28907
BULLY	.50232	-.03983	-.26266	-.24199	.06513	.33409	.11948	.05728	-.17619	.46977

Appendix 12 (con't)

	RASH	REFLEC	RELIAB	RESER	RESPON	RESTLS	RIGID	SELSUF	SOLIT	SPITE
CALM	-.45394	.25469	.31321	.25786	.10393	-.47714	.03324	.21638	.01294	-.26523
CAFREE	.47329	-.13222	-.08280	-.47892	.14519	.31354	-.39443	.19023	-.27675	.17623
CAFUL	-.41155	.40956	.48035	.23840	.28205	-.47294	.04446	.21475	-.01346	-.26510
CALESS	.37768	-.34130	-.40939	-.17998	-.21016	.44719	-.05275	-.18319	.05501	.32316
CAUTIO	-.59673	.13859	.13743	.58914	-.19131	-.46085	.41531	-.11363	.34359	-.26627
CHANGE	.45565	-.06936	-.28519	-.13524	.01407	.44167	.16017	-.16570	-.07758	.43082
CHEEKY	.59095	-.11754	-.25436	-.42770	.07560	.42610	-.13270	.09298	-.04429	.57861
CONTEM	-.24623	.63010	.53446	.08370	.43156	-.31992	-.03793	.39872	-.00413	-.14788
CONTROL	-.50068	.43144	.54905	.29547	.26689	-.54445	.09633	.27883	.04422	-.29249
DARING	.57386	-.10104	-.09559	-.49441	.24645	.39322	-.34811	.22815	-.41809	.26346
DREAMY	-.31845	-.12052	-.28615	.39766	-.49212	-.16113	.29879	-.34616	.50306	.05987
DISOBE	.59762	-.30574	-.45728	-.29755	-.13052	.54393	.06550	-.10740	-.00618	.56625
DISORG	.33250	-.42114	-.52240	-.14166	-.26954	.37676	.09028	-.28593	.13658	.37600
DISTRA	.45352	-.41329	-.50588	-.25705	-.24307	.55299	.08887	-.24928	.06089	.39991
EASY	.20305	.04279	.11072	-.38643	.21343	.12794	-.38625	.17684	-.33618	-.25448
EMOTION	.10925	.00782	-.09615	.10149	-.13164	.17012	-.00363	-.17328	.03790	.06756
EVENTEM	-.48553	.24317	.31369	.25001	.02867	-.43728	.17371	.07248	.18111	-.30719
EXACT	-.34167	.51814	.49962	.18111	.34438	-.35727	.04459	.30777	.00682	-.28931
EXCITA	.59703	-.10462	-.10207	-.52754	.16493	.52119	-.43282	.11106	-.33304	.24969
FOOLHD	.60305	-.26059	-.38430	-.31926	.00440	.52279	-.05290	-.11555	-.19527	.44290
HOSTILE	.31146	-.10100	-.30714	-.17269	-.10162	.31706	.21769	.01362	.21012	.53904
HYACT	.59211	-.07241	-.20979	-.37611	.10955	.55456	.00497	.04911	-.13581	.56206
IMPAT	.43532	-.07067	-.15613	-.30346	.05709	.45823	-.20819	.10166	.13581	.54059
IMPULS	.67732	-.07067	-.12747	-.48612	.19123	.46928	-.21413	.14546	-.20696	.44340
INSENS	.36468	-.15399	-.29600	-.30856	.04786	.27670	.14982	.03734	.18123	.60011
IRRESP	.34886	-.41020	-.59486	-.17643	-.22843	.40973	.28821	-.24074	.10322	.50765
LIVE	.67672	-.01625	-.03175	-.60087	.30140	.53023	-.47811	.21656	-.43915	.26142
LOOK	-.59096	.36535	.40023	.43969	.08332	-.55297	.23623	.07393	.15129	-.31280
MOODY	.04896	-.06697	-.18764	.02292	-.18643	.13676	.05439	-.05556	.47297	.41587
MOTIVA	-.02653	.53775	.54239	-.16787	.54590	-.17429	-.35516	.52487	-.24482	-.22274
NAUGHTY	.64639	-.34910	-.46771	-.38265	-.10748	.57853	-.12672	-.08918	-.11138	.51178
OPTIM	.29645	.23902	.26667	-.39386	.38180	.08722	-.29906	.37284	-.33875	-.04273
ORDER	-.34013	.48225	.52469	.14869	.33704	-.40220	.12515	.36269	-.03971	-.19356
OUTGO	.61549	.02316	.01865	-.68723	.36053	.39315	-.48983	.36188	-.45786	.17972
PASSIVE	-.52008	-.13792	-.13982	.55640	-.38326	-.33459	.43918	-.30607	.66778	.05499
PERSIST	.09408	.44443	.43937	-.20154	.47861	.01828	-.26644	.42722	-.22338	-.02989
QUICK	.30388	.36993	.41866	-.38267	.62378	.15781	-.38236	.52224	-.35198	.05812
QUIET	-.70267	.10353	.12210	.73666	-.28561	-.50923	.45097	-.23830	.45490	-.22075
RASH	1.00000	-.17506	-.29936	-.58099	.14873	.57948	-.28586	.05395	-.37055	.37559
REFLEC	-.17506	1.00000	.57482	.10165	.39707	-.29242	.00061	.40407	.02036	-.13702
RELIAB	-.29936	.57482	1.00000	.09758	.48334	-.37461	-.16310	.44246	-.10146	-.29615
RESER	-.58099	.10165	.09758	1.00000	-.23966	-.46116	.46353	-.26782	.43268	-.12119
RESPON	.14873	.39707	.48334	-.23966	1.00000	-.08602	-.33391	.47399	-.31815	-.00201
RESTLS	.57948	-.29242	-.37461	-.46116	-.08602	1.00000	-.21352	-.08156	-.17769	.34215
RIGID	-.28586	.00061	-.16310	.46353	-.33391	-.21352	1.00000	-.28498	.34316	.10888
SELSUF	.05395	.40447	.44246	-.26782	.47399	-.08156	-.28499	1.00000	-.21455	-.00665
SOLIT	-.37055	.02036	-.10146	.43268	-.31815	-.17769	.34316	-.21455	1.00000	.23195
SPITE	.37559	-.13702	-.29615	-.12119	-.00201	.34215	.10888	-.00665	.23195	1.00000
STABLE	-.20696	.44894	.57448	-.01087	.43447	-.42938	-.13762	.52953	-.20477	-.25891
SYSTEM	-.18085	.67876	.60604	.03899	.47315	-.31272	-.01094	.51949	-.17575	-.23477

Appendix 12 (con't)

	RASH	REFLEC	RELIAB	RESER	RESPON	RESTLS	RIGID	SELSUF	SOLIT	SPITE
TALK	.58953	.01796	.04320	-.64118	.36480	.46419	-.44957	.24715	-.44870	.14332
THINK	-.35051	.55580	.35851	.25553	.20056	-.46562	.14979	.21133	.03583	-.25853
THOUGHT	-.19817	.57298	.58959	.00628	.47129	-.36912	-.15388	.43737	-.08188	-.25531
TOUCHY	.17524	-.11604	-.28380	.12149	-.06807	.21383	.43011	-.23072	.11430	.41022
TROUBL	.47165	-.35724	-.42942	-.23986	-.04474	.50721	.07076	-.15246	.14353	.66578
UNPRED	.38420	-.19132	-.39047	-.23209	-.07377	.46442	-.16347	-.12670	.11802	.47532
UNSOC	-.12724	-.01071	-.24277	.28910	-.20356	-.05572	.51733	-.18723	.69723	.46233
UNTIDY	.33073	-.44012	-.36598	-.16831	-.28058	.37359	-.10512	-.24850	.01456	.29279
VIGOR	.62750	.08579	.02328	-.56385	.35473	.39977	-.33639	.23778	-.46759	.26131

	STABLE	SYSTEM	TALK	THINK	THOUGHT	TOUCHY	TROUBL	UNPRED	UNSOC	UNTIDY
AGE	-.05430	-.08696	.08851	-.11555	-.11026	.06870	-.02157	-.08635	-.17735	.00174
ABMIND	-.39324	-.43210	-.15431	-.20943	-.29806	.06452	.28637	.24483	.32671	.18919
ACTION	-.03018	.01407	.55726	-.18520	.06731	-.09721	.26794	.26816	-.26967	.08210
AGGRES	-.26653	-.26200	.29534	-.23723	-.27364	.33979	.52498	.42703	.11739	.32241
ANALYT	.25848	.48970	.29729	.16792	.51588	-.03548	-.09241	.02567	-.14355	-.19188
ANXIO	-.28212	-.11037	-.30337	.06417	-.02741	.17343	-.06932	.03651	.18332	-.26412
ATTENT	.40740	.50217	-.02354	.29903	.52175	-.18567	-.39658	-.31385	-.14624	-.34157
BLOW	-.19748	-.23509	.37336	-.32976	-.28921	.42796	.51572	.39988	.11209	.31806
BOAST	-.06341	.00833	.36188	-.14499	-.02419	.29068	.51091	.34035	.33415	.09472
BRIGHT	.32576	.51870	.35570	.18224	.48006	-.18412	-.18418	-.09599	-.37717	-.22327
BUBBLE	.03757	.10201	.65633	-.15034	.17051	-.09361	.14640	.23570	-.37837	.13698
BULLY	-.10711	-.02696	.24422	-.12785	-.13686	.28737	.33057	.29230	.03425	.17259
CALM	.43329	.28997	-.38040	.37446	.23493	-.23172	-.43813	-.42467	-.07646	-.27719
CAFREE	.07846	-.05924	.44689	-.29414	-.14055	-.13517	.20613	.13487	-.21656	.22461
CAFUL	.38412	.45606	-.17827	.39060	.40928	-.09439	-.41682	-.32885	-.09811	-.47764
CALESS	-.30549	-.47873	.16275	-.45461	-.45285	.08399	.41282	.32978	.13224	.56233
CAUTIO	.09393	.11498	-.56298	.28851	.07679	.00933	-.30851	-.33923	.20330	-.24096
CHANGE	-.29673	-.18746	.20788	-.21111	-.27100	.51686	.48177	.44000	.16588	.19980
CHEEKY	-.22024	-.15814	.40964	-.27144	-.20702	.20825	.53085	.50114	.17638	.33634
CONTEM	.46522	.56768	-.04439	.50641	.66870	-.11615	-.29573	-.23524	-.03668	-.46746
CONTROL	.51496	.52755	-.28207	.49522	.46508	-.21753	-.45311	-.51623	-.02547	-.44722
DARING	-.00392	-.00446	.47697	-.16808	.04477	.00825	.29470	.22486	-.22361	.11930
DREAMY	-.25220	-.30235	-.42572	-.05412	-.18741	.05670	.03087	.11085	.39453	.11082
DISOBE	-.35658	-.33965	.28696	-.35248	-.36643	.31990	.67940	.43555	.25213	.38083
DISORG	-.39846	-.54704	.11465	-.43749	-.44734	.23055	.49525	.40072	.27097	.48355
DISTRA	-.39162	-.44059	.28799	-.47058	-.42490	.33623	.60658	.45289	.20693	.33991
EASY	.23501	.13539	.30980	-.06890	.02327	-.14778	.02462	-.02886	-.25846	-.01288
EMOTION	-.37885	-.11652	.05291	-.03711	-.19792	.32093	.10003	.27282	.04933	.16023
EVENTEM	.37066	.32848	-.29393	.24294	.23752	-.21268	-.35151	[illegible]	.01163	-.37646
EXACT	.35827	.54981	-.09786	.42065	.49139	-.16483	-.34237	-.32549	-.06114	-.54134
EXCITA	-.12011	-.08682	.59109	-.29721	-.03123	.02149	.31545	.33912	-.26185	.25560
FOOLHD	-.22922	-.30352	.32783	-.39176	-.30657	.37245	.50065	.36617	.03260	.40006
HOSTILE	-.21998	-.11919	.06702	-.05648	-.11439	.34882	.47985	.34552	.41090	.06769
HYACT	-.18138	-.06803	.42584	-.19476	-.16776	.31634	.57959	.32392	.11834	.13800
IMPAT	-.25357	-.13684	.38912	-.26954	-.07646	.12370	.48111	.44184	.19500	.20205

Appendix 12 (con't)

	STABLE	SYSTEM	TALK	THINK	THOUGHT	TOUCHY	TROUBL	UNPRED	UNSOC	UNTIDY
IMPULS	-.15024	-.06229	.52482	-.26288	-.02920	.18311	.46178	.37498	-.00573	.27464
INSENS	-.10721	-.17632	.20217	-.20414	-.23818	.27487	.59848	.31857	.47210	.14721
IRRESP	-.36668	-.38586	.03853	-.32457	-.37899	.35546	.58035	.33686	.36336	.28187
LIVE	-.04887	-.01084	.71111	-.25182	.00259	.03085	.33661	.32911	-.30537	.21630
LOOK	.34082	.38420	-.32965	.46104	.32398	-.09918	-.42032	-.38795	.04457	-.43327
MOODY	-.35500	-.21331	-.08410	-.06833	-.11516	.20568	.40622	.38950	.46835	.23029
MOTIVA	.44417	.56152	.20539	.32700	.65454	-.21728	-.30910	-.13058	-.29716	-.27757
NAUGHTY	-.38584	-.39596	.36764	-.38688	-.32456	.19160	.59924	.54036	.10590	.47718
OPTIM	.35112	.37347	.42833	.06123	.25614	-.20152	-.03910	-.07868	-.30026	-.15349
ORDER	.41914	.64432	-.10093	.41386	.51725	-.06004	-.32870	-.33245	-.06981	-.60123
OUTGO	.08753	.07146	.70158	-.15939	.10299	-.13762	.21381	.14962	-.32143	.14517
PASSIVE	-.10583	-.18410	-.59929	.03333	-.17567	.06465	-.04064	-.04572	.51033	-.06673
PERSIST	.27372	.44403	.27708	.18031	.36151	-.06153	-.12091	-.02092	-.24321	-.09732
QUICK	.30262	.43895	.51435	.06083	.35691	-.06131	-.04633	.01127	-.29005	-.10301
QUIET	.03448	.09095	-.70320	.26395	.01161	.07190	-.29967	-.23126	.27776	-.17814
RASH	-.20696	-.18085	.58953	-.35051	-.19817	.17524	.47165	.38420	-.12724	.33073
REFLEC	.44894	.67876	.01796	.55580	.57298	-.11604	-.35724	-.19132	-.01071	-.44012
RELIAB	.57448	.60604	.04320	.35851	.58959	-.28380	-.42942	-.39047	-.24277	-.36596
RESER	-.01087	.03899	-.64118	.25553	.00628	.12149	-.23986	-.23209	.28910	-.16831
RESPON	.43447	.47315	.36480	.20056	.47129	-.06807	-.04474	-.07377	-.20356	-.28058
RESTLS	-.42938	-.31272	.46419	-.46562	-.36912	.21383	.50721	.46462	-.05572	.37359
RIGID	-.13702	-.01094	-.44957	.14979	-.15388	.43011	.07476	-.16347	.51733	-.10512
SELSUF	.52953	.51949	.24715	.21133	.43737	-.23002	-.15246	-.12670	-.18723	-.24050
SPLIT	-.20477	-.17575	-.44870	.03583	-.08188	.11430	.14353	.11802	.69723	.01456
SPITE	-.25891	-.23477	.14332	-.25053	-.25531	.41022	.66578	.47532	.46233	.29279
STABLE	1.00000	.61348	-.00715	.38264	.44716	-.33685	-.42809	-.53749	-.20298	-.39309
SYSTEM	.61348	1.00000	.06125	.51558	.64253	-.15016	-.37276	-.38313	-.17310	-.52312
TALK	-.00715	.06125	1.00000	-.27869	.06598	-.00093	.25870	.23519	-.35338	.10807
THINK	.38264	.51558	-.27869	1.00000	.50145	-.14987	-.37095	-.38265	.05892	-.46538
THOUGHT	.44716	.64253	.06598	.50145	1.00000	-.26701	-.33638	-.24325	-.18073	-.44866
TOUCHY	-.33685	-.15016	-.00093	-.14987	-.26701	1.00000	.42043	.30194	.34925	.07984
TROUBL	-.42809	-.37276	.25870	-.37095	-.33638	.42043	1.00000	.49880	.40875	.38644
UNPRED	-.53749	-.38313	.23519	-.38265	-.24325	.30194	.49880	1.00000	.15832	.33191
UNSOC	-.20298	-.17310	-.35338	.05892	-.18073	.34925	.40875	.15832	1.00000	.09311
UNTIDY	-.39309	-.52312	.10807	-.46538	-.44866	.07984	.38644	.33191	.09311	1.00000
VIGOR	.07287	.14202	.57112	-.12380	.02854	.00762	.26266	.17303	-.21874	.12602

	VIGOR
ABMIND	-.20794
ACTION	.59613
AGGRES	.41253
ANALYT	.27502
ANXIO	-.31680
ATTENT	.01057
BLOW	.37648

APPENDIX 13 Correlation matrix for Nicholson and Gray's TRS factor analysis (24 adjectives)

	AGGRES	ANXIO	CALM	CAFREE	CAFUL	EVENTEM	EXCITA	IMPULS	LIVELY	MOODY
AGGRES	1.00000	-.20888	-.46117	.33300	-.48783	-.51999	.43022	.55731	.36325	.18403
ANXIO	-.20888	1.00000	-.08222	-.52064	.15203	.04241	-.18597	-.16246	-.29125	.23321
CALM	-.46117	-.08222	1.00000	-.18962	.40526	.49466	-.55820	-.49696	-.44353	-.25970
CAFREE	.33300	-.52064	-.18962	1.00000	-.28244	-.17843	.40498	.40324	.46221	-.08429
CAFUL	-.48783	.15203	.40526	-.28244	1.00000	.39510	-.29569	-.29621	-.22663	-.15426
EVENTEM	-.51999	.04241	.49466	-.17843	.39510	1.00000	-.45821	-.44442	-.38831	-.28125
EXCITA	.43022	-.18597	-.55820	.40498	-.29569	-.45821	1.00000	.66066	.73813	.04209
IMPULS	.55731	-.16246	-.49696	.40324	-.29621	-.44442	.66066	1.00000	.67556	.19164
LIVELY	.36325	-.29125	-.44353	.46221	-.22663	-.38831	.73813	.67556	1.00000	-.00515
MOODY	.18403	.23321	-.25970	-.08429	-.15426	-.28125	.04209	.19164	-.00515	1.00000
OPTIM	.01748	-.39732	.00030	.24801	.15790	-.02803	.29160	.25427	.38490	-.22059
OUTGO	.30381	-.42312	-.30536	.51300	-.17413	-.31137	.61742	.60565	.74828	-.06762
PASSIVE	-.27056	.27658	.15160	-.31741	.07567	.29384	-.53620	-.45804	-.60003	.27455
QUIET	-.45167	.36693	.42732	-.47395	.29457	.42359	-.69666	-.61364	-.77307	-.01399
RELIAB	-.35686	.03313	.31321	-.08280	.48035	.31369	-.10207	-.12747	-.03175	-.18764
RESER	-.33393	.38921	.25786	-.47892	.23840	.25001	-.52754	-.48612	-.60087	.02292
RESPON	.00338	-.22765	.10393	.14519	.28205	.02867	.16493	.19123	.30140	-.18643
RESTLS	.43101	-.15229	-.47714	.31354	-.47294	-.43728	.52119	.46928	.53023	.13676
RIGID	-.00789	.30471	.03324	-.39443	.04446	.17371	-.43282	-.21413	-.47811	.05439
STABLE	-.26653	-.28212	.43329	.07846	.38412	.37066	-.12011	-.15024	-.04887	-.35500
TALK	.29534	-.33337	-.38040	.44689	-.17827	-.29393	.59109	.52482	.71111	-.08414
THOUGHT	-.27364	-.02741	.23493	-.14655	.40928	.23750	-.03123	-.02922	.00259	-.11516
TOUCHY	.33979	.17343	-.23172	-.13517	-.09439	-.21268	.02149	.18311	.03085	.20568
UNSOC	.11739	.18332	-.07646	-.21656	-.09811	.01163	-.26185	-.00573	-.30537	.46835

	OPTIM	OUTGO	PASSIVE	QUIET	RELIAB	RESER	RESPON	RESTLS	RIGID	STABLE
AGGRES	.01748	.30381	-.27056	-.45167	-.35686	-.33393	.00338	.43101	-.00789	-.26653
ANXIO	-.39732	-.42312	.27658	.36693	.03313	.38921	-.22765	-.15229	.30471	-.28212
CALM	.00030	-.30536	.15160	.42732	.31321	.25786	.10393	-.47714	.03324	.43329
CAFREE	.24801	.51300	-.31741	-.47395	-.08280	-.47892	.14519	.31354	-.39443	.07846
CAFUL	.15790	-.17413	.07567	.29457	.48035	.23840	.28205	-.47294	.04446	.38412
EVENTEM	-.02803	-.31137	.29384	.42359	.31369	.25001	.02867	-.43728	.17371	.37066
EXCITA	.29160	.61742	-.53620	-.69666	-.10207	-.52754	.16493	.52119	-.43282	-.12011
IMPULS	.25427	.60565	-.45804	-.61364	-.12747	-.48612	.19123	.46928	-.21413	-.15024
LIVELY	.38490	.74828	-.60003	-.77307	-.03175	-.60087	.30140	.53023	-.47811	-.04887
MOODY	-.22059	-.06762	.27455	-.01399	-.18764	.02292	-.18643	.13676	.05439	-.35500
OPTIM	1.00000	.48252	-.40659	-.37781	.26667	-.39386	.38180	.08722	-.29906	.35112
OUTGO	.48252	1.00000	-.66295	-.80430	.01865	-.68723	.36053	.39315	-.48983	.28753
PASSIVE	-.40659	-.66295	1.00000	.64022	-.13982	.55643	-.38326	-.33459	.43918	-.10583
QUIET	-.37781	-.80430	.64022	1.00000	.12210	.73666	-.28561	-.52923	.45097	.03448
RELIAB	.26667	.01865	-.13982	.12210	1.00000	.09758	.48334	-.37461	-.16310	.57448
RESER	-.39386	-.68723	.55640	.73666	.09758	1.00000	-.23966	-.46116	.46353	-.21087
RESPON	.38180	.36053	-.38326	-.28561	.48334	-.23966	1.00000	-.08602	-.33391	.43447

Appendix 13 (con't).

	OPTIM	OUTGO	PASSIVE	QUIET	RELIAB	RESER	RESPON	RESTLS	RIGID	STABLE
RESTLS	.08722	.39315	-.33459	-.50923	-.37461	-.46116	-.08602	1.00000	-.21352	-.42938
RIGID	-.29906	-.48983	.43918	.45097	-.16310	.46353	-.33391	-.21352	1.00000	-.13702
STABLE	.35112	.08753	-.10583	.03448	.57448	-.01087	.43447	-.42938	-.13702	1.00000
TALK	.42833	.70158	-.59929	-.70320	.04320	-.64118	.36480	.46419	-.44957	-.00715
THOUGHT	.25614	.10299	-.17567	.01161	.58959	.00628	.47129	-.36912	-.15388	.44716
TOUCHY	-.20152	-.13762	.06465	.07190	-.28380	.12149	-.06807	.21383	.43011	-.33685
UNSOC	-.30026	-.32143	.51033	.27776	-.24277	.28910	-.20356	-.05572	.51733	-.22298

	TALK	THOUGHT	TOUCHY	UNSOC
AGGRES	.29534	-.27364	.33979	.11739
ANXIO	-.30337	-.02741	.17343	.18332
CALM	-.38246	.23493	-.23172	-.07646
CAFREE	.44689	-.14055	-.13517	-.21656
CAFUL	-.17827	.40928	-.09439	-.09811
EVENTEM	-.29393	.23750	-.21268	.01163
EXCITA	.59109	-.03123	.02149	-.26185
IMPULS	.52482	-.02920	.18311	-.00573
LIVELY	.71111	.00259	.03085	-.30537
MOODY	-.08410	-.11516	.20568	.46835
OPTIM	.42833	.25614	-.20152	-.30026
OUTGO	.70158	.10299	-.13762	-.32143
PASSIVE	-.59929	-.17567	.06465	.51033
QUIET	-.70320	.01161	.07190	.27776
RELIAB	.04320	.58959	-.28380	-.24277
RESER	-.64118	.00628	.12149	.28910
RESPON	.36480	.47129	-.06807	-.20356
RESTLS	.46419	-.36912	.21383	-.05572
RIGID	-.44957	-.15388	.43011	.51733
STABLE	-.00715	.44716	-.33685	-.20298
TALK	1.00000	.06598	-.00493	-.35338
THOUGHT	.06598	1.00000	-.26701	-.18073
TOUCHY	-.00093	-.26701	1.00000	.34925
UNSOC	-.35338	-.18073	.34925	1.00000

Appendix 14a Correlation matrix for New Teacher's Rating Scale factor analysis: second study (N=112)

	ABMIND	ACTION	AGGRES	ANALYT	ANXIO	ATTENT	BLOW	BOAST	BUBBLE	BULLY
ABMIND	1.00000	-.10361	.33107	-.48605	-.02665	-.63519	.25105	.19134	.00082	.26372
ACTION	-.10361	1.00000	.28268	.12675	-.26343	-.17100	.27638	.20257	.52648	.18309
AGGRES	.33107	.28268	1.00000	.03548	-.18345	-.45500	.75040	.50509	.50985	.77764
ANALYT	-.48605	.12675	.03548	1.00000	-.19367	.35567	.20744	.33498	.29187	.12578
ANXIO	-.02665	-.26343	-.18345	-.19367	1.00000	.25859	-.13954	-.10508	-.25566	-.11517
ATTENT	-.63519	-.17100	-.45500	.35567	.25859	1.00000	-.37451	-.34469	-.30837	-.36576
BLOW	.25105	.27638	.75040	.20744	-.13954	-.37451	1.00000	.59494	.58173	.71110
BOAST	.19134	.20257	.50509	.33498	-.10508	-.34469	.59494	1.00000	.54676	.63264
BUBBLE	.00082	.52648	.50985	.29187	-.25566	-.30837	.58173	.54676	1.00000	.46122
BULLY	.26372	.18309	.77764	.12578	-.11517	-.36576	.71110	.63264	.46122	1.00000
CALM	-.26260	-.10015	-.45064	.11311	-.24165	.32752	-.44659	-.30239	-.41853	-.41321
CAFREE	.09073	.53757	.45411	.15332	-.53272	-.36495	.40868	.34985	.69001	.34817
CAFUL	-.53299	-.06929	-.26313	.21911	.19541	.70990	-.37862	-.36782	-.38339	-.30046
CALESS	.52674	.04761	.37757	-.30252	-.18257	-.66054	.38909	.25973	.35153	.31059
CAUTIO	-.46071	-.10618	-.50934	.04234	.31619	.63564	-.52169	-.43385	-.46319	-.43407
CHANGE	.23979	.15907	.60725	.09102	.06630	-.39420	.63477	.53168	.47624	.54424
CHEEKY	.43618	.23455	.73810	.00520	-.16507	-.54701	.68644	.59552	.54708	.76764
CONTEM	-.49384	-.02676	-.36388	.46437	.11641	.57231	-.20804	-.11823	-.24137	-.23441
CONTROL	-.45220	-.03021	-.53048	.19700	.04491	.58531	-.57900	-.42145	-.42920	-.48417
DARING	.04835	.28880	.49410	.19014	-.37778	-.31585	.41412	.34317	.47233	.40400
DREAMY	.36412	.11218	.27988	.02415	.20890	-.24719	.27923	.25203	.05932	.31867
DISOBE	.49987	.16100	.67902	-.03891	-.13736	-.62020	.69881	.61015	.52896	.68326
DISORG	.67908	.03295	.46827	-.43399	-.10434	-.76745	.42599	.31743	.30284	.42474
DISTRA	.58576	.20522	.59735	-.28975	-.12958	-.74230	.55372	.45587	.47125	.55424
EASY	.40349	.35397	.45431	-.02285	-.35490	-.50703	.39411	.30590	.36497	.31992
EMOTION	.07164	-.10246	.22634	.01362	.42359	.01999	.20249	.09668	.13826	.23996
EVENTEM	-.43516	-.01448	-.61398	.07144	-.10188	.48790	-.63992	-.49766	-.43855	-.59850
EXACT	-.53584	-.05854	-.39957	.38059	.07457	.66054	-.36154	-.36356	-.36086	-.37223
EXCITA	.25411	.37716	.64303	.07666	-.15215	-.52101	.65956	.56525	.67475	.62753
FOOLHD	.47407	.29002	.69463	-.04165	-.09941	-.54319	.59312	.53764	.45028	.64809
HOSTILE	.33217	.03325	.69863	.04082	.08468	-.32416	.66372	.51288	.35496	.73152
HYACT	.26509	.34085	.59863	.13373	-.26185	-.43109	.60888	.59702	.65581	.55697
IMPAT	.28616	.19774	.64904	.11841	-.07918	-.38396	.69563	.61326	.61230	.64566
IMPLT	.23157	.36444	.63326	.14605	-.17591	-.48135	.66609	.63124	.75070	.61319
IMPULS	.22844	.40136	.71317	.16151	-.17620	-.44522	.75045	.61968	.70784	.69381
INSENS	.27819	.08733	.64481	-.03477	-.17911	-.50311	.47847	.43678	.40294	.59443
IRRESP	.47720	.21576	.66290	-.14598	-.16099	-.69492	.61658	.49261	.46639	.65149
LIVE	.04905	.42795	.50049	.31153	-.30527	-.29969	.48881	.50798	.73191	.43217
LOOK	-.35427	.09852	-.30580	.29160	.07969	.32148	-.12042	-.04324	-.04036	-.28981
METHOD	-.49556	-.02514	-.30324	.41840	.10032	.64593	-.23419	-.18703	-.27743	-.21644
MOODY	.26058	-.18817	.30590	.09944	.17102	-.09360	.38563	.31737	.18098	.28847
MOTIVA	-.34893	-.19884	-.21230	.26730	.25887	.53482	-.14573	-.13969	-.24750	-.05864
NAUGHTY	.36402	.22859	.68202	-.00508	-.22295	-.63057	.65841	.54584	.58312	.66119
OPTIM	-.18727	.36461	.03167	.31100	-.36751	.08611	.03846	.19769	.32078	.06706
ORDER	-.47886	-.01395	-.37743	.35954	.00117	.61053	-.35222	-.25040	-.28007	-.36250
OUTGO	-.02445	.32202	.21845	.23453	-.40590	-.16404	.28844	.34607	.61815	.23492

Appendix 14a (con't)

	ABMIND	ACTION	AGGRES	ANALYT	ANXIO	ATTENT	BLOW	BOAST	BUBBLE	BULLY
PASSIVE	-.03779	-.09870	-.36222	-.22494	.21348	.16494	-.49007	-.42649	-.51162	-.36531
PERSIST	-.18455	.10898	.02129	.21970	.02521	.11313	.06595	.19518	.20708	.01965
QUICK	-.52613	.15145	-.01445	.68192	-.23447	.31647	.14628	.21829	.29170	.10309
QUIET	-.25018	-.23871	-.48435	-.12230	.38551	.45832	-.49999	-.50726	-.57128	-.50046
RASH	.38595	.25090	.65823	-.06125	-.15370	-.62403	.67374	.58599	.57923	.68003
REFLEC	-.41017	-.03880	-.35203	.42088	.12073	.68030	-.31445	-.22558	-.23509	-.27697
RELIAB	-.69370	.10572	-.39943	.46619	.02020	.65787	-.28509	-.21989	-.07594	-.33731
RESER	-.20579	-.19340	-.41612	-.04597	.27306	.41698	-.45273	-.41619	-.48264	-.45669
RESPON	-.57263	.11374	-.16948	.52427	-.07348	.55438	-.03232	.03654	.14676	-.07984
RESTLS	.50155	.15412	.47556	-.31914	-.10592	-.63630	.41453	.35226	.44018	.43075
RIGID	-.37358	-.13442	-.35610	-.09056	.29162	.27074	-.35049	-.28774	-.34396	-.34839
SOLIT	.02009	-.34780	-.14299	-.22450	.36162	.20869	-.22543	-.24724	-.40056	-.21075
SPITE	.34343	-.08988	.60396	-.23971	-.12141	-.47472	.43116	.28369	.18083	.61251
STABLE	-.44443	.19427	-.41143	.36001	-.16725	.52388	-.37974	-.21039	-.16054	-.36734
SYSTEM	-.65675	.01860	-.36151	.52069	.02091	.66297	-.25818	-.16472	-.15118	-.29944
TALK	.27836	.25239	.48973	-.03103	-.19348	-.56495	.51589	.42371	.55717	.56688
THINK	-.41824	-.08107	-.51826	.25749	.11545	.59413	-.43519	-.36534	-.34540	-.52209
THOUGHT	-.49117	.02656	-.37586	.42424	.05694	.62268	-.33409	-.21156	-.20115	-.36268
TOUCHY	.24934	-.21562	.34117	-.05408	.32952	-.18046	.36695	.20452	.18220	.31075
TROUBL	.30042	.08676	.66004	.01466	-.02449	-.48418	.63532	.47083	.50767	.66949
UNPRED	.48628	-.02489	.62313	-.19323	.08688	-.54502	.57183	.37435	.38026	.57547
UNSOC	.22581	-.38773	-.07107	-.24127	.35466	-.02748	-.09977	-.11785	-.41155	.06178
UNTIDY	.34589	.07915	.39411	-.27876	-.18185	-.62434	.36025	.21499	.25704	.43155
VIGOR	.07987	.43650	.53712	.20996	-.32931	-.30564	.52733	.41803	.64707	.51390

	CALM	CAFREE	CAFUL	CALESS	CAUTIO	CHANGE	CHEEKY	CONTEM	CONTROL	CARING
ABMIND	-.26260	.09073	-.53299	.52674	-.46071	.23979	.43618	-.49384	-.45220	.04835
ACTION	-.10015	.53757	-.06929	.04761	-.10618	.15907	.23455	-.02676	-.03021	.28880
AGGRES	-.45064	.45411	-.26313	.37757	-.50934	.60725	.73810	-.36388	-.53048	.49410
ANALYT	.11311	.15332	.21911	-.30252	.04234	.09102	.00520	.46437	.19700	.19014
ANXIO	-.24165	-.53272	.19541	-.18257	.31619	.06630	-.16507	.11641	.04491	-.37778
ATTENT	.32752	-.36495	.70990	-.66054	.63564	-.39420	-.54701	.57231	.58531	-.31585
BLOW	-.44659	.40868	-.37862	.38909	-.52169	.63477	.68644	-.20604	-.57900	.41412
BOAST	-.30239	.34985	-.36782	.25973	-.43385	.53168	.59552	-.11823	-.42145	.34317
BUBBLE	-.41853	.69001	-.38339	.35153	-.46319	.47624	.54708	-.24137	-.42920	.47233
BULLY	-.41321	.34817	-.30046	.31059	-.43407	.54424	.76764	-.23441	-.48417	.40400
CALM	1.00000	-.16443	.47964	-.40054	.39066	-.57438	-.47464	.45619	.56300	-.16898
CAFREE	-.16443	1.00000	-.31274	.30504	-.45033	.29955	.41210	-.24686	-.26383	.54117
CAFUL	.47964	-.31274	1.00000	-.78271	.64962	-.40603	-.49980	.62631	.68661	-.20869
CALESS	-.40054	.30504	-.78271	1.00000	-.65277	.33407	.53899	-.63199	-.67986	.23049
CAUTIO	.39066	-.45033	.64962	-.65277	1.00000	-.49826	-.62384	.60462	.67182	-.44295
CHANGE	-.57438	.29955	-.40603	.33407	-.49826	1.00000	.58995	-.33695	-.54110	.41325
CHEEKY	-.47464	.41210	-.49980	.53899	-.62384	.58995	1.00000	-.43677	-.68801	.46298
CONTEM	.45619	-.24686	.62631	-.63199	.60462	-.33695	-.43877	1.00000	.59228	-.23121
CONTROL	.56300	-.26383	.68661	-.67986	.67182	-.54110	-.68801	.59228	1.00000	-.32242

Appendix 14a (con't)

	CALM	CAFREE	CAFUL	CALESS	CAUTIO	CHANGE	CHEEKY	CONTEM	CONTROL	DARING
DARING	-.16898	.54117	-.20869	.23049	-.44295	.41325	.46298	-.23121	-.32242	1.00000
DREAMY	-.07375	.06133	-.05676	.03814	-.10474	.33700	.24885	-.00429	-.06411	-.08962
DISOBE	-.54225	.39789	-.63281	.64370	-.66496	.64111	.83601	-.48282	-.77548	.49924
DISORG	-.47079	.27164	-.75627	.76764	-.60422	.48925	.64552	-.64442	-.78078	.22999
DISTRA	-.46738	.40985	-.63972	.71873	-.61426	.51027	.70652	-.62592	-.71196	.38034
EASY	-.21380	.50322	-.40731	.48221	-.50927	.41563	.50686	-.36285	-.33408	.40583
EMOTION	-.49912	-.19995	-.09939	.14139	-.01995	.41895	.25544	-.08105	-.30523	-.02024
EVENTEM	.65600	-.23265	.48722	-.40705	.55184	-.69821	-.59729	.39563	.63390	-.30319
EXACT	.52778	-.28459	.74008	-.77114	.65211	-.44802	-.58257	.67288	.72848	-.30911
EXCITA	-.52961	.54180	-.49813	.46757	-.63047	.63714	.76326	-.45472	-.59261	.54195
FOOLHD	-.40681	.40624	-.45266	.46849	-.53415	.58659	.78795	-.39512	-.61062	.44573
HOSTILE	-.43705	.15224	-.30444	.34227	-.44816	.63127	.65454	-.25869	-.45869	.24432
HYACT	-.51006	.55328	-.51355	.43609	-.51249	.50486	.67865	-.27852	-.57202	.50557
IMPAT	-.58776	.46514	-.53047	.54154	-.55331	.62739	.72950	-.35129	-.66125	.46947
IMPET	-.53251	.59388	-.50693	.46134	-.64434	.62662	.68839	-.40613	-.61225	.55940
IMPULS	-.59412	.56756	-.51925	.48776	-.60483	.67262	.74860	-.41871	-.58215	.57380
INSENS	-.35568	.38323	-.36983	.33368	-.55187	.44857	.57808	-.44430	-.46247	.45921
IRRESP	-.48558	.47241	-.64242	.60382	-.64491	.62512	.76076	-.53889	-.68771	.45967
LIVE	-.40534	.64432	-.36741	.38345	-.48994	.39175	.55849	-.21914	-.39304	.55730
LOOK	.38681	-.04754	.41120	-.29598	.31336	-.28278	-.34512	.58728	.39937	-.22243
METHOD	.51155	-.21976	.71614	-.65278	.57786	-.34018	-.41663	.71051	.65235	-.22398
MOODY	-.37019	-.08135	-.18491	.10378	-.23855	.55342	.22801	-.12697	-.27107	.06020
MOTIVA	.19148	-.38519	.47756	-.44563	.43526	-.14842	-.18808	.46840	.40109	-.28279
NAUGHTY	-.53520	.48339	-.57689	.49044	-.69934	.64210	.78985	-.48025	-.66963	.49964
OPTIM	.04223	.29856	.03641	-.02109	-.05039	-.09648	.19298	.14505	.04992	.28442
ORDER	.50709	-.18162	.69859	-.65730	.52156	-.40550	-.48326	.60342	.70893	-.24805
OUTGO	-.24902	.57205	-.35270	.29977	-.37485	.23146	.34933	-.16705	-.31598	.45926
PASSIVE	.32638	-.28172	.33131	-.31021	.35952	-.29122	-.34863	.04592	.36184	-.23447
PERSIST	.09817	.13597	.18231	-.11572	.08725	.08089	.05319	.26434	.01361	.11213
QUICK	.05009	.14592	.17422	-.20957	-.02940	-.01578	.05709	.37583	.15030	.22209
QUIET	.39239	-.46396	.56917	-.54133	.62761	-.44891	-.63517	.40157	.58465	-.46665
RASH	-.56499	.45872	-.68511	.60500	-.65429	.64203	.79912	-.49209	-.75595	.47879
REFLEC	.37477	-.27350	.71067	-.72055	.57560	-.30999	-.46575	.70898	.65375	-.27457
RELIAB	.42890	-.09659	.61144	-.59409	.57254	-.37323	-.44670	.59565	.60623	-.17078
RESER	.46547	-.39563	.55317	-.53578	.56329	-.41566	-.62240	.37662	.57617	-.36219
RESPON	.30341	.03682	.43432	-.40520	.29939	-.21144	-.14300	.51008	.27225	.06270
RESTLS	-.55857	.30231	-.69974	.62552	-.69543	.41941	.65967	-.68602	-.70850	.28137
RIGID	.16294	-.29610	.29972	-.26978	.28838	-.24515	-.53157	.12035	.36273	-.30156
SOLIT	.22274	-.35183	.37573	-.26225	.37792	-.13576	-.32156	.16144	.19954	-.30926
SPITE	-.42141	.08123	-.37707	.43475	-.45455	.36786	.56794	-.41046	-.53469	.26307
STABLE	.61883	-.01598	.54920	-.56225	.48869	-.52606	-.42461	.53773	.65992	-.07810
SYSTEM	.46360	-.19955	.65959	-.67181	.51577	-.40353	-.48382	.68335	.62941	-.10736
TALK	-.48657	.59996	-.62506	.55752	-.60346	.44906	.68375	-.41211	-.64256	.42530
THINK	.52174	-.25503	.65613	-.57519	.60532	-.47990	-.62152	.62243	.73994	-.40683
THOUGHT	.44262	-.17631	.62654	-.54443	.55446	-.31631	-.46915	.61862	.60333	-.28081
TOUCHY	-.48385	-.13334	-.23522	.27635	-.31746	.46582	.29030	-.24815	-.36595	.10175
TROUBL	-.57741	.25319	-.54671	.56062	-.55945	.59829	.71480	-.46323	-.71776	.38064
UNPRED	-.61630	.16658	-.53524	.55538	-.52806	.62866	.63392	-.46925	-.68815	.23967
UNSOC	.02029	-.44579	.09232	-.01434	.07087	-.01979	-.04929	.04352	-.00578	-.33688
UNTIDY	-.41426	.27737	-.63310	.66383	-.57557	.30049	.57161	-.65502	-.62628	.30290
VIGOR	-.33879	.56233	-.36960	.33974	-.45055	.39477	.56089	-.29693	-.40137	.62791

Appendix 14a (con't)

	DREAMY	DISOBE	DISORG	DISTRA	EASY	EMOTION	EVENTEM	EXACT	EXCITA	FOOLHD
ABMIND	.36412	.49987	.67908	.58576	.40349	.07164	-.43516	-.53584	.25411	.47407
ACTION	.11218	.16100	.03295	.20522	.35397	-.10246	-.01448	-.05854	.37716	.29802
AGGRES	.27988	.67902	.46827	.59735	.45431	.22634	-.61398	-.39957	.64303	.69463
ANALYT	.02415	-.03891	-.43399	-.28975	-.02285	.01362	.07144	.38059	.07666	-.04165
ANXIO	.20890	-.13736	-.10434	-.12958	-.35490	.42359	-.10188	.07457	-.15215	-.09941
ATTENT	-.24719	-.62020	-.76745	-.74230	-.50703	.01999	.48790	.66054	-.52101	-.54319
BLOW	.27923	.69881	.42599	.55372	.39411	.20249	-.63992	-.36154	.65956	.59312
BOAST	.25203	.61015	.31743	.45587	.30590	.09668	-.49766	-.36356	.56525	.53764
BUBBLE	.05932	.52896	.30284	.47125	.36497	.13826	-.43855	-.36086	.67475	.45028
BULLY	.31867	.68326	.42474	.55424	.31992	.23996	-.59850	-.37223	.62753	.64809
CALM	-.07375	-.54225	-.47079	-.46738	-.21380	-.49912	.65600	.52778	-.52961	-.40681
CAFREE	.06133	.39789	.27164	.40985	.50322	-.19995	-.23265	-.28459	.54180	.40624
CAFUL	-.05676	-.63281	-.75627	-.63972	-.40731	-.09939	.48722	.74008	-.49813	-.45266
CALESS	.03814	.64370	.76764	.71873	.48221	.14139	-.40705	-.77114	.46757	.46849
CAUTIO	-.10474	-.66496	-.60422	-.61416	-.50927	-.01995	.55184	.65211	-.63047	-.53415
CHANGE	.33700	.64111	.48925	.51027	.41563	.41895	-.69621	-.44802	.63714	.58659
CHEEKY	.24885	.83601	.64552	.70652	.50686	.25544	-.59729	-.58257	.76326	.78795
CONTEM	-.00429	-.48282	-.64442	-.62592	-.36285	-.08105	.39563	.67288	-.45472	-.39512
CONTROL	-.06411	-.77548	-.78078	-.71196	-.33408	-.30523	.63390	.72648	-.59261	-.61062
DARING	-.08962	.49924	.22999	.38034	.40583	-.02024	-.30319	-.30911	.54195	.44573
DREAMY	1.00000	.23856	.21611	.24571	.25207	.09431	-.26911	-.04518	.16992	.32617
DISOBE	.23856	1.00000	.70361	.77095	.49302	.24907	-.73598	-.64745	.73970	.80095
DISORG	.21611	.70361	1.00000	.82732	.49798	.21789	-.53210	-.78809	.54678	.60377
DISTRA	.24571	.77095	.82732	1.00000	.53662	.20275	-.53453	-.74452	.70310	.67066
EASY	.25207	.49302	.49798	.53662	1.00000	.04261	-.27138	-.37355	.48560	.47034
EMOTION	.09431	.24907	.21789	.20275	.04261	1.00000	-.41075	-.18014	.28205	.14223
EVENTEM	-.26911	-.73598	-.53210	-.53453	-.27138	-.41075	1.00000	.53463	-.57359	-.57454
EXACT	-.04518	-.64745	-.78609	-.74452	-.37355	-.18014	.53463	1.00000	-.57426	-.55194
EXCITA	.16992	.73970	.54678	.70310	.48560	.28205	-.57359	-.57426	1.00000	.68481
FOOLHD	.32617	.80095	.60377	.67066	.47034	.14223	-.57454	-.55194	.68481	1.00000
HOSTILE	.40531	.65063	.41998	.48350	.26183	.37545	-.67353	-.34902	.56198	.55386
HYACT	.01580	.68481	.49887	.58758	.33854	.08195	-.49908	-.47991	.70347	.61781
IMPAT	.17396	.77513	.52774	.58579	.37060	.33749	-.68604	-.52568	.71314	.64574
IMPET	.17600	.70909	.48115	.63238	.40070	.13272	-.57631	-.58777	.78916	.69460
IMPULS	.18890	.74568	.50648	.62251	.47805	.22104	-.63446	-.51792	.79239	.66809
INSENS	.24776	.61694	.41156	.48343	.25316	.02058	-.54219	-.45702	.57655	.59195
IRRESP	.32839	.82918	.71776	.77382	.56326	.16541	-.66467	-.63232	.74099	.73273
LIVE	-.08066	.53862	.28536	.45453	.42308	.12532	-.32102	-.33644	.69453	.51048
LOOK	.05090	-.39541	-.45028	-.41578	-.15942	-.27167	.32786	.41458	-.36864	-.33369
METHOD	.08399	-.47961	-.72698	-.62072	-.25145	-.12460	.46761	.84373	-.42403	-.42920
MOODY	.22317	.29950	.21351	.18125	.01270	.37764	-.58610	-.18598	.22415	.24255

Appendix 14 a (con't)

	DREAMY	DISOBE	DISORG	DISTRA	EASY	EMOTION	EVENTEM	EXACT	EXCITA	FCOLHD
MOTIVA	.11111	-.28084	-.48760	-.45820	-.19110	.15399	.27452	.54817	-.25147	-.29024
NAUGHTY	.21598	.76375	.63021	.63012	.50727	.20696	-.68519	-.58025	.71465	.67910
OPTIM	-.17242	.07878	-.13432	-.01258	.19668	-.13958	.12637	.02969	.16801	.27660
ORDER	.00028	-.56259	-.78143	-.67017	-.28835	-.22803	.48690	.84075	-.48461	-.47038
OUTGO	-.29241	.36861	.15753	.30494	.26879	.00885	-.21369	-.26978	.47199	.23543
PASSIVE	.19965	-.45789	-.16510	-.26621	-.08977	-.17324	.41711	.20903	-.40706	-.22580
PERSIST	-.03017	.02702	-.05612	.01137	.20879	.09171	.00082	.14937	.09811	.22927
QUICK	-.21197	-.07807	-.41258	-.27731	-.09308	-.08594	.12725	.27689	.04513	-.02658
QUIET	.12309	-.66023	-.47351	-.55591	-.46209	-.18840	.45153	.49384	-.66163	-.48760
RASH	.15447	.85686	.70646	.75607	.41011	.21413	-.65325	-.67890	.80196	.75847
REFLEC	.05485	-.53244	-.67687	-.65404	-.25254	-.00109	.43163	.77122	-.43950	-.43605
RELIAB	-.15760	-.57963	-.68812	-.57626	-.36741	-.11809	.59392	.64683	-.35339	-.48570
RESER	.20349	-.60680	-.48647	-.51909	-.42194	-.22776	.43444	.51735	-.62959	-.46155
RESPON	-.29430	-.27946	-.45088	-.34172	-.22472	-.01963	.36071	.46392	-.11911	-.23140
RESTLS	-.00205	.68161	.69231	.67448	.39729	.08079	-.57857	-.73043	.59494	.59923
RIGID	-.03138	-.47429	-.36564	-.36189	-.29713	-.08136	.26559	.23007	-.34833	-.47349
SOLIT	.13817	-.25430	-.17244	-.26030	-.32170	-.01462	.08711	.22365	-.42984	-.14695
SPITE	.00280	.57152	.48167	.48973	.23863	.19191	-.59401	-.47755	.40779	.47646
STABLE	-.10664	-.56823	-.64727	-.54551	-.18069	-.35193	.70225	.65415	-.40386	-.42631
SYSTEM	-.14524	-.55824	-.80625	-.69049	-.35876	-.15856	.50414	.78083	-.43656	-.48596
TALK	-.01369	.70826	.58863	.68380	.40519	.22842	-.55833	-.57096	.67664	.54853
THINK	.08343	-.69268	-.66634	-.69692	-.33015	-.17766	.57754	.71757	-.63162	-.56341
THOUGHT	.05470	-.55851	-.61655	-.58021	-.21341	-.05042	.52800	.68513	-.44117	-.39794
TOUCHY	.21397	.37992	.31077	.25588	.17119	.39992	-.60107	-.32057	.32415	.28000
TROUBL	.14414	.79975	.57739	.63411	.34447	.35055	-.72272	-.59198	.65024	.62905
UNPRED	.21076	.71360	.65680	.63300	.31958	.42890	-.72437	-.62583	.60188	.60657
UNSOC	.35011	-.03503	.09977	-.06881	-.12239	.15468	-.10690	.02596	-.24197	.00287
UNTIDY	-.07221	.57265	.68474	.67156	.31405	-.00194	-.34583	-.74073	.56185	.49934
VIGOR	-.09696	.50142	.33409	.45531	.33282	.02474	-.34989	-.41188	.64543	.53551

	HOSTILE	HYACT	IMPAT	IMPET	IMPULS	INSENS	IRRESP	LIVE	LOOK	METHOD
ABMIND	.33217	.26509	.28616	.23157	.22844	.27819	.47720	.04905	-.35427	-.49556
ACTION	.03325	.34085	.19774	.36444	.40136	.08733	.21576	.42795	.09852	-.02514
AGGRES	.69863	.59863	.64904	.63326	.71317	.64481	.66290	.50049	-.30580	-.30324
ANALYT	.04082	.13373	.11841	.14605	.16151	-.03477	-.14598	.31153	.29160	.41840
ANXIO	.08468	-.26185	-.07918	-.17591	-.17620	-.17911	-.16099	-.30527	.07969	.10032
ATTENT	-.32416	-.43109	-.38396	-.48135	-.44522	-.50311	-.69492	-.29969	.32148	.64593
BLOW	.66372	.60888	.69563	.66609	.75045	.47847	.61658	.48881	-.12042	-.23419
BOAST	.51288	.59702	.61326	.63124	.61968	.43678	.49061	.50798	-.04324	-.18703
BUBBLE	.35496	.65581	.61230	.75070	.70784	.40294	.46639	.73191	-.04036	-.27743
BULLY	.73152	.55697	.64566	.61319	.69381	.59443	.65149	.43217	-.28981	-.21644
CALM	-.43705	-.51006	-.58776	-.53251	-.59412	-.35568	-.48558	-.40534	.38681	.51155
CAFREE	.15224	.55328	.46514	.59388	.56756	.38323	.47241	.64432	-.04754	-.21976
CAFUL	-.30444	-.51355	-.53047	-.50693	-.51925	-.36983	-.64242	-.36741	.41120	.71614
CALESS	.34227	.43609	.54154	.46134	.48776	.33368	.60382	.38345	-.29598	-.65248

Appendix 14a (con't)

	HOSTILE	HYACT	IMPAT	IMPET	IMPULS	INSENS	IRRESP	LIVE	LOOK	METHOD
CAUTIO	-.44816	-.51249	-.55331	-.64434	-.60483	-.55187	-.64491	-.48994	.31336	.57786
CHANGE	.63127	.50486	.62739	.62662	.67262	.44857	.62512	.39175	-.28278	-.34918
CHEEKY	.65454	.67865	.72950	.68839	.74860	.57808	.76076	.55849	-.34512	-.41663
CONTEM	-.25869	-.27852	-.35129	-.40613	-.41871	-.44430	-.53889	-.21914	.58728	.71051
CONTROL	-.45869	-.57202	-.66125	-.61225	-.58215	-.46247	-.68771	-.39304	.39937	.65235
DARING	.24432	.50557	.46947	.55940	.57380	.45921	.45967	.55730	-.22243	-.22398
DREAMY	.40531	.01580	.17396	.17600	.18890	.24776	.32839	-.08066	.05090	.08399
DISOBE	.65063	.66481	.77513	.70909	.74568	.61694	.82918	.53862	-.39541	-.47961
DISORG	.41998	.49887	.52774	.48115	.50648	.41156	.71776	.28536	-.45028	-.72688
DISTRA	.48350	.58758	.58579	.63238	.62251	.48343	.77382	.45453	-.41578	-.62072
EASY	.26183	.33854	.37060	.40070	.47805	.25316	.56326	.42308	-.15942	-.25145
EMOTION	.37545	.08195	.33749	.13272	.22104	.02058	.16541	.12532	-.27167	-.12460
EVENTEM	-.67353	-.49908	-.68604	-.57631	-.63446	-.54219	-.66467	-.32102	.32786	.46761
EXACT	-.34902	-.47991	-.52568	-.58777	-.51792	-.45702	-.63232	-.33644	.41458	.84373
EXCITA	.56198	.70347	.71314	.78916	.79239	.57655	.74099	.69453	-.36864	-.42403
FOOLHD	.55386	.61781	.64574	.69460	.66809	.59195	.73273	.51048	-.33369	-.42920
HOSTILE	1.00000	.45380	.65468	.51277	.65235	.52129	.58044	.31467	-.30805	-.20808
HYACT	.45380	1.00000	.74213	.77933	.75689	.45985	.59671	.75001	-.31319	-.39829
IMPAT	.65468	.74213	1.00000	.74095	.83848	.54833	.67461	.66075	-.31252	-.40980
IMPET	.51277	.77933	.74095	1.00000	.82394	.63072	.66468	.74279	-.30826	-.46903
IMPULS	.65235	.75689	.83848	.82394	1.00000	.58135	.67096	.70738	-.34205	-.39358
INSENS	.52129	.45985	.54833	.63072	.58135	1.00000	.66765	.40327	-.33621	-.38960
IRRESP	.58044	.59671	.67461	.66468	.67096	.66765	1.00000	.47279	-.38680	-.50328
LIVE	.31467	.75001	.66075	.74279	.70738	.40327	.47279	1.00000	-.18916	-.26258
LOOK	-.30805	-.31319	-.31252	-.30826	-.34205	-.33621	-.38680	-.18916	1.00000	.46654
METHOD	-.20808	-.39829	-.40980	-.46903	-.39358	-.38960	-.50328	-.26258	.46654	1.00000
MOODY	.48307	.20168	.36774	.21784	.28867	.21103	.16892	.06179	-.07448	-.17304
MOTIVA	-.13719	-.36215	-.28432	-.39062	-.27622	-.32837	-.33511	-.22720	.28654	.66675
NAUGHTY	.65979	.63486	.68824	.74984	.74011	.65441	.77789	.52112	-.37583	-.51277
OPTIM	-.14180	.27690	.11896	.25193	.18318	-.05240	.03556	.40533	.08981	.02154
ORDER	-.35595	-.44136	-.50053	-.48453	-.49738	-.36981	-.54719	-.28560	.46638	.81995
OUTGO	.06489	.60545	.47832	.53810	.47617	.17866	.27174	.71201	-.19211	-.21327
PASSIVE	-.29481	-.57389	-.51339	-.43685	-.45669	-.32175	-.32186	-.55209	.10762	.11725
PERSIST	-.15652	.05925	.04406	.01381	-.07690	-.08985	-.00406	.23114	.38376	.26121
QUICK	-.06272	.15418	.12435	.19096	.14848	-.02700	-.15095	.30456	.31895	.26542
QUIET	-.37433	-.66838	-.62677	-.60693	-.63838	-.45180	-.58841	-.69045	.27129	.40558
RASH	.59367	.70481	.77669	.74026	.81359	.65611	.79817	.59391	-.45752	-.56218
REFLEC	-.26379	-.37693	-.41631	-.42515	-.41987	-.49207	-.57989	-.24998	.38253	.74127
RELIAB	-.33968	-.27897	-.34817	-.31711	-.33162	-.46903	-.62128	-.13665	.37063	.59589
RESER	-.27909	-.60686	-.56140	-.55995	-.57480	-.36203	-.53599	-.62483	.31167	.40755
RESPON	-.19722	.01540	-.06676	-.08467	-.07621	-.34734	-.41742	.18337	.32574	.49321
RESTLS	.41553	.56110	.53545	.60943	.60364	.45172	.65355	.43394	-.42899	-.70069
RIGID	-.32426	-.55884	-.45064	-.41298	-.41059	-.15666	-.30982	-.47643	.29904	.21528
SOLIT	-.03897	-.47760	-.27268	-.35854	-.35220	-.08211	-.28530	-.51286	.13202	.19594
SPITE	.53784	.33800	.48249	.36166	.42188	.62858	.59012	.19723	-.41089	-.41905
STABLE	-.44833	-.30227	-.46746	-.36703	-.41472	-.45205	-.54621	-.13834	.43249	.59543
SYSTEM	-.31205	-.37832	-.37807	-.37062	-.38169	-.33088	-.60640	-.19511	.50677	.75436
TALK	.46723	.64194	.62410	.61379	.66820	.43899	.67230	.58468	-.39504	-.49170
THINK	-.42015	-.57540	-.56615	-.60721	-.57943	-.53086	-.67387	-.43794	.58794	.67308

Appendix 14a (con't)

	HOSTILE	HYACT	IMPAT	IMPET	IMPULS	INSENS	IRRESP	LIVE	LOOK	METHOD
THOUGHT	-.33045	-.42579	-.42479	-.44095	-.44235	-.50459	-.54650	-.26477	.53407	.66635
TOUCHY	.41956	.13466	.40531	.28840	.34798	.33611	.31964	.09015	-.14649	-.24256
TROUBL	.67730	.52699	.69965	.62093	.70648	.60750	.71702	.44509	-.42056	-.46804
UNPRED	.69170	.46988	.61754	.56499	.58918	.60776	.64185	.35836	-.45232	-.55469
UNSOC	.13041	-.33052	-.13337	-.21508	-.25465	.04938	.00173	-.44214	.07935	.02789
UNTIDY	.26751	.42303	.44749	.52646	.50066	.48227	.63279	.34493	-.48855	-.68047
VIGOR	.29465	.74208	.57998	.75338	.71879	.47081	.45872	.75999	-.35619	-.36797

	MOODY	MOTIVA	NAUGHTY	OPTIM	ORDER	OUTGO	PASSIVE	PERSIST	QUICK	QUIET
ABMIND	.26058	-.34893	.36402	-.18727	-.47886	-.02445	-.03779	-.18455	-.52613	-.25018
ACTION	-.18817	-.10884	.22859	.36461	-.01395	.32202	-.09870	.10898	.15145	-.23871
AGGRES	.30590	-.21230	.68202	.03167	-.37743	.21845	-.36222	.02129	-.01445	-.48435
ANALYT	.09944	.26730	-.00508	.31100	.35954	.23453	-.22494	.21970	.68192	-.12230
ANXIO	.17102	.25887	-.20295	-.36751	.00117	-.40590	.21348	.02521	-.23447	.38551
ATTENT	-.09360	.53482	-.63057	.08611	.61053	-.16404	.16494	.11313	.31647	.45832
BLOW	.38563	-.14573	.65841	.03846	-.35222	.28844	-.49007	.06595	.14628	-.49999
BOAST	.31737	-.13969	.54584	.19769	-.25040	.34607	-.42649	.19518	.21829	-.50706
BUBBLE	.18098	-.24750	.58312	.32078	-.28007	.61815	-.51162	.20708	.29170	-.57128
BULLY	.28847	-.05864	.66119	.06706	-.36250	.23492	-.36531	.01965	.10009	-.50046
CALM	-.37019	.19148	-.53520	.04223	.50709	-.24902	.32638	.09817	.05009	.39239
CAFREE	-.08135	-.38519	.48339	.29856	-.18162	.57205	-.28172	.13597	.14592	-.46396
CAFUL	-.18491	.47756	-.57689	.03641	.69859	-.35270	.33131	.18231	.17422	.56917
CALESS	.10378	-.44563	.49044	-.02109	-.65730	.29977	-.31021	-.11572	-.20957	-.54133
CAUTIO	-.23855	.43526	-.69934	-.05039	.52156	-.37485	.35952	.08725	-.02940	.62761
CHANGE	.55342	-.14842	.64210	-.09648	-.40550	.23146	-.29122	.08089	-.01578	-.44891
CHEEKY	.22801	-.18808	.78985	.19298	-.48326	.34933	-.34863	.05319	.05709	-.63517
CONTEM	-.12697	.46840	-.48025	.14505	.60342	-.16705	.04592	.26434	.37583	.40157
CONTROL	-.27107	.40109	-.66963	.04992	.70893	-.31598	.36184	.01361	.15030	.58465
DARING	.06020	-.28279	.49964	.28442	-.24805	.45926	-.23447	.11213	.22209	-.46665
DREAMY	.22317	.11111	.21598	-.17242	.00028	-.29241	.19965	-.03017	-.21197	.12309
DISOBE	.29950	-.28084	.76375	.07878	-.56259	.36861	-.45789	.02702	-.07807	-.66023
DISORG	.21351	-.48760	.63021	-.13432	-.78143	.15753	-.16510	-.05612	-.41258	-.47351
DISTRA	.18125	-.45820	.63012	-.01258	-.67017	.30494	-.26621	.01137	-.27731	-.55591
EASY	.01270	-.19110	.50727	.19668	-.28835	.26879	-.08977	.20879	-.09308	-.46209
EMOTION	.37764	.15399	.20696	-.13958	-.22803	.00885	-.17324	.09171	-.08594	-.18840
EVENTEM	-.58610	.27452	-.68519	.12657	.48690	-.21369	.41711	.00082	.12725	.45153
EXACT	-.18590	.54817	-.58025	.02969	.84075	-.26978	.20903	.14937	.27689	.49384
EXCITA	.22415	-.25147	.71465	.16801	-.48461	.47199	-.40706	.09811	.04513	-.66163
FOOLHD	.24255	-.29024	.67910	.07660	-.47038	.23543	-.22580	.02927	-.02658	-.48760
HOSTILE	.48307	-.13719	.65979	-.14180	-.35595	.06489	-.29481	-.15652	-.06272	-.37433
HYACT	.20168	-.36215	.63486	.27690	-.44136	.60545	-.57389	.05925	.15418	-.66838
IMPAT	.36774	-.28432	.68824	.11896	-.50053	.47832	-.51339	.04426	.12435	-.62677
IMPET	.21784	-.39062	.74984	.25193	-.48453	.53810	-.43685	.01381	.19096	-.60693
IMPULS	.28867	-.27622	.74011	.18318	-.49738	.47617	-.45669	-.00690	.14848	-.63838
INSENS	.21103	-.32837	.65441	-.05240	-.36981	.17866	-.32175	-.08985	-.02700	-.45180

Appendix 14a (con't)

	MOODY	MOTIVA	NAUGHTY	OPTIM	ORDER	OUTGO	PASSIVE	PERSIST	QUICK	QUIET
IRRESP	.16892	-.33511	.77789	.03556	-.54719	.27174	-.32186	-.00406	-.15095	-.58841
LIVE	.06179	-.22720	.52112	.40533	-.28560	.71201	-.55209	.23114	.30456	-.69045
LOOK	-.07448	.28654	-.37583	.08981	.46638	-.19211	.10762	.38376	.31895	.27129
METHOD	-.17304	.66675	-.51277	.02154	.81995	-.21327	.11725	.26121	.26542	.40558
MOODY	1.00000	-.08970	.27453	-.34058	-.20806	-.00373	-.23198	.07083	-.10119	-.19976
MOTIVA	-.08970	1.00000	-.35049	.06238	.54547	-.18456	.05493	.35201	.21916	.20820
NAUGHTY	.27453	-.35049	1.00000	.10165	-.50273	.31999	-.32113	-.02296	.01916	-.59575
OPTIM	-.34058	.06238	.10165	1.00000	.14476	.50801	-.21918	.18282	.52848	-.30779
ORDER	-.20806	.54547	-.50273	.14476	1.00000	-.18476	.17720	.17130	.34513	.40612
OUTGO	-.00373	-.18456	.31999	.50801	-.18476	1.00000	-.63320	.20218	.31128	-.65068
PASSIVE	-.23198	.05493	-.32113	-.21918	.17720	-.63320	1.00000	-.16327	-.25744	.61740
PERSIST	.07083	.35201	-.02296	.18282	.17130	.20218	-.16327	1.00000	.10659	-.20116
QUICK	-.10119	.21916	.01916	.52848	.34513	.31128	-.25744	.10659	1.00000	-.15433
QUIET	-.19976	.20820	-.59575	-.30779	.40612	-.65068	.61740	-.20116	-.15433	1.00000
RASH	.19764	-.34697	.75123	.08999	-.63054	.41085	-.47252	-.03477	.00964	-.66843
REFLEC	-.09296	.57945	-.49539	.17474	.71164	-.23292	.17978	.14331	.30294	.40831
RELIAB	-.29507	.39073	-.47547	.22056	.59739	-.03070	.21899	.08289	.42341	.39102
RESER	-.11559	.09662	-.58620	-.31054	.44623	-.62760	.58189	-.21181	-.11773	.79140
RESPON	-.17299	.39550	-.30349	.33230	.41738	.24921	-.15953	.33829	.54224	-.21937
RESTLS	.15392	-.39929	.69012	.10842	-.67270	.33589	-.32884	-.09076	-.11801	-.60826
RIGID	-.17799	.14695	-.39444	-.22592	.28350	-.43185	.31160	-.02645	-.04557	.45322
SOLIT	.09957	.11211	-.30517	-.49879	.13961	-.50011	.41554	-.06894	-.36627	.53576
SPITE	.24254	-.24310	.55577	-.13115	-.44719	.10799	-.33749	-.07992	-.14576	-.42390
STABLE	-.40339	.33381	-.50995	.38534	.66098	-.00677	.27720	.09889	.39178	.32760
SYSTEM	-.15951	.46670	-.46404	.09813	.75105	-.12504	.13475	.13600	.49618	.36583
TALK	.13244	-.30764	.63846	.17902	-.52568	.53477	-.54357	.00275	.11310	-.70426
THINK	-.22174	.41367	-.64323	-.01234	.66971	-.40086	.38446	.09735	.13355	.61581
THOUGHT	-.18403	.49136	-.48665	.15550	.69480	-.29336	.31296	.20436	.34899	.44369
TOUCHY	.60140	-.01369	.34970	-.34754	-.32966	-.02359	-.24698	.06857	-.18719	-.12377
TROUBL	.36341	-.19361	.72019	-.05444	-.57860	.30178	-.48947	-.05751	-.02966	-.56737
UNPRED	.46238	-.33475	.67624	-.16844	-.60904	.15882	-.40252	-.06423	-.23542	-.51951
UNSOC	.15700	.16005	-.03457	-.38767	-.00691	-.67308	.34173	-.07124	-.26346	.33101
UNTIDY	-.03189	-.43328	.52284	.04995	-.70456	.26934	-.19005	-.16559	-.13569	-.45385
VIGOR	.05566	-.33620	.52725	.40621	-.39259	.66439	-.48607	.03612	.26765	-.61054

	RASH	REFLEC	RELIAB	RESER	RESPON	RESTLS	RIGID	SOLIT	SPITE	STABLE
ABNIND	.38595	-.41017	-.69370	-.205[illegible]9	-.57263	.50155	-.37358	.02009	.34343	-.44443
ACTION	.25090	-.03880	.10572	-.19340	.11374	.15412	-.13442	-.34780	-.08988	.19427
AGGRES	.65823	-.35203	-.39943	-.41612	-.16948	.47556	-.35610	-.14299	.60396	-.41143
ANALYT	-.06125	.42088	.46619	-.04597	.52427	-.31914	-.09056	-.22450	-.23971	.36301
ANXIO	-.15370	.12073	.02020	.27306	-.07348	-.10592	.29162	.36162	-.12141	-.16725
ATTENT	-.62403	.68030	.65787	.41698	.55438	-.63630	.27074	.20869	-.47472	.52388
BLOW	.67374	-.31445	-.28509	-.45273	-.03232	.41453	-.35049	-.22543	.43116	-.37974
BOAST	.58599	-.22558	-.21989	-.41619	.03654	.35206	-.28774	-.24724	.28369	-.21039
BUBBLE	.57923	-.23509	-.07594	-.48264	.14676	.44018	-.34396	-.40056	.18083	-.16054

Appendix 14a (con't)

	RASH	REFLEC	RELIAB	RESER	RESPON	RESTLS	RIGID	SOLIT	SPITE	STABLE
BULLY	.68003	-.27697	-.33731	-.45669	-.07984	.43075	-.34839	-.21075	.61251	-.36734
CALM	-.56499	.37477	.42890	.46547	.30341	-.55857	.16294	.22274	-.42141	.61883
CAFREE	.45872	-.27350	-.09659	-.39563	.03682	.30231	-.29610	-.35183	.08123	-.21598
CAFUL	-.68511	.71067	.61144	.55317	.43432	-.69974	.29972	.37573	-.37707	.54920
CALESS	.60500	-.72055	-.59409	-.53578	-.40520	.62552	-.26978	-.26225	.43475	-.56225
CAUTIO	-.65429	.57560	.57254	.56329	.29939	-.69543	.28638	.37792	-.45455	.48869
CHANGE	.64203	-.30999	-.37323	-.41566	-.21144	.41941	-.24515	-.13576	.36786	-.52606
CHEEKY	.79912	-.46575	-.44670	-.62240	-.14300	.65967	-.53157	-.32156	.56794	-.42461
CONTEM	-.49209	.70898	.59565	.37662	.51008	-.68602	.12035	.16144	-.41046	.53773
CONTROL	-.75595	.65375	.60623	.57617	.27225	-.70850	.36273	.19954	-.53469	.65992
DARING	.47879	-.27457	-.17078	-.36219	.06270	.28137	-.30156	-.30926	.26307	-.07810
DREAMY	.15447	.05485	-.15760	.20349	-.29430	-.00005	-.03138	.13817	.00280	-.10664
DISOBE	.85686	-.53244	-.57963	-.60680	-.27946	.68161	-.47429	-.25430	.57152	-.56823
DISORG	.70646	-.67687	-.68012	-.48647	-.45088	.69231	-.36564	-.17244	.48167	-.64727
DISTRA	.75607	-.65404	-.57626	-.51909	-.34172	.67448	-.36189	-.26030	.48973	-.54551
EASY	.41011	-.25254	-.36741	-.42194	-.22472	.39729	-.29713	-.32170	.23863	-.18069
EMOTION	.21413	-.00109	-.11809	-.22776	-.01963	.08079	-.08136	-.01462	.19191	-.35193
EVENTEM	-.65325	.43163	.59392	.43444	.36071	-.57857	.26559	.08711	-.59401	.70225
EXACT	-.67890	.77122	.64603	.51735	.46392	-.73043	.23007	.22365	-.47755	.65415
EXCITA	.80196	-.43950	-.35339	-.62959	-.11911	.59494	-.34833	-.42984	.40779	-.42386
FOOLHD	.75847	-.43605	-.48570	-.46155	-.23140	.59923	-.47349	-.14695	.47646	-.42631
HOSTILE	.59367	-.26379	-.33968	-.27909	-.19722	.41553	-.32426	-.03897	.53784	-.44833
HYACT	.70481	-.37693	-.27897	-.60686	.01540	.56110	-.55884	-.47760	.33800	-.30227
IMPAT	.77669	-.41631	-.34817	-.56140	-.06676	.53545	-.45064	-.27268	.48249	-.46746
IMPET	.74026	-.42515	-.31711	-.55993	-.08467	.60943	-.41298	-.35854	.36166	-.36703
IMPULS	.81359	-.41987	-.33162	-.57480	-.07621	.60364	-.41059	-.35220	.42188	-.41472
INSENS	.65611	-.49207	-.46903	-.36203	-.34734	.45172	-.15666	-.08211	.62858	-.45205
IRRESP	.79817	-.57989	-.62128	-.53599	-.41742	.65355	-.30982	-.28530	.59012	-.54621
LIVE	.59391	-.24998	-.13665	-.62483	.18337	.43394	-.47643	-.51286	.19723	-.13834
LOOK	-.45752	.38253	.37063	.31167	.32574	-.42899	.29904	.13202	-.41089	.43249
METHOD	-.56218	.74127	.59589	.40755	.49321	-.70069	.21528	.19594	-.41905	.59543
MOODY	.19764	-.09296	-.29507	-.11559	-.17299	.15392	-.17799	.09957	.24254	-.40339
MOTIVA	-.34697	.57945	.39073	.09662	.39550	-.39929	.14695	.11211	-.24310	.33381
NAUGHTY	.75123	-.49539	-.47547	-.58620	-.30349	.69012	-.39444	-.30517	.55577	-.50995
OPTIM	.08999	.17474	.22056	-.31054	.33230	.10842	-.22592	-.49879	-.13115	.38534
ORDER	-.63054	.71164	.59739	.44623	.41738	-.67270	.28350	.13961	-.44719	.66098
OUTGO	.41085	-.23292	-.03070	-.62760	.24921	.33589	-.43185	-.50011	.10799	-.00677
PASSIVE	-.47252	.17978	.21899	.58189	-.15953	-.32884	.31160	.41554	-.33749	.27720
PERSIST	-.03477	.14331	.08289	-.21181	.33809	-.09076	-.02845	-.06894	-.07992	.09889
QUICK	.00964	.30294	.42341	-.11773	.54224	-.11801	-.04557	-.36627	-.14576	.39178
QUIET	-.66843	.40831	.39102	.79140	-.01937	-.60826	.45322	.53576	-.42390	.32760
RASH	1.00000	-.62223	-.53384	-.65039	-.23764	.73200	-.40361	-.34549	.58882	-.58027
REFLEC	-.62223	1.00000	.65095	.46619	.47374	-.68085	.12117	.15897	-.52909	.63563
RELIAB	-.53384	.65095	1.00000	.39641	.66654	-.68805	.18462	.05860	-.60749	.72584
RESER	-.65039	.46619	.39641	1.00000	.01939	-.63847	.41755	.55240	-.45700	.41620
RESPON	-.23764	.47374	.66654	.01939	1.00000	-.36934	-.13132	-.08174	-.35678	.53258
RESTLS	.73200	-.68085	-.68805	-.63847	-.36934	1.00000	-.35419	-.32832	.53168	-.61166
RIGID	-.40361	.12117	.18462	.41755	-.13132	-.35419	1.00000	.23339	-.15317	.05897
SOLIT	-.34549	.15897	.05860	.55240	-.08174	-.32832	.23339	1.00000	-.01937	-.07586

Appendix 14a (con't)

	RASH	REFLEC	RELIAB	RESER	RESPON	RESTLS	RIGID	SOLIT	SPITE	STABLE
SPITE	.58882	-.52909	-.60749	-.45700	-.35678	.53168	-.15317	-.01937	1.00000	-.63126
STABLE	-.58027	.63563	.72584	.41620	.53258	-.61166	.05897	-.07586	-.63126	1.00000
SYSTEM	-.58905	.69393	.73556	.46117	.60178	-.72978	.23163	.17082	-.42231	.66480
TALK	.77988	-.52345	-.45982	-.65891	-.13691	.68451	-.39530	-.52316	.48529	-.44966
THINK	-.77511	.69603	.66579	.65524	.35332	-.76225	.32235	.32359	-.62805	.63855
THOUGHT	-.61367	.76193	.69563	.49848	.45772	-.70477	.28793	.14255	-.58832	.63130
TOUCHY	.33744	-.27161	-.46138	-.20175	-.32469	.35099	-.02685	.12582	.42375	-.59567
TROUBL	.78427	-.53840	-.52345	-.59135	-.25949	.65783	-.31892	-.20655	.65846	-.64055
UNPRED	.73110	-.52273	-.59898	-.50927	-.40860	.61485	-.29227	-.06514	.65942	-.73965
UNSOC	-.15079	.07295	-.24463	.26176	-.29109	-.09010	.25514	.43915	.17647	-.25983
UNTIDY	.66256	-.72201	-.51148	-.56072	-.33466	.64248	-.18312	-.27262	.52603	-.54002
VIGOR	.61767	-.31754	-.14761	-.58783	.12441	.47890	-.46414	-.51036	.31111	-.16522

	SYSTEM	TALK	THINK	THOUGHT	TOUCHY	TROUBL	UNPRED	UNSOC	UNTIDY	VIGOR
ABMIND	-.65675	.27836	-.41824	-.49117	.24934	.30042	.48828	.22581	.34589	.07987
ACTION	.01860	.25239	-.08107	.02656	-.21562	.08676	-.02489	-.38773	.07915	.43650
AGGRES	-.36151	.48973	-.51826	-.37586	.34117	.66004	.62313	-.07127	.39411	.53712
ANALYT	.52069	-.03103	.25749	.42424	-.05408	.01466	-.19323	-.24127	-.27876	.20996
ANXID	.02091	-.19348	.11545	.05694	.32952	-.02449	.08688	.35466	-.18185	-.32931
ATTENT	.66297	-.56495	.59413	.62268	-.18046	-.48418	-.54502	-.02748	-.62434	-.30564
BLOW	-.25818	.51589	-.43519	-.33409	.36695	.63532	.57183	-.09977	.36025	.52733
BOAST	-.16472	.42371	-.36534	-.21156	.20452	.47083	.37435	-.11765	.21499	.41803
BUBBLE	-.15118	.55717	-.34540	-.20115	.18220	.50767	.38026	-.41155	.25704	.64707
BULLY	-.29944	.56688	-.52209	-.36268	.31075	.66949	.57547	.06178	.43155	.51390
CALM	.46360	-.48657	.52174	.44262	-.48385	-.57741	-.61630	.02029	-.41426	-.38879
CAFREE	-.19955	.39996	-.25503	-.17631	-.13334	.25319	.16658	-.44579	.27737	.56233
CAFUL	.65959	-.62506	.65613	.62654	-.23522	-.54671	-.53524	.09232	-.63310	-.36960
CALESS	-.67181	.55752	-.57519	-.54443	.27635	.56062	.55538	-.01434	.66383	.33974
CAUTIO	.51577	-.60346	.60532	.55446	-.31746	-.55945	-.52806	.07287	-.57557	-.45055
CHANGE	-.40353	.44906	-.47990	-.31631	.46582	.59829	.62866	-.01979	.30049	.39477
CHEEKY	-.48382	.68375	-.62152	-.46915	.29030	.71480	.63392	-.04929	.57161	.56089
CONTEM	.68335	-.41211	.62243	.61862	-.24815	-.46323	-.46925	.04352	-.65542	-.29693
CONTROL	.62941	-.64256	.73994	.60333	-.36595	-.71776	-.68815	-.00578	-.62628	-.40137
DARING	-.10736	.42530	-.40683	-.28081	.10175	.38064	.23967	-.33688	.30290	.62791
DREAMY	-.14524	-.01369	.08343	.05470	.21397	.14414	.21076	.35011	-.07221	-.09696
DISOBE	-.55824	.70826	-.69268	-.55851	.37992	.79975	.71360	-.03583	.57265	.50142
DISORG	-.80625	.58863	-.66634	-.61655	.31077	.57739	.65680	.09977	.68474	.33409
DISTRA	-.69049	.68380	-.69692	-.58071	.25588	.63411	.63300	-.06681	.67156	.45531
EASY	-.35876	.40519	-.33015	-.21341	.17119	.34447	.31958	-.12239	.31405	.33282
EMOTION	-.15856	.22842	-.17766	-.05042	.39992	.35055	.42690	.15468	-.00194	.02474
EVENTEM	.50414	-.55033	.57754	.52000	-.60107	-.72272	-.72437	-.10690	-.34583	-.34989
EXACT	.78083	-.57096	.71757	.68513	-.32087	-.59198	-.62583	.02596	-.74073	-.41188
EXCITA	-.43656	.67664	-.63162	-.44117	.32415	.65024	.60188	-.24197	.56185	.64543
FOOLHD	-.48596	.54853	-.56341	-.39794	.28000	.62905	.60657	.00287	.49934	.53551
HOSTILE	-.31205	.46723	-.42015	-.33045	.41956	.67730	.69170	.13041	.26751	.29465

Appendix 14a (con't)

	SYSTEM	TALK	THINK	THOUGHT	TOUCHY	TROUBL	UNPRED	UNSOC	UNTIDY	VIGOR
HYACT	-.37832	.64194	-.57540	-.42579	.13466	.52699	.46988	-.33852	.42303	.74208
IMPAT	-.37807	.62410	-.56615	-.42479	.40531	.69965	.61754	-.13337	.44749	.57998
IMPET	-.37062	.61379	-.60721	-.44095	.28840	.62093	.56499	-.21508	.52646	.75338
IMPULS	-.38169	.66820	-.57943	-.44235	.34798	.70648	.58918	-.25465	.50066	.71879
INSENS	-.33088	.43899	-.53086	-.50459	.33611	.60750	.60776	.04938	.48227	.47081
IRRESP	-.60640	.67230	-.67387	-.54650	.31964	.71702	.64185	.00173	.63279	.45872
LIVE	-.19511	.58468	-.43794	-.26477	.09015	.44509	.35836	-.44214	.34493	.75999
LOOK	.50677	-.39504	.58794	.53407	-.14649	-.42056	-.45232	.07935	-.48855	-.35619
METHOD	.75436	-.49170	.67308	.66635	-.24256	-.46804	-.55469	.02789	-.68047	-.36797
MOODY	-.15951	.13244	-.22174	-.18403	.60140	.36341	.46238	.15700	-.03189	.05566
MOTIVA	.46670	-.30764	.41367	.49136	-.01369	-.19361	-.33475	.16005	-.43328	-.33620
NAUGHTY	-.46404	.63846	-.64323	-.48665	.34970	.72019	.67624	-.03457	.52284	.52725
OPTIM	.09813	.17902	-.01234	.15550	-.34754	-.05444	-.16844	-.38767	.04995	.40621
ORDER	.75105	-.52568	.66971	.69480	-.32966	-.57860	-.60904	-.02691	-.70456	-.39259
OUTGO	-.12504	.53477	-.40086	-.29336	-.02359	.30178	.15882	-.67308	.26934	.66439
PASSIVE	.13475	-.54357	.38446	.31296	-.24698	-.48947	-.40252	.34173	-.19005	-.48607
PERSIST	.13640	.00275	.09735	.20436	.06857	-.05751	-.06423	-.07124	-.16559	.03612
QUICK	.49618	.11310	.13355	.34899	-.18719	-.02966	-.23542	-.26346	-.13569	.26765
QUIET	.36583	-.70426	.61581	.44369	-.12377	-.58737	-.51951	.33101	-.45385	-.61054
RASH	-.58905	.77988	-.77511	-.61367	.33744	.78427	.73110	-.15079	.66256	.61767
REFLEC	.69393	-.52345	.69603	.76193	-.27161	-.53840	-.52273	.07295	-.72201	-.31754
RELIAB	.73556	-.45982	.66579	.69563	-.46138	-.52345	-.59898	-.24463	-.51148	-.14761
RESER	.46117	-.65891	.65524	.49848	-.20175	-.59135	-.50927	.26176	-.56072	-.58783
RESPON	.60178	-.13691	.35332	.45722	-.32469	-.25949	-.40860	-.29109	-.33466	.12441
RESTLS	-.72978	.68451	-.76225	-.70477	.35099	.65783	.61485	-.09010	.64248	.47890
RIGID	.23163	-.39530	.32235	.28793	-.02685	-.31892	-.29227	.25514	-.18312	-.46414
SOLIT	.17082	-.52316	.32359	.14255	.12580	-.20655	-.06514	.43915	-.27282	-.51036
SPITE	-.42231	.48529	-.62805	-.58832	.42375	.65046	.65942	.17607	.52603	.31111
STABLE	.66480	-.44966	.63855	.63130	-.59567	-.64055	-.73965	-.25983	-.54002	-.16522
SYSTEM	1.00000	-.47882	.64730	.65838	-.28321	-.49350	-.59527	-.10814	-.63097	-.27008
TALK	-.47882	1.00000	-.71017	-.57172	.22760	.73727	.59776	-.26076	.58634	.58200
THINK	.64730	-.71017	1.00000	.73786	-.36175	-.72959	-.67406	.12361	-.70240	-.51762
THOUGHT	.65838	-.57172	.73786	1.00000	-.35830	-.53903	-.57233	.07895	-.66487	-.36410
TOUCHY	-.28321	.22760	-.36175	-.35830	1.00000	.49793	.58372	.26601	.15174	.10550
TROUBL	-.49350	.73727	-.72959	-.53903	.49793	1.00000	.75316	-.02803	.55471	.46072
UNPRED	-.59527	.59776	-.67406	-.57233	.58372	.75316	1.00000	.14265	.51459	.40404
UNSOC	-.10814	-.26076	.12361	.07895	.26601	-.02803	.14265	1.00000	-.04887	-.42851
UNTIDY	-.63097	.58634	-.70240	-.66487	.15174	.55471	.51459	-.04887	1.00000	.49528
VIGOR	-.27008	.58200	-.51762	-.36410	.10550	.46072	.40404	-.42851	.49528	1.00000

Appendix 14b Correlation matrix for New TRS factor analysis: second study (Pairwise deletion)

	ABMIND	ACTION	AGGRES	ANALYT	ANXIO	ATTENT	BLOW	BOAST	BUBBLE	BULLY
ABMIND	1.00000	-.10596	.27547	-.48681	.19731	-.66710	.19535	.12520	-.08764	.14582
ACTION	-.10596	1.00000	.38364	.03826	-.11544	-.09591	.38872	.35776	.59809	.26943
AGGRES	.27547	.38364	1.00000	-.02553	-.07657	-.44579	.73279	.60411	.49405	.73946
ANALYT	-.48681	.03826	-.02553	1.00000	-.18801	.38517	.04683	.13075	.19945	-.03703
ANXIO	.19731	-.11544	-.07657	-.18801	1.00000	.02761	.01999	-.10223	-.19762	.05024
ATTENT	-.66710	-.09591	-.44579	.38517	.02761	1.00000	-.35158	-.29761	-.14951	-.27630
BLOW	.19535	.38872	.73279	.04683	.01999	-.35158	1.00000	.61006	.52763	.69320
BOAST	.12520	.35776	.60411	.13075	-.10223	-.29761	.61006	1.00000	.57946	.50143
BUBBLE	-.08764	.59809	.49405	.19945	-.19762	-.14951	.52763	.57946	1.00000	.37724
BULLY	.14582	.26943	.73946	-.03703	.05024	-.27630	.69320	.50143	.37724	1.00000
CALM	-.34891	-.19341	-.49172	.13352	-.29187	.41322	-.45571	-.36996	-.37137	-.40083
CAFREE	-.03044	.43852	.37799	-.03575	-.38531	-.21922	.37939	.34662	.60464	.28890
CAFUL	-.56185	-.05092	-.30991	.28398	.04512	.68757	-.32918	-.35805	-.23207	-.25360
CALESS	.54869	.07984	.40211	-.33237	-.01547	-.65272	.37253	.33878	.23133	.27750
CAUTIO	-.24236	-.18858	-.49808	.00161	.29774	.37544	-.38645	-.41661	-.46048	-.32456
CHANGE	.30424	.21072	.57068	-.01906	.13235	-.44799	.60187	.48417	.35192	.42139
CHEEKY	.27368	.21191	.68193	.05547	-.15720	-.44365	.54747	.50317	.43928	.65228
CONTEM	-.55106	-.06543	-.26878	.64114	-.05848	.57878	-.24158	-.17981	-.09121	-.20144
CONTROL	-.35770	-.13421	-.53894	.17435	.05283	.50124	-.55420	-.44742	-.43529	-.39876
DARING	-.03749	.36519	.52409	.14713	-.33413	-.15250	.36216	.42344	.52851	.32650
DREAMY	.39048	.02439	.25655	-.12547	.25903	-.36948	.27944	.20991	-.00026	.30418
DISOBE	.50451	.22086	.66623	-.01521	-.04437	-.62613	.61589	.58991	.44951	.47788
DISORG	.66321	.05579	.45686	-.31736	.07321	-.72630	.36394	.29087	.18478	.30825
DISTRA	.58022	.19904	.56969	-.30501	.04663	-.76066	.50388	.41441	.35179	.41033
EASY	.15459	.25538	.34163	-.07367	-.29078	-.24358	.26371	.24083	.35493	.22964
EMOTION	.15733	.07436	.28656	.02511	.33882	-.09169	.17102	.25207	.19611	.14477
EVENTEM	-.34942	-.10123	-.51397	.00666	-.11837	.38040	-.47902	-.45403	-.43126	-.37234
EXACT	-.55532	-.08654	-.41581	.37628	-.04441	.66820	-.36377	-.35277	-.24397	-.30062
EXCITA	.24661	.45127	.63776	.03065	-.01152	-.43118	.64871	.60627	.65044	.51271
FOOLHD	.28317	.33099	.63830	-.01055	-.17628	-.38532	.47022	.52928	.50584	.47136
HOSTILE	.30817	.08816	.60369	.10556	.11042	-.30522	.51120	.32648	.19565	.62349
HYACT	.19993	.35786	.53773	.30098	-.09956	-.30097	.53974	.41858	.51293	.39671
IMPAT	.24644	.27115	.59482	.03664	-.00766	-.34359	.52800	.56907	.51600	.46098
IMPET	.23935	.42906	.64299	.12578	.02380	-.41602	.64660	.62728	.66196	.52406
IMPULS	.19240	.44503	.65304	.07760	-.11365	-.35949	.60673	.57784	.64746	.53620
INSENS	.39262	.00360	.38590	.26485	-.08602	-.42392	.14038	.23004	.25002	.16734
IRRESP	.55373	.16805	.54182	-.23752	-.00876	-.71090	.42614	.43507	.32575	.37885
LIVE	.10836	.48225	.56226	.17380	-.08119	-.31846	.57258	.58685	.68908	.40386
LOOK	-.31509	.08134	-.26435	.24896	.07144	.29761	-.08878	-.06708	-.04809	-.20630
METHOD	-.43684	-.06506	-.24521	.53645	.01092	.52865	-.19010	-.24131	-.21758	-.17767
MOODY	.30447	-.06242	.30208	.05976	.18816	-.24850	.32152	.34134	.14356	.18052
MOTIVA	-.49591	.01892	-.18501	.34862	.00950	.60147	-.18236	-.08505	-.01788	-.03404
NAUGHTY	.43286	.26405	.66599	-.09831	-.03867	-.64223	.63164	.53331	.44396	.52465
OPTIM	-.21312	.36936	.11800	.24470	-.28936	.09950	.16893	.26883	.39748	.08999
ORDER	-.58561	-.05389	-.40260	.35622	-.09942	.67437	-.37161	-.29399	-.14057	-.35305
OUTGO	-.18095	.38502	.30025	.23481	-.33958	.00105	.26461	.44854	.64669	.19164

Appendix 14b (con't)

	ABMIND	ACTION	AGGRES	ANALYT	ANXIO	ATTENT	BLOW	BOAST	BUBBLE	BULLY
PASSIVE	.04864	-.24156	-.40547	-.17840	.21011	.10555	-.38937	-.47672	-.53388	-.25473
PERSIST	-.42950	.10601	-.05548	.32655	-.07297	.43573	-.03241	.03489	.17855	.01933
QUICK	-.54843	.19987	.02167	.56850	-.26022	.40234	.05351	.16850	.32291	.09248
QUIET	-.22303	-.34916	-.54873	-.01578	.19366	.44140	-.54543	-.60519	-.58443	-.42131
RASH	.40522	.28631	.57917	-.03693	-.02761	-.53827	.50106	.52437	.48478	.46721
REFLEC	-.40424	-.05800	-.31238	.51325	.12404	.62145	-.27083	-.22574	-.17570	-.27528
RELIAB	-.68054	.03324	-.35673	.37721	-.10203	.65792	-.26951	-.27033	-.06183	-.22059
RESER	-.17070	-.31368	-.50192	-.08280	.13634	.37178	-.49444	-.54995	-.53691	-.42719
RESPON	-.57644	.18594	-.11581	.38161	-.09240	.56774	.00324	.01952	.19275	-.02238
RESTLS	.48706	.26216	.51718	-.19087	.09432	-.54660	.46039	.44543	.39483	.41502
RIGID	-.26821	-.24595	-.28417	.09985	.21587	.15970	-.29986	-.31130	-.33869	-.30633
SOLIT	.12318	-.25417	-.05728	.06425	.30172	.00599	-.08752	-.16911	-.33661	-.05297
SPITE	.22516	.01295	.54555	-.10335	.09292	-.28064	.40479	.18787	.09266	.66646
STABLE	-.46821	.02559	-.42635	.32682	-.21714	.56747	-.48373	-.27588	-.12676	-.31097
SYSTEM	-.51158	-.01867	-.24469	.60870	-.01665	.52202	-.16696	-.20529	-.12085	-.17271
TALK	.17672	.33952	.54853	-.01739	-.08096	-.41860	.51462	.53887	.55291	.49073
THINK	-.48087	-.11042	-.43565	.29244	-.01811	.60663	-.39360	-.31650	-.25188	-.33336
THOUGHT	-.52117	.02174	-.28517	.45904	-.02760	.61038	-.24449	-.18245	-.08579	-.22451
TOUCHY	.29409	-.05603	.40718	-.08501	.29534	-.27675	.38186	.31187	.17131	.25552
TROUBL	.35423	.17180	.67128	-.03302	.04794	-.54273	.62643	.52939	.41181	.58422
UNPRED	.53993	.06343	.53694	-.10321	.15200	-.55500	.40727	.37995	.29643	.36587
UNSOC	.26277	-.28972	.05814	.02919	.32085	-.17567	.07398	-.11523	-.35892	.18453
UNTIDY	.44947	.06660	.40998	-.17389	-.03782	-.62222	.33154	.25434	.17252	.25843
VIGOR	-.00173	.49195	.53834	.21128	-.27969	-.19644	.45869	.44609	.64449	.44455

	CALM	CAFREE	CAFUL	CALESS	CAUTIO	CHANGE	CHEEKY	CONTEM	CONTROL	DARING
ABMIND	-.34891	-.03044	-.56185	.54869	-.24236	.30424	.27368	-.55106	-.35770	-.03749
ACTION	-.19341	.43852	-.05092	.07984	-.18858	.21072	.21191	-.06543	-.13421	.36519
AGGRES	-.49172	.37799	-.30991	.40211	-.49808	.57068	.68193	-.26878	-.53894	.52409
ANALYT	.13352	-.03575	.28398	-.33237	.00161	-.01906	.05547	.64114	.17435	.14713
ANXIO	-.29187	-.38531	.04512	-.01547	.29774	.13235	-.15720	-.05848	.05283	-.33413
ATTENT	.41322	-.21922	.68757	-.65272	.37544	-.44799	-.44365	.57878	.50124	-.15250
BLOW	-.45571	.37939	-.32918	.37253	-.38645	.60187	.54747	-.24158	-.55420	.36216
BOAST	-.36996	.34662	-.35805	.33878	-.41661	.48417	.50317	-.17981	-.44742	.42344
BUBBLE	-.37137	.60464	-.23207	.23133	-.46048	.35192	.43928	-.09121	-.43529	.52851
BULLY	-.40083	.28890	-.25360	.27750	-.32456	.42139	.65228	-.20144	-.39876	.32650
CALM	1.00000	-.10215	.51505	-.49214	.26639	-.49772	-.45172	.42637	.53423	-.13948
CAFREE	-.10215	1.00000	-.20966	.21093	-.42637	.27011	.28119	-.23871	-.27591	.48041
CAFUL	.51505	-.20966	1.00000	-.83521	.42618	-.39731	-.41762	.59613	.58593	-.12159
CALESS	-.49214	.21093	-.83521	1.00000	-.43597	.37313	.44235	-.62103	-.62126	.15390
CAUTIO	.26639	-.42637	.42618	-.43597	1.00000	-.38694	-.49736	.35617	.59720	-.54291
CHANGE	-.49772	.27011	-.39731	.37313	-.38694	1.00000	.41635	-.42663	-.52565	.33497
CHEEKY	-.45172	.28119	-.41762	.44235	-.49736	.41635	1.00000	-.20135	-.50287	.37108
CONTEM	.42637	-.23871	.59613	-.62103	.35617	-.42663	-.20135	1.00000	.48562	-.15251
CONTROL	.53423	-.27591	.58593	-.62126	.59720	-.52565	-.50287	.48562	1.00000	-.35971

Appendix 14b (con't)

	CALM	CAFREE	CAFUL	CALESS	CAUTIO	CHANGE	CHEEKY	CONTEM	CONTROL	DARING
DARING	-.13948	.48041	-.12159	.15390	-.54291	.33497	.37108	-.15251	-.35971	1.00000
DREAMY	-.28968	.05109	-.25390	.23809	.00395	.29060	.33844	-.19600	-.02401	-.13696
DISOBE	-.52946	.28533	-.59600	.60536	-.55380	.64174	.66249	-.42407	-.69560	.46668
DISORG	-.50401	.09063	-.72684	.75592	-.34077	.45693	.48209	-.54905	-.68050	.13229
DISTRA	-.53668	.27452	-.67531	.72796	-.41774	.51854	.57645	-.55235	-.63627	.25377
EASY	-.09248	.53035	-.19973	.25787	-.44731	.23753	.39527	-.18992	-.26736	.34672
EMOTION	-.47210	-.19306	-.21026	.23361	-.06665	.37502	.23123	-.11706	-.29091	.08784
EVENTEM	.56461	-.21831	.42830	-.38464	.42356	-.53739	-.42541	.24890	.58342	-.28537
EXACT	.53812	-.19022	.76410	-.79004	.45139	-.45716	-.42565	.65037	.65635	-.20830
EXCITA	-.55263	.45428	-.44509	.45359	-.55625	.59108	.60997	-.35644	-.58697	.50700
FOOLHD	-.32429	.36874	-.36076	.36470	-.55335	.43604	.60508	-.20948	-.59375	.51277
HOSTILE	-.38332	-.03851	-.25751	.28856	-.34059	.47662	.57008	-.11091	-.35010	.21095
HYACT	-.38710	.25441	-.28681	.26914	-.39557	.40185	.54386	-.03704	-.46598	.40430
IMPAT	-.52457	.30162	-.47284	.48758	-.47679	.50468	.55196	-.28116	-.59681	.42768
IMPET	-.55744	.43900	-.46838	.47472	-.51976	.62024	.57280	-.35958	-.58394	.50114
IMPULS	-.55616	.42468	-.45992	.46525	-.53709	.58938	.60376	-.35990	-.57768	.54235
INSENS	-.31075	.07457	-.38251	.37494	-.36671	.31871	.40749	-.30775	-.34741	.29577
IRRESP	-.52225	.34550	-.70301	.67237	-.48000	.55846	.50409	-.56201	-.63759	.32996
LIVE	-.46603	.51916	-.35849	.38924	-.45561	.44153	.49484	-.24589	-.43299	.51860
LOOK	.31679	-.06628	.35348	-.27310	.25774	-.24124	-.22679	.44528	.36892	-.15513
METHOD	.46242	-.25669	.66478	-.64196	.38166	-.31331	-.26522	.66491	.57939	-.17524
MOODY	-.36746	-.03056	-.27505	.23327	-.24061	.49946	.25104	-.18888	-.24904	.10941
MOTIVA	.27853	-.18333	.54414	-.52864	.17194	-.26343	-.18005	.54394	.30110	-.05274
NAUGHTY	-.55220	.32627	-.58451	.52555	-.51306	.61649	.64217	-.43177	-.58055	.38278
OPTIM	.04529	.32331	.08431	-.07949	-.13419	-.03869	.17777	.15008	.01941	.32499
ORDER	.55553	-.12175	.73989	-.72899	.37521	-.46437	-.43465	.58470	.65724	-.18514
OUTGO	-.18519	.44805	-.14833	.15384	-.41907	.14671	.30120	.03029	-.34835	.50476
PASSIVE	.31993	-.27900	.21572	-.20712	.36795	-.22460	-.35066	-.01678	.39881	-.33667
PERSIST	.28371	.05147	.42628	-.37609	.03808	-.16162	-.08245	.45555	.03683	.10518
QUICK	.13661	.11707	.27670	-.28528	-.11958	-.10836	.10629	.42543	.11739	.28182
QUIET	.44816	-.41369	.51249	-.51082	.54156	-.44709	-.56256	.32800	.57084	-.46334
RASH	-.52028	.28270	-.64858	.61044	-.53385	.53770	.60299	-.43219	-.69108	.43257
REFLEC	.33191	-.34379	.65822	-.66198	.48821	-.35457	-.27328	.71064	.60853	-.23596
RELIAB	.47797	-.10544	.66781	-.63230	.38253	-.39650	-.35042	.55200	.51178	-.11489
RESER	.48048	-.36085	.44140	-.44105	.52556	-.41085	-.59193	.23323	.55022	-.43342
RESPON	.29359	.03310	.46247	-.44529	.17026	-.26179	-.15469	.48411	.17662	.10816
RESTLS	-.66102	.19821	-.63682	.61059	-.53796	.47156	.59016	-.49979	-.67551	.29115
RIGID	.13859	-.29394	.24401	-.21752	.25935	-.24761	-.25652	.24229	.33702	-.32168
SOLIT	.02010	-.41067	.13392	-.07755	.30523	-.00558	-.01559	.13387	.20923	-.30308
SPITE	-.40555	.00411	-.28789	.32166	-.26806	.22591	.57914	-.20063	-.34521	.13535
STABLE	.55962	-.39392	.50589	-.51419	.34684	-.62456	-.37643	.52151	.59448	-.07417
SYSTEM	.40577	-.24781	.62431	-.63104	.33288	-.32438	-.25159	.64737	.56061	-.08916
TALK	-.49802	.30743	-.50226	.47305	-.49637	.37804	.60495	-.26419	-.58258	.42853
THINK	.50322	-.18730	.64665	-.63489	.39918	-.44944	-.45797	.62450	.65107	-.26607
THOUGHT	.44573	-.17640	.65088	-.60793	.37667	-.37537	-.33461	.69914	.54130	-.17384
TOUCHY	-.47024	-.03685	-.28568	.32354	-.25592	.50267	.28331	-.27731	-.34179	.13269
TROUBL	-.56772	.19875	-.55817	.54966	-.45573	.60363	.62486	-.41371	-.63462	.33140
UNPRED	-.57041	.09832	-.56624	.57284	-.41618	.54633	.47124	-.40453	-.60711	.23361
UNSOC	-.06150	-.41881	.01152	.01511	.10383	.09360	.15467	.07176	.05056	-.30012
UNTIDY	-.43375	.13517	-.65356	.67336	-.40659	.36154	.43521	-.52257	-.59294	.21453
VIGOR	-.35796	.43065	-.27318	.26569	-.47900	.28463	.51870	-.07990	-.41538	.62335

Appendix 14b (con't)

	DREAMY	DISOBE	DISORG	DISTRA	EASY	EMOTION	EVENTEM	EXACT	EXCITA	FOOLHD
ABMIND	.39048	.50451	.66321	.58022	.15459	.15733	-.34942	-.55532	.24661	.28317
ACTION	.02439	.22086	.05579	.19904	.25538	.07436	-.10123	-.08654	.45127	.33099
AGGRES	.25655	.66623	.45686	.56969	.34163	.28656	-.51397	-.41581	.63776	.63830
ANALYT	-.12547	-.01521	-.31736	-.30501	-.07367	.02511	.00666	.37628	.03065	-.01055
ANXIO	.25903	-.04437	.07321	.04663	-.29078	.33882	-.11837	-.04441	-.01152	-.17628
ATTENT	-.36948	-.62613	-.72630	-.76066	-.24358	-.09169	.38040	.66820	-.43118	-.38532
BLOW	.27944	.61589	.36394	.50388	.26371	.17102	-.47902	-.36377	.64871	.47022
BOAST	.20991	.58991	.29087	.41441	.24083	.25207	-.45403	-.35277	.60627	.52928
BUBBLE	-.00026	.44951	.18478	.35179	.35493	.19611	-.43126	-.24397	.65044	.50584
BULLY	.30418	.47788	.30825	.41033	.22964	.14477	-.37234	-.30062	.51271	.47136
CALM	-.28968	-.52946	-.50401	-.53668	-.09248	-.47210	.56461	.53812	-.55263	-.32429
CAFREE	.05109	.28533	.09063	.27452	.53035	-.19306	-.21831	-.19022	.45428	.36874
CAFUL	-.25390	-.59603	-.72684	-.67531	-.19973	-.21026	.42830	.76410	-.44509	-.36076
CALESS	.23809	.60536	.75592	.72796	.25787	.23361	-.38464	-.79004	.45359	.36470
CAUTIO	.00395	-.55380	-.34077	-.41774	-.44731	-.06665	.42356	.45139	-.55625	-.55335
CHANGE	.29060	.64174	.45693	.51854	.23753	.37502	-.53739	-.45716	.59108	.43604
CHEEKY	.33844	.66249	.48209	.57645	.39527	.23123	-.42541	-.42565	.60997	.60508
CONTEM	-.19600	-.42407	-.54905	-.55235	-.18992	-.11706	.24890	.65037	-.35644	-.20948
CONTROL	-.02401	-.69560	-.68050	-.63627	-.26736	-.29091	.58342	.65635	-.58697	-.59375
DARING	-.13696	.46668	.13229	.25377	.34672	.08784	-.28537	-.20830	.50700	.51277
DREAMY	1.00000	.22299	.34216	.37647	.12292	.09387	-.20989	-.19288	.18911	.17794
DISOBE	.22299	1.00000	.64040	.71121	.27126	.34701	-.61956	-.61204	.70404	.68472
DISORG	.34216	.64040	1.00000	.78968	.19541	.29188	-.44779	-.76262	.45839	.43419
DISTRA	.37647	.71121	.78968	1.00000	.31511	.27694	-.47401	-.73662	.62014	.52747
EASY	.12292	.27126	.19541	.31511	1.00000	-.05634	-.17613	-.20774	.36389	.40050
EMOTION	.09387	.34701	.29188	.27694	-.05634	1.00000	-.41469	-.26020	.36864	.18012
EVENTEM	-.20989	-.61956	-.44779	-.47401	-.17613	-.41469	1.00000	.39810	-.52812	-.52033
EXACT	-.19288	-.61204	-.76262	-.73662	-.20774	-.26020	.39810	1.00000	-.53439	-.42866
EXCITA	.18911	.70404	.45839	.62014	.36389	.36864	-.52812	-.53439	1.00000	.61680
FOOLHD	.17794	.68472	.43419	.52747	.40050	.18012	-.52033	-.42866	.61680	1.00000
HOSTILE	.21695	.55323	.36652	.38002	.08704	.27525	-.43974	-.29808	.43144	.41904
HYACT	-.03955	.57121	.38877	.44064	.20192	.17481	-.33135	-.37798	.61036	.47180
IMPAT	.11847	.67787	.41069	.48985	.21534	.43982	-.58847	-.46577	.67816	.55552
IMPET	.19988	.68004	.46360	.60602	.27852	.26501	-.54464	-.53219	.74344	.58896
IMPULS	.18585	.64762	.45629	.54820	.34672	.29656	-.52955	-.47917	.73886	.62608
INSENS	.17438	.51771	.47303	.45406	.07993	.17990	-.42480	-.44754	.40551	.43773
IRRESP	.37017	.75360	.67700	.74839	.33490	.24813	-.54508	-.66561	.62270	.58470
LIVE	.09264	.57219	.31043	.47364	.31030	.26223	-.37285	-.38317	.77830	.48637
LOOK	.03274	-.32603	-.36278	-.35059	-.10094	-.21918	.27551	.36526	-.29268	-.26613
METHOD	-.20218	-.37996	-.57653	-.56984	-.18771	-.16461	.37323	.70322	-.36322	-.34147
MOODY	.23254	.41791	.30362	.29851	-.03384	.44055	-.53541	-.24374	.29164	.24619

Appendix 14b (con't)

	DREAMY	DISOBE	DISORG	DISTRA	EASY	EMOTION	EVENTEM	EXACT	EXCITA	FOOLHD
MOTIVA	-.20707	-.32644	-.58273	-.55632	-.05460	.00344	.16501	.60456	-.19104	-.11780
NAUGHTY	.29524	.78671	.60227	.64766	.27892	.30568	-.53451	-.58690	.65404	.55764
OPTIM	-.16781	.09264	-.16733	-.04486	.27502	-.06681	.07658	.01671	.23359	.14564
ORDER	-.28613	-.58978	-.83366	-.70778	-.14187	-.21907	.39857	.82899	-.45851	-.35645
OUTGO	-.26974	.31227	.03827	.15188	.28115	.12319	-.24034	-.13812	.47245	.36035
PASSIVE	.05849	-.40845	-.10680	-.21805	-.12876	-.25519	.39014	.15794	-.46535	-.32329
PERSIST	-.26458	-.21531	-.33232	-.34764	.14120	-.05394	.09257	.41645	-.07095	.00718
QUICK	-.26795	-.12280	-.40104	-.34714	.09194	-.05774	.09788	.34254	.05146	.07586
QUIET	-.06904	-.66639	-.41198	-.54767	-.36081	-.30009	.41856	.48099	-.68791	-.49947
RASH	.22605	.73837	.65591	.69087	.25295	.27483	-.55942	-.64126	.68709	.66866
REFLEC	.02398	-.43460	-.56009	-.56697	-.26563	.04577	.36174	.69169	-.38395	-.36601
RELIAB	-.35163	-.58774	-.64514	-.61471	-.16138	-.20922	.49953	.62988	-.36372	-.38598
RESER	.01387	-.61855	-.41735	-.49039	-.37480	-.30659	.39772	.46776	-.66665	-.48574
RESPON	-.37537	-.29751	-.47222	-.41549	-.08632	-.02411	.29484	.45185	-.05613	-.11836
RESTLS	.19406	.68568	.65706	.67833	.23409	.29860	-.53350	-.66584	.63416	.49664
RIGID	.07116	-.36235	-.21143	-.22534	-.20144	-.14804	.17696	.21522	-.32867	-.38270
SOLIT	.23398	-.07396	.08094	-.04520	-.36376	.03971	.03797	.06633	-.24954	-.14051
SPITE	.21848	.35696	.35072	.33684	.09388	.14736	-.33989	-.30333	.28912	.27440
STABLE	-.28694	-.58075	-.58086	-.57664	-.07526	-.32704	.51095	.58240	-.45532	-.29247
SYSTEM	-.30391	-.38066	-.58220	-.57782	-.23624	-.18795	.38928	.65172	-.32683	-.35548
TALK	.11518	.63198	.42979	.55990	.29667	.36061	-.46950	-.47541	.67918	.52762
THINK	-.21738	-.59317	-.64406	-.71122	-.18438	-.21336	.39890	.71302	-.51128	-.41608
THOUGHT	-.17946	-.47081	-.61366	-.60204	-.15081	-.11021	.39271	.69853	-.36090	-.27518
TOUCHY	.25713	.43937	.32137	.33138	.09538	.40640	-.55371	-.33204	.36908	.25281
TROUBL	.23261	.79563	.57699	.62874	.18561	.37993	-.58112	-.57619	.61049	.54546
UNPRED	.28228	.68897	.64353	.62557	.13181	.42875	-.62975	-.60235	.53964	.52763
UNSOC	.40595	.07111	.20186	.07701	-.22318	.08397	-.05582	-.01580	-.11882	-.05572
UNTIDY	.15038	.58112	.75456	.67500	.09729	.16944	-.35136	-.73122	.47020	.40196
VIGOR	-.10446	.45886	.27083	.36287	.29804	.17367	-.32537	-.34111	.62821	.57178

	HOSTILE	HYACT	IMPAT	IMPET	IMPULS	INSENS	IRRESP	LIVE	LOOK	METHOD
ABMIND	.30817	.19993	.24644	.23935	.19240	.39262	.55373	.10836	-.31509	-.43684
ACTION	.08816	.35786	.27115	.42906	.44503	.00360	.16805	.48225	.08134	-.06506
AGGRES	.60369	.53773	.59482	.64299	.65304	.38590	.54182	.56226	-.26435	-.24521
ANALYT	.10556	.30098	.03664	.12578	.07760	.26485	-.23752	.17380	.24896	.53645
ANXIO	.11042	-.09956	-.00766	.02380	-.11365	-.08602	-.00876	-.08119	.07144	.01092
ATTENT	-.30522	-.30097	-.34359	-.41602	-.35949	-.42392	-.71090	-.31846	.29761	.52865
BLOW	.51120	.53974	.52800	.64660	.60673	.14038	.42614	.57258	-.08878	-.19810
BOAST	.32648	.41858	.56907	.62728	.57784	.23004	.43507	.58685	-.06708	-.24131
BUBBLE	.19565	.51293	.51600	.66196	.64746	.25002	.32575	.68908	-.04809	-.21758
BULLY	.62349	.39671	.46098	.52406	.53620	.16734	.37885	.40386	-.20630	-.17767
CALM	-.38332	-.38710	-.52457	-.55744	-.55616	-.31075	-.52225	-.46603	.31679	.46242
CAFREE	-.03851	.25441	.30162	.43900	.42468	.07457	.34550	.51916	-.06628	-.25669
CAFUL	-.25751	-.28681	-.47284	-.46838	-.45992	-.38251	-.70301	-.35849	.35348	.66478
CALESS	.28856	.26914	.48758	.47472	.46525	.37494	.67237	.38924	-.27310	-.64196

Appendix 14b (con't)

	HOSTILE	HYACT	IMPAT	IMPET	IMPULS	INSENS	IRRESP	LIVE	LOOK	METHOD
CAUTIO	-.34059	-.39557	-.47679	-.51976	-.53709	-.36671	-.48000	-.45561	.25774	.38166
CHANGE	.47662	.40185	.50468	.62024	.58938	.31871	.55846	.44153	-.24124	-.31331
CHEEKY	.57008	.54386	.55196	.57280	.60376	.40749	.50409	.49484	-.22679	-.26522
CONTEM	-.11091	-.03704	-.28116	-.35958	-.35990	-.30775	-.56201	-.24589	.44528	.66491
CONTROL	-.35010	-.46598	-.59681	-.58394	-.57768	-.34741	-.63759	-.43299	.36892	.57939
DARING	.21095	.40430	.42768	.50114	.54235	.29577	.32996	.51860	-.15513	-.17524
DREAMY	.21695	-.03955	.11847	.19988	.18585	.17438	.37017	.09264	.03274	-.20218
DISOBE	.55323	.57121	.67787	.68004	.64762	.51771	.75360	.57219	-.32603	-.37996
DISORG	.36652	.38877	.41069	.46360	.45629	.47300	.67700	.31043	-.36278	-.57653
DISTRA	.38002	.44064	.48985	.60602	.54820	.45406	.74839	.47364	-.35059	-.56984
EASY	.08704	.20192	.21534	.27852	.34672	.07993	.33490	.31030	-.10094	-.18771
EMOTION	.27525	.17481	.43982	.26501	.29656	.17990	.24813	.26223	-.21918	-.16461
EVENTEM	-.43974	-.33135	-.58847	-.54464	-.52955	-.42480	-.54508	-.37285	.27551	.37323
EXACT	-.29808	-.37798	-.46577	-.53219	-.47917	-.44754	-.66561	-.38317	.36526	.70322
EXCITA	.43144	.61036	.67816	.74344	.73886	.40551	.62270	.77830	-.29268	-.36322
FOOLHD	.41904	.47180	.55552	.58896	.62608	.43773	.58470	.48637	-.26613	-.34147
HOSTILE	1.00000	.50962	.51095	.43708	.48619	.37286	.37763	.27008	-.19963	-.02076
HYACT	.50962	1.00000	.53578	.61154	.57504	.39285	.33743	.61757	-.19910	-.05574
IMPAT	.51095	.53578	1.00000	.65304	.74071	.39358	.56524	.63194	-.25564	-.36074
IMPET	.43708	.61154	.65304	1.00000	.76062	.51725	.56866	.72934	-.23858	-.37745
IMPULS	.48619	.57504	.74071	.76062	1.00000	.50182	.55837	.66427	-.25784	-.37736
INSENS	.37286	.39285	.39358	.51725	.50182	1.00000	.56319	.28893	-.24219	-.25150
IRRESP	.37763	.33743	.56524	.56866	.55837	.56319	1.00000	.43901	-.32831	-.54904
LIVE	.27008	.61757	.63194	.72934	.66427	.28893	.43901	1.00000	-.17586	-.26032
LOOK	-.19963	-.19910	-.25564	-.23858	-.25784	-.24219	-.32831	-.17586	1.00000	.38563
METHOD	-.02076	-.05574	-.36074	-.37745	-.37736	-.25150	-.54904	-.26032	.38563	1.00000
MOODY	.35818	.15506	.41274	.31966	.25970	.25976	.29455	.19391	-.07015	-.15125
MOTIVA	-.13034	-.21776	-.16650	-.31198	-.19730	-.36806	-.46754	-.16967	.22197	.51282
NAUGHTY	.56346	.50277	.60541	.65745	.60913	.44450	.70282	.53773	-.30141	-.41354
OPTIM	-.14591	.31113	.10722	.23981	.17467	-.09738	-.01674	.38539	.08069	.04366
ORDER	-.34583	-.35889	-.39183	-.46767	-.45643	-.38819	-.61437	-.33759	.41293	.69700
OUTGO	.03387	.43372	.42732	.46486	.45527	.10217	.12235	.59981	-.15746	-.06578
PASSIVE	-.17311	-.39306	-.47072	-.39437	-.45830	-.18484	-.22501	-.55717	.10532	.09921
PERSIST	-.12735	.02272	-.07727	-.11757	-.11833	-.26823	-.36266	.02164	.29353	.42176
QUICK	-.01079	.18239	.10071	.11298	.12205	-.05438	-.26530	.19749	.31814	.25644
QUIET	-.28921	-.53854	-.60198	-.62454	-.62552	-.30690	-.53951	-.71350	.24856	.35690
RASH	.43202	.50938	.65370	.70878	.75717	.63951	.70500	.56166	-.31737	-.51552
REFLEC	-.12895	-.14068	-.34598	-.33824	-.35179	-.24130	-.57377	-.23188	.36850	.73133
RELIAB	-.22459	-.14191	-.33107	-.37524	-.31110	-.44052	-.73539	-.23749	.32128	.57340
RESER	-.23291	-.54029	-.52617	-.60931	-.58170	-.32238	-.46692	-.67453	.25963	.31757
RESPON	-.13997	.07783	-.01284	-.10693	-.04433	-.39117	-.49349	.11110	.32859	.44256
RESTLS	.37432	.51470	.53268	.67290	.60935	.42606	.61468	.53424	-.40269	-.56020
RIGID	-.15401	-.31774	-.43259	-.34196	-.39455	-.02008	-.25589	-.41598	.27838	.26559
SOLIT	.14766	-.08662	-.15540	-.13523	-.19834	.14539	-.12859	-.29125	.10939	.19891
SPITE	.53712	.28825	.30074	.32089	.31935	.30582	.29609	.19085	-.26038	-.19053
STABLE	-.34823	-.31510	-.35007	-.42591	-.38470	-.28746	-.50979	-.31291	.40413	.42296
SYSTEM	-.02729	-.00563	-.31827	-.30669	-.34080	-.22789	-.59040	-.20737	.45943	.84922
TALK	.36232	.51949	.59149	.59381	.63530	.30946	.52445	.61728	-.28348	-.37352
THINK	-.25721	-.38506	-.41391	-.53537	-.51290	-.48229	-.66693	-.41014	.49548	.62992

Appendix 14b (con't)

	HOSTILE	HYACT	IMPAT	IMPET	IMPULS	INSENS	IRRESP	LIVE	LOOK	METHOD
THOUGHT	-.19189	-.19830	-.31740	-.42093	-.41550	-.52729	-.60866	-.26229	.47970	.64960
TOUCHY	.32884	.12812	.43617	.36632	.30479	.24508	.35694	.23614	-.11963	-.23887
TROUBL	.58760	.44638	.61106	.62330	.61107	.43135	.65425	.48783	-.36021	-.37321
UNPRED	.49301	.31617	.53643	.57622	.51756	.59907	.69622	.38896	-.39966	-.51375
UNSOC	.30949	.03696	-.08138	-.08974	-.16385	.10818	-.00058	-.21230	.07174	.13824
UNTIDY	.24333	.34681	.39077	.49671	.44368	.50080	.63075	.34595	-.43540	-.53953
VIGOR	.27499	.66397	.52386	.63496	.66062	.37321	.34880	.69362	-.28408	-.21508

	MOODY	MOTIVA	NAUGHTY	OPTIM	ORDER	OUTGO	PASSIVE	PERSIST	QUICK	QUIET
ABMIND	.30447	-.49591	.43286	-.21312	-.58561	-.18095	.04864	-.42950	-.54843	-.22303
ACTION	-.06242	.01892	.26405	.36936	-.05389	.38502	-.24156	.10601	.19987	-.34916
AGGRES	.38208	-.18501	.66599	.11800	-.40260	.30025	-.40547	-.05548	.02167	-.54873
ANALYT	.05976	.34862	-.09831	.24470	.35622	.23481	-.17840	.32655	.56850	-.01578
ANXIO	.18816	.00950	-.03867	-.28936	-.09942	-.33958	.21011	-.07297	-.26022	.19366
ATTENT	-.24850	.60147	-.64223	.09950	.67437	.00105	.10555	.43573	.40234	.44140
BLOW	.32152	-.18236	.63164	.16893	-.37161	.26461	-.38937	-.03241	.05351	-.54543
BOAST	.34134	-.08505	.53331	.26883	-.29399	.44854	-.47672	.03489	.16850	-.60519
BUBBLE	.14356	-.01788	.44396	.39748	-.14057	.64669	-.53388	.17855	.32291	-.58443
BULLY	.18052	-.03404	.52465	.08999	-.35305	.19164	-.25473	.01933	.09248	-.42131
CALM	-.36746	.27853	-.55220	.04529	.55553	-.18519	.31993	.28371	.13661	.44816
CAFREE	-.03056	-.18333	.32627	.32331	-.12175	.44805	-.27900	.05147	.11707	-.41369
CAFUL	-.27505	.54414	-.58451	.08431	.73989	-.14833	.21572	.42628	.27670	.51249
CALESS	.23327	-.52864	.52555	-.07949	-.72899	.15384	-.20712	-.37609	-.28528	-.51082
CAUTIO	-.24061	.17194	-.51306	-.13419	.37521	-.41907	.36795	.03808	-.11958	.54156
CHANGE	.49946	-.26343	.61649	-.03869	-.46437	.14671	-.22468	-.16162	-.10836	-.44709
CHEEKY	.25104	-.18005	.64217	.17777	-.43465	.30120	-.35066	-.08245	.10629	-.56256
CONTEM	-.18888	.54394	-.43177	.15008	.58470	.03029	-.01678	.45555	.42543	.32800
CONTROL	-.24904	.30110	-.58055	.01941	.65724	-.34835	.39881	.03683	.11739	.57084
DARING	.10941	-.05274	.38278	.32499	-.18514	.50476	-.33667	.10518	.28182	-.46334
DREAMY	.23254	-.20707	.29524	-.16781	-.28613	-.26974	.05849	-.26458	-.26795	-.06904
DISOBE	.41791	-.32644	.78671	.09264	-.58978	.31227	-.40845	-.21531	-.12280	-.66639
DISORG	.30362	-.58273	.60227	-.16733	-.83366	.03827	-.10680	-.33232	-.40104	-.41198
DISTRA	.29851	-.55632	.64766	-.04486	-.70778	.15188	-.21805	-.34764	-.34714	-.54767
EASY	-.03384	-.05460	.27892	.27502	-.14187	.28115	-.12876	.14120	.09194	-.36081
EMOTION	.44055	.00044	.30568	-.06681	-.21907	.12319	-.25519	-.05394	-.05774	-.30009
EVENTEM	-.53541	.16501	-.53451	.07658	.39857	-.24034	.39014	.09257	.09788	.41856
EXACT	-.24374	.60456	-.58690	.01671	.82899	-.13812	.15794	.41645	.34254	.48099
EXCITA	.29164	-.19104	.65404	.23359	-.45851	.47245	-.46535	-.07095	.05146	-.68791
FOOLHD	.24619	-.11780	.55764	.14564	-.35645	.36035	-.32329	.00718	.07586	-.49947
HOSTILE	.35818	-.13034	.56346	-.14591	-.34583	.03587	-.17311	-.12735	-.01079	-.28921
HYACT	.15576	-.21776	.50277	.31113	-.35889	.43372	-.39306	.02272	.18239	-.53854
IMPAT	.41274	-.16650	.60541	.10722	-.39183	.42732	-.47072	-.07727	.10071	-.60198
IMPET	.31966	-.31198	.65745	.23981	-.46767	.46486	-.39437	-.11757	.11298	-.62454
IMPULS	.25970	-.19730	.60913	.17467	-.45643	.45527	-.45830	-.11833	.12205	-.62552
INSENS	.25976	-.36806	.44450	-.09738	-.38819	.10217	-.18484	-.26823	-.05438	-.30690

Appendix 14b (con't)

	MOODY	MOTIVA	NAUGHTY	OPTIM	ORDER	OUTGO	PASSIVE	PERSIST	QUICK	QUIET
IRRESP	.29455	-.46754	.70282	-.01674	-.61437	.12235	-.22501	-.36266	-.26530	-.53951
LIVE	.19391	-.16967	.53773	.38539	-.33759	.59981	-.55717	.02164	.19749	-.71350
LOOK	-.07015	.22197	-.30141	.08069	.41293	-.15746	.10532	.29353	.31814	.24856
METHOD	-.15125	.51282	-.41354	.04366	.69700	-.06578	.09921	.42176	.25644	.35690
MOODY	1.00000	-.21118	.37521	-.23361	-.27900	.03656	-.22797	-.11867	-.18667	-.28177
MOTIVA	-.21118	1.00000	-.40492	.14476	.61025	.11666	-.06368	.56316	.41562	.21530
NAUGHTY	.37521	-.40492	1.00000	.08318	-.54670	.24065	-.31772	-.26203	-.09969	-.61682
OPTIM	-.23361	.14476	.08318	1.00000	.14291	.48749	-.25137	.20542	.49441	-.32556
ORDER	-.27900	.61025	-.54670	.14291	1.00000	-.01813	.10010	.41653	.38159	.38847
OUTGO	.03656	.11666	.24065	.48749	-.01813	1.00000	-.63105	.24260	.40653	-.56203
PASSIVE	-.22797	-.06368	-.31772	-.25137	.10010	-.63105	1.00000	-.10970	-.29314	.58093
PERSIST	-.11867	.56316	-.26203	.20542	.41653	.24260	-.10970	1.00000	.30167	.03278
QUICK	-.18667	.41562	-.09969	.49441	.38159	.40653	-.29314	.30167	1.00000	-.07499
QUIET	-.28177	.21530	-.61682	-.32556	.38847	-.56203	.58093	.03278	-.07499	1.00000
RASH	.28634	-.33693	.63156	.07901	-.61350	.33641	-.39024	-.21163	-.00610	-.59497
REFLEC	-.09582	.55295	-.43456	.15532	.65005	-.14870	.14251	.22229	.35138	.36376
RELIAB	-.39420	.49178	-.52048	.15396	.62019	.05551	.14452	.37656	.43390	.41339
RESER	-.22245	.08195	-.58575	-.37732	.37627	-.59776	.56965	-.03807	-.13011	.80578
RESPON	-.23499	.50065	-.29574	.34886	.48514	.33094	-.17262	.47245	.54424	.00558
RESTLS	.29286	-.39394	.67217	.08744	-.63282	.27252	-.32909	-.23195	-.15966	-.63551
RIGID	-.09732	.03446	-.31342	-.24527	.20323	-.35518	.27649	-.05289	-.05042	.42215
SOLIT	.13226	-.06280	-.09429	-.37079	-.05452	-.36935	.27600	-.07326	-.28242	.34081
SPITE	.17269	-.14851	.39128	-.10253	-.38471	.00510	-.19372	-.02996	-.07153	-.27411
STABLE	-.43247	.43735	-.53901	.19698	.62918	.03673	.20602	.28035	.41144	.39944
SYSTEM	-.15719	.41895	-.35383	.09365	.61455	-.01244	.09296	.33808	.39476	.32992
TALK	.23245	-.18905	.59568	.27007	-.39624	.52687	-.53723	-.07462	.14730	-.74796
THINK	-.23790	.53780	-.56865	-.02557	.67725	-.17591	.24369	.38667	.26242	.54999
THOUGHT	-.25374	.60245	-.41829	.18782	.66322	-.06862	.13656	.46267	.40975	.36539
TOUCHY	.66881	-.13835	.40223	-.19276	-.36615	-.07672	-.24398	-.10342	-.17787	-.23985
TROUBL	.44416	-.27851	.76765	.00459	-.57965	.23996	-.39346	-.22595	-.09785	-.60058
UNPRED	.49813	-.35771	.60870	-.10966	-.61860	.11822	-.30296	-.29898	-.22219	-.48396
UNSOC	.19861	-.06274	.08178	-.30462	-.13117	-.50791	.25220	-.07889	-.26971	.19283
UNTIDY	.23426	-.51132	.52062	-.01683	-.75003	.13468	-.13817	-.34609	-.25928	-.41303
VIGOR	.09528	-.11851	.46037	.42860	-.27085	.66338	-.48652	.07786	.32461	-.58084

	RASH	REFLEC	RELIAB	RESER	RESPON	RESTLS	RIGID	SOLIT	SPITE	STABLE
ABMIND	.40522	-.40424	-.68054	-.17070	-.57644	.48706	-.26821	.12318	.22516	-.46821
ACTION	.28631	-.05800	.03024	-.31368	.18594	.26216	-.24595	-.25417	.01295	.02559
AGGRES	.57917	-.31238	-.35673	-.50192	-.11581	.51718	-.28417	-.05728	.54555	-.42635
ANALYT	-.03693	.51325	.37721	-.08280	.38161	-.19087	.09985	.06425	-.10335	.32682
ANXIO	-.02761	.12404	-.10203	.13634	-.09240	.09432	.21587	.30172	.09092	-.21714
ATTENT	-.53827	.62145	.65792	.37178	.56774	-.54660	.15970	.00599	-.28064	.56747
BLOW	.50106	-.27883	-.26951	-.49444	.00324	.46039	-.29986	-.08752	.40479	-.48373
BOAST	.52437	-.22574	-.27033	-.54995	.01952	.44543	-.31130	-.16911	.18787	-.27588
BUBBLE	.48478	-.17570	-.06183	-.53691	.19275	.39483	-.33869	-.33661	.09266	-.12676

Appendix 14b (con't)

	RASH	REFLEC	RELIAB	RESER	RESPON	RESTLS	RIGID	SOLIT	SPITE	STABLE
BULLY	,46721	-,22528	-,22059	-,42719	-,02238	,41502	-,30633	-,05297	,66646	-,31097
CALM	-,52028	,33191	,47797	,48048	,29359	-,66102	,13859	,02010	-,40555	,55962
CAFREE	,28270	-,34379	-,10544	-,36085	,03310	,19821	-,29394	-,41067	,00411	-,09392
CAFUL	-,64858	,65822	,66781	,44140	,46247	-,63682	,24401	,13392	-,28789	,50589
CALESS	,61044	-,66198	-,63230	-,44105	-,44529	,61059	-,21752	-,07755	,32166	-,51419
CAUTIO	-,53385	,48821	,38253	,52556	,17026	-,53796	,25935	,30523	-,26806	,34684
CHANGE	,53770	-,35457	-,39650	-,41085	-,26179	,47156	-,24761	-,00558	,22591	-,62456
CHEEKY	,60299	-,27328	-,35042	-,59193	-,15469	,59016	-,25652	-,01559	,57914	-,37643
CONTEM	-,43219	,71064	,55200	,23323	,48411	-,49979	,24229	,13387	-,20063	,52151
CONTROL	-,69108	,60853	,51178	,55022	,17662	-,67551	,33702	,20923	-,34521	,59448
DARING	,43257	-,23596	-,11489	-,43342	,10816	,29115	-,32168	-,30308	,13535	-,07417
DREAMY	,22605	,02398	-,35163	,01387	-,37537	,19406	,07116	,23398	,21848	-,28694
DISCRE	,73837	-,43460	-,58774	-,61855	-,29751	,68568	-,36235	-,07396	,35696	-,58075
DISORG	,65591	-,56009	-,64514	-,41735	-,47222	,65706	-,21143	,08094	,35072	-,58086
DISTRA	,69087	-,56697	-,61471	-,49039	-,41549	,67833	-,22534	-,04520	,33684	-,57664
EASY	,25295	-,26563	-,16138	-,37480	-,08632	,23409	-,20144	-,36376	,09388	-,07526
EMOTION	,27483	,04577	-,20922	-,30659	-,02411	,29860	-,14804	,03971	,14736	-,32704
EVENTEM	-,55942	,36174	,49953	,39772	,29484	-,53350	,17696	,03797	-,33989	,51095
EXACT	-,64126	,69169	,62988	,46776	,45185	-,66584	,21522	,06633	-,30333	,58240
EXCITA	,68709	-,38395	-,36372	-,66665	-,05613	,63416	-,32867	-,24954	,28912	-,45532
FOOLHD	,66866	-,36601	-,38598	-,48574	-,11836	,49664	-,38270	-,14051	,27440	-,29247
HOSTILE	,43202	-,12895	-,22459	-,23291	-,13997	,37432	-,15401	,14766	,53712	-,34823
HYACT	,50938	-,14068	-,14191	-,54029	,07783	,51470	-,31774	-,08662	,28825	-,31510
IMPAT	,65370	-,34598	-,33107	-,52617	-,01284	,53268	-,43259	-,15540	,30074	-,35007
IMPET	,70878	-,33824	-,37524	-,60931	-,10693	,67290	-,34106	-,13523	,32089	-,42591
IMPULS	,75717	-,35179	-,31110	-,58170	-,04433	,60935	-,39455	-,19834	,31935	-,38470
INSENS	,63951	-,24130	-,44052	-,32238	-,39117	,42606	-,02008	,14539	,30582	-,28746
IRRESP	,70500	-,57377	-,73539	-,46692	-,49349	,61468	-,25589	-,12859	,29609	-,50979
LIVE	,56166	-,23188	-,23749	-,67453	,11110	,53424	-,41598	-,29125	,19085	-,31291
LOOK	-,31737	,36850	,32128	,25963	,32859	-,40269	,27838	,10939	-,26038	,40413
METHOD	-,51552	,73133	,57340	,31757	,44256	-,56020	,26559	,19891	-,19053	,42296
MOODY	,28634	-,09582	-,39420	-,22245	-,23499	,29286	-,09732	,13226	,17269	-,43247
MOTIVA	-,33693	,55295	,49178	,08195	,50065	-,39394	,03446	-,06280	-,14851	,43735
NAUGHTY	,63156	-,43456	-,52048	-,58575	-,29574	,67217	-,31342	-,09429	,39128	-,53901
OPTIM	,07901	,15532	,15396	-,37732	,34886	,08744	-,24527	-,37079	-,10253	,19698
ORDER	-,61350	,65005	,62019	,37627	,48514	-,63282	,20323	-,05452	-,38471	,62918
OUTGO	,33641	-,14870	,05551	-,59776	,33004	,27252	-,35518	-,36935	,00510	,03673
PASSIVE	-,39024	,14251	,14452	,56965	-,17262	-,32909	,27649	,27600	-,19372	,20602
PERSIST	-,21163	,22229	,37656	-,03807	,47245	-,23195	-,05289	-,07326	-,02996	,28035
QUICK	-,00610	,35138	,43390	-,1301	,54424	-,15966	-,05042	-,28242	-,07153	,41144
QUIET	-,59497	,36376	,41339	,80578	,00558	-,63551	,42215	,34081	-,27411	,39944
RASH	1,00000	-,47036	-,54076	-,60869	-,23825	,67097	-,30347	-,08406	,38749	-,44936
REFLEC	-,47036	1,00000	,58698	,33602	,44238	-,54991	,17807	,27609	-,27805	,60497
RELIAB	-,54076	,58698	1,00000	,38347	,64449	-,64129	,13183	-,07149	-,36246	,64110
RESER	-,60869	,33602	,38347	1,00000	,01918	-,61201	,34592	,29645	-,35922	,40499
RESPON	-,23825	,44238	,64449	,01918	1,00000	-,32231	-,18457	-,16627	-,22053	,47381
RESTLS	,67097	-,54991	-,64129	-,61201	-,32231	1,00000	-,31126	-,08111	,47063	-,60013
RIGID	-,30347	,17807	,13183	,34592	-,18457	-,31126	1,00000	,33711	-,05004	,05145
SOLIT	-,08406	,27609	-,07149	,29645	-,16627	-,08111	,33711	1,00000	,24572	-,17288

Appendix 14b (con't)

	RASH	REFLEC	RELIAB	RESER	RESPON	RESTLS	RIGID	SOLIT	SPITE	STABLE
SPITE	.38749	-.27805	-.36246	-.35922	-.22053	.47063	-.05004	.24572	1.00000	-.42638
STABLE	-.44936	.60497	.64110	.40499	.47381	-.60013	.05145	-.17288	-.42638	1.00000
SYSTEM	-.50620	.71281	.64742	.33046	.50584	-.54692	.29267	.19635	-.16060	.45836
TALK	.64655	-.37570	-.40460	-.70452	-.03175	.66966	-.35209	-.30874	.36892	-.37871
THINK	-.68593	.62971	.66430	.55403	.40881	-.69729	.26285	.09043	-.38975	.57490
THOUGHT	-.56278	.75512	.67221	.35563	.54181	-.58401	.21704	.05666	-.33341	.57447
TOUCHY	.34542	-.27371	-.43833	-.26857	-.32085	.38986	-.02163	.09641	.29784	-.52435
TROUBL	.67438	-.44935	-.55334	-.61362	-.28462	.65210	-.25777	.00433	.50939	-.62304
UNPRED	.72476	-.41393	-.69152	-.50268	-.44545	.60973	-.20160	.10328	.41532	-.59312
UNSOC	-.04947	.18866	-.21910	.15401	-.27716	.04659	.36764	.55324	.35197	-.34295
UNTIDY	.64614	-.61011	-.56001	-.47046	-.39764	.62131	-.29570	-.00562	.33922	-.53190
VIGOR	.54309	-.21151	-.09133	-.58818	.18698	.43597	-.38880	-.34156	.25863	-.12013

	SYSTEM	TALK	THINK	THOUGHT	TOUCHY	TROUBL	UNPRED	UNSOC	UNTIDY	VIGOR
ABMIND	-.51158	.17672	-.48087	-.52117	.29409	.35423	.53993	.26277	.44947	-.00173
ACTION	-.01867	.33952	-.11042	.02174	-.05603	.17180	.06343	-.28972	.06660	.49195
AGGRES	-.24469	.54853	-.43565	-.28517	.40718	.67128	.53694	.05814	.40998	.53834
ANALYT	.60870	-.01739	.29244	.45904	-.08501	-.03302	-.10321	.02919	-.17389	.21128
ANXIO	-.01665	-.08096	-.01811	-.02760	.29534	.04794	.15200	.32085	-.03782	-.27969
ATTENT	.52202	-.41860	.60663	.61038	-.27675	-.54273	-.55500	-.17567	-.62222	-.19644
BLOW	-.16696	.51462	-.39360	-.24449	.38186	.62643	.40727	.07398	.33154	.45869
BOAST	-.20529	.53887	-.31650	-.18245	.31187	.52939	.37995	-.11523	.25434	.44609
BUBBLE	-.12085	.55291	-.25188	-.08579	.17131	.41181	.29643	-.35892	.17252	.64449
BULLY	-.17271	.49073	-.33336	-.22451	.25552	.58422	.36587	.18453	.25843	.44455
CALM	.40577	-.49802	.50322	.44573	-.47024	-.56772	-.57041	-.06150	-.43375	-.35796
CAFREE	-.24781	.30743	-.18730	-.17640	-.03685	.19875	.09832	-.41881	.13517	.43065
CAFUL	.62431	-.50226	.64665	.65088	-.28568	-.55817	-.56624	.01152	-.65356	-.27318
CALESS	-.63104	.47305	-.63489	-.60793	.32354	.54966	.57284	.01511	.67336	.26569
CAUTIO	.33288	-.49637	.39918	.37667	-.25592	-.45573	-.41618	.10383	-.40659	-.47900
CHANGE	-.32438	.37804	-.44944	-.37537	.50267	.60363	.54633	.09360	.36154	.28463
CHEEKY	-.25159	.63495	-.45797	-.33461	.28331	.62486	.47124	.15487	.43521	.51870
CONTEM	.64737	-.26419	.62450	.69914	-.27731	-.41371	-.40453	.07176	-.52237	-.07990
CONTEL	.56061	-.58258	.65107	.54130	-.34179	-.63462	-.60711	.05056	-.59294	-.41538
DARING	-.08916	.42853	-.26607	-.17384	.13269	.33140	.23361	-.30012	.21453	.62335
DREAMY	-.30391	.11518	-.21738	-.17946	.25713	.23261	.28228	.40595	.15038	-.10446
DISOBE	-.38066	.63198	-.59317	-.47031	.43937	.79563	.68897	.07111	.58112	.45886
DISCRS	-.58220	.42979	-.64406	-.61366	.32137	.57699	.64353	.20186	.75456	.27083
DISTRA	-.57782	.55990	-.71122	-.60204	.33138	.62874	.62557	.07701	.67500	.36287
EASY	-.23824	.29667	-.18438	-.15081	.09538	.18561	.13181	-.22318	.09729	.29804
EMOTION	-.18795	.36061	-.21336	-.11021	.40640	.37993	.42875	.08397	.16944	.17367
EVENTEM	.38928	-.46950	.59890	.39271	-.55371	-.58112	-.62975	-.05582	-.35136	-.32537
EXACT	.65172	-.47541	.71302	.69053	-.33204	-.57619	-.60235	-.01580	-.73122	-.34111
EXCITA	-.32683	.67918	-.51128	-.36090	.36908	.61049	.53964	-.11882	.47020	.62821
FOOL-?	-.35548	.52762	-.41608	-.27518	.25281	.54546	.52763	-.05572	.40196	.57178
HOSTILE	-.02729	.36232	-.25721	-.19189	.32884	.58760	.49301	.30949	.24333	.27499

Appendix 14b (con't)

	SYSTEM	TALK	THINK	THOUGHT	TOUCHY	TROUBL	UNPRED	UNSOC	UNTIDY	VIGOR
HYACT	-.00563	.51949	-.38506	-.19830	.12812	.44638	.31617	.05696	.34681	.66397
IMPAT	-.31827	.59149	-.41391	-.31740	.43617	.61106	.53643	-.08138	.39077	.52386
IMPET	-.30669	.59381	-.53537	-.42093	.36632	.62330	.57622	-.08974	.49671	.63496
IMPULS	-.34080	.63530	-.51290	-.41550	.30479	.61107	.51756	-.16385	.44368	.66062
INSENS	-.22789	.30946	-.48229	-.52729	.24508	.43135	.59907	.10818	.50080	.37321
IRRESP	-.59040	.52445	-.66693	-.60866	.35694	.65425	.69622	-.00058	.63075	.34880
LIVE	-.20737	.61728	-.41014	-.26229	.23614	.48783	.38896	-.21230	.34595	.69362
LOOK	.45943	-.28348	.49548	.47970	-.11963	-.36021	-.39966	.07174	-.43540	-.28408
METHOD	.84922	-.37352	.62992	.64960	-.23887	-.37321	-.51375	.13824	-.53953	-.21508
MOODY	-.15719	.23245	-.23790	-.25374	.66881	.44416	.49813	.19861	.23426	.09528
MOTIVA	.41895	-.18905	.53780	.60245	-.13835	-.27851	-.35771	-.06274	-.51132	-.11851
NAUGHTY	-.35383	.59560	-.56865	-.41829	.40223	.76765	.60870	.08178	.52062	.46037
OPTIM	.09365	.27007	-.02557	.18782	-.19276	.00459	-.10966	-.30462	-.01683	.42860
ORDER	.61455	-.39624	.67725	.66322	-.36615	-.57965	-.61860	-.13117	-.75003	-.27085
OUTGO	-.01244	.52687	-.17591	-.06862	-.00672	.23996	.11822	-.50791	.13468	.66038
PASSIVE	.09296	-.53723	.24369	.13656	-.24398	-.39346	-.30296	.25220	-.13817	-.48652
PERSIST	.33808	-.07462	.38667	.46267	-.10342	-.22595	-.29898	-.07889	-.34609	.07786
QUICK	.39476	.14730	.26242	.40975	-.17787	-.09785	-.22219	-.26971	-.25928	.32461
QUIET	.32992	-.74796	.54999	.36539	-.23985	-.60058	-.40396	.19283	-.41303	-.58084
RASH	-.50620	.64655	-.68593	-.56278	.34542	.67438	.72476	-.04947	.64614	.54309
REFLEC	.71281	-.37570	.62971	.75512	-.27371	-.44935	-.41393	.18866	-.61011	-.21151
RELIAB	.64742	-.40460	.66430	.67221	-.43833	-.55034	-.69152	-.21910	-.56001	-.09133
RESER	.33046	-.70452	.55403	.35563	-.26857	-.61362	-.50268	.15401	-.47046	-.58818
RESPON	.50584	-.03175	.40881	.54181	-.32085	-.28462	-.44545	-.27716	-.39764	.18698
RESTLS	-.54692	.66966	-.69729	-.58401	.38986	.65210	.60973	.04659	.62131	.43597
RIGID	.29267	-.35209	.26285	.21704	-.02163	-.25777	-.20160	.36764	-.09570	-.38880
SOLIT	.19635	-.30874	.09043	.05666	.09641	.00433	.10328	.55324	-.00562	-.34156
SPITE	-.16060	.36892	-.38975	-.33341	.29784	.50939	.41532	.35197	.33922	.25863
STABLE	.45836	-.37871	.57490	.57447	-.52435	-.62304	-.59312	-.34295	-.53190	-.12013
SYSTEM	1.00000	-.35170	.61241	.66171	-.24356	-.35556	-.51759	.08051	-.51820	-.14063
TALK	-.35170	1.00000	-.56161	-.38636	.27351	.66202	.49285	-.12495	.43814	.59881
THINK	.61241	-.56161	1.00000	.74058	-.30390	-.59931	-.60807	-.00729	-.65851	-.36330
THOUGHT	.66171	-.38636	.74058	1.00000	-.31930	-.45943	-.54858	.01754	-.63565	-.18813
TOUCHY	-.24356	.27351	-.30390	-.31930	1.00000	.49630	.52086	.21615	.26311	.09652
TROUBL	-.35556	.66202	-.59931	-.45943	.49630	1.00000	.70436	.11395	.53966	.41854
UNPRED	-.51759	.49285	-.60807	-.54858	.52086	.70436	1.00000	.14297	.56636	.33165
UNSOC	.08051	-.12495	-.00729	.01754	.21615	.11395	.14297	1.00000	.10671	-.29282
UNTIDY	-.51820	.43814	-.65851	-.63565	.26311	.53966	.56636	.10671	1.00000	.39349
VIGOR	-.14063	.59881	-.36330	-.18813	.09652	.41854	.33165	-.29282	.39349	1.00000

Appendix 15 Correlation matrix for New Teacher's Rating Scale factor analysis: samples A & B combined

	ABMIND	ACTION	AGGRES	ANALYT	ANXIO	ATTENT	BLOW	BOAST	BUBBLE	BULLY
ABMIND	1.00000	-.11185	.23645	-.46314	.14631	-.55786	.14568	.11783	-.11494	.13068
ACTION	-.11185	1.00000	.32138	.21271	-.26867	-.05318	.32248	.26625	.53554	.23486
AGGRES	.23645	.32138	1.00000	-.01969	-.19843	-.45486	.67071	.47091	.33211	.71902
ANALYT	-.46314	.21271	-.01969	1.00000	-.19629	.44959	.08759	.24536	.37441	.04305
ANXIO	.14631	-.26867	-.19843	-.19629	1.00000	.11408	-.19444	-.20634	-.28535	-.19245
ATTENT	-.55786	-.05318	-.45486	.44959	.11408	1.00000	-.35250	-.21625	-.26072	-.35892
BLOW	.14568	.32248	.67071	.08759	-.19444	-.35250	1.00000	.57116	.44322	.61210
BOAST	.11783	.26625	.47091	.24536	-.20634	-.21625	.57116	1.00000	.35309	.51804
BUBBLE	-.11494	.53554	.33211	.37441	-.28535	-.26072	.44322	.35309	1.00000	.30581
BULLY	.13068	.23486	.71902	.04305	-.19245	-.35892	.61210	.51804	.30581	1.00000
CALM	-.27727	-.24406	-.43137	.10524	-.15209	.32064	-.44344	-.28430	-.38399	-.33254
CAFREE	.03723	.45392	.37759	.09060	-.51043	-.25528	.34612	.27554	.53453	.28732
CAFUL	-.42598	-.12366	-.37566	.22604	.16659	.64123	-.38434	-.29689	-.26295	-.30652
CALESS	.42798	.10881	.44112	-.27573	-.18355	-.55737	.40349	.24928	.21487	.30510
CAUTIO	-.17515	-.35284	-.45563	-.08388	.40453	.35909	-.48994	-.37345	-.49914	-.37850
CHANGE	.17850	.14266	.50547	.07812	.01562	-.34875	.57451	.39535	.34845	.44835
CHEEKY	.25773	.32626	.65474	.07207	-.17965	-.39686	.63696	.55445	.48893	.61334
CONTEM	-.36432	-.05198	-.33542	.49958	.05023	.53043	-.25287	-.03836	-.06649	-.20332
CONTROL	-.37386	-.15153	-.50721	.20077	.01766	.52013	-.49894	-.29439	-.34752	-.39196
DARING	-.06012	.52325	.44731	.20925	-.37961	-.12882	.42802	.36292	.51296	.41363
DREAMY	.44639	-.22964	.02107	-.19775	.27119	-.28402	.00146	-.00356	-.21436	.02771
DISOBE	.29678	.29469	.65906	-.03885	-.21158	-.54862	.64144	.54245	.35095	.61049
DISORG	.52808	.09059	.43211	-.32344	-.07524	-.59395	.45591	.30155	.19166	.35844
DISTRA	.45781	.24994	.54085	-.26306	-.07786	-.64480	.52592	.39700	.29296	.46124
EASY	.10275	-.31089	.22385	-.05368	-.35679	-.20009	.18415	.13580	.33682	.15417
EMOTION	.11304	-.04199	.12553	.02791	.32896	-.00533	.15931	.00215	.13708	.08770
EVENTEM	-.25378	-.15565	-.51729	.04210	-.02049	.35019	-.52556	-.32567	-.37644	-.41295
EXACT	-.42541	-.10583	-.40054	.37423	.08837	.57188	-.36896	-.22775	-.18479	-.35433
EXCITA	.15404	.51173	.50617	.14827	-.17030	-.29095	.52954	.36815	.64986	.41491
FOOLHD	.25887	.30204	.59083	-.03172	-.23160	-.42296	.61325	.47532	.36487	.54709
HOSTILE	.31791	.12508	.58311	-.03194	.01552	-.34771	.48365	.48133	.17006	.60868
HYACT	.14691	.36890	.49172	.09266	-.23718	-.32802	.56220	.53964	.47914	.55838
IMPAT	.25364	.34860	.51941	.09923	-.04377	-.24437	.50830	.53087	.43103	.47938
IMPULS	.14067	.47953	.62456	.20232	-.16516	-.26062	.63200	.53065	.62559	.58220
INSENS	.24131	.15629	.53414	-.04767	-.22624	-.41752	.45301	.54143	.20421	.48372
IRRESP	.37270	.15941	.52999	-.20394	-.12892	-.59703	.46582	.42396	.18652	.55761
LIVE	-.07532	.57306	.40121	.31156	-.29400	-.12543	.47777	.39986	.75575	.32994
LOOK	-.23555	-.17346	-.36986	.17835	.19299	.37130	-.30067	-.16787	-.18115	-.32917
MOODY	.26563	-.06071	.21354	.00248	.21014	-.13430	.22825	.29586	.04250	.14034
MOTIVA	-.35990	.09960	-.18950	.42735	.04200	.56618	-.14041	-.04691	.06967	-.06434
NAUGHTY	.29026	.35106	.66542	-.03513	-.17484	-.55530	.61439	.44066	.44422	.57754
OPTIM	-.25733	.36737	.03188	.34260	-.38389	.17347	.08828	.20073	.35363	.07767
ORDER	-.42190	-.38852	-.37782	.35187	.02215	.55960	-.31556	-.14449	-.18613	-.25901
OUTGO	-.14381	.50695	.26969	.30568	-.41747	-.03619	.34227	.35415	.67982	.24091
PASSIVE	.17206	-.33943	-.27946	-.31985	.25152	.00717	-.30440	-.21089	-.55223	-.25255
PERSIST	-.27624	.16071	-.00336	.35938	-.05356	.25941	.06409	.15158	.23048	.01057

Appendix 15 (con't)

	ABMIND	ACTION	AGGRES	ANALYT	ANXIO	ATTENT	BLOW	BOAST	BUBBLE	BULLY
QUICK	-.43563	.31588	.05346	.60496	-.23291	.35367	.19517	.24141	.43843	.12400
QUIET	-.05149	-.50161	-.45719	-.17309	.37176	.26274	-.46745	-.40523	-.62646	-.39832
RASH	.17150	.41329	.58980	.05739	-.27253	-.42780	.61247	.47038	.56479	.56378
REFLEC	-.31464	-.05448	-.26598	.43040	.03232	.52740	-.24763	-.07984	-.07950	-.14207
RELIAB	-.49371	.01005	-.36478	.39105	.02760	.60399	-.27841	-.15342	-.02195	-.25130
RESER	-.01407	-.38468	-.34845	-.15352	.33279	.23144	-.36290	-.35396	-.53509	-.37966
RESPON	-.45875	.22418	-.06322	.50937	-.16783	.51041	.05191	.16122	.26694	.22989
RESTLS	.27687	.29491	.44324	-.11771	-.13054	-.48513	.43590	.33401	.40279	.36901
RIGID	-.07521	-.31923	-.17420	-.14828	.29167	.00471	-.15918	-.08245	-.42230	-.11189
SOLIT	.24410	-.36264	-.13251	-.23041	.30254	.01636	-.15262	-.01979	-.41836	-.17473
SPITE	.25064	.10052	.55189	-.11562	-.07697	-.34330	.49415	.46800	.10817	.54555
STABLE	-.38893	.06302	-.29976	.27906	-.22817	.43559	-.26358	-.11749	-.06373	-.13616
SYSTEM	-.52585	.01442	-.30400	.49842	-.05480	.56295	-.24301	-.05694	-.01649	-.15070
TALK	.01230	.45362	.37062	.16880	-.26404	-.22179	.42725	.37915	.61206	.36939
THINK	-.30625	-.13927	-.36936	.21188	.08419	.42390	-.37243	-.22420	-.24002	-.31963
THOUGHT	-.37203	.05300	-.30949	.47239	.00475	.55658	-.30512	-.09016	.00558	-.22320
TOUCHY	.13497	-.13600	.33843	-.04295	.22838	-.18365	.40480	.26022	.01942	.29300
TROUBL	.29703	.20500	.58290	-.05702	-.05246	-.43084	.56244	.48815	.29501	.37512
UNPRED	.34399	.13965	.49927	-.06812	.05351	-.40407	.46707	.34122	.30665	.42348
UNSOC	.29090	-.30511	.05102	-.17942	.24020	-.10614	.03779	.19352	-.38984	.24693
UNTIDY	.24559	.07591	.33918	-.21932	-.10856	-.44737	.33030	.13686	.19396	.26566
VIGOR	-.08178	.53663	.46973	.23583	-.31810	-.11536	.43624	.34097	.58444	.45542

	CALM	CAFREE	CAFUL	CALESS	CAUTIO	CHANGE	CHEEKY	CONTEM	CONTROL	CARING
ABMIND	-.27727	.03723	-.42598	.42798	-.17515	.17850	.25773	-.36432	-.37386	-.26012
ACTION	-.24406	.45392	-.12366	.10881	-.35284	.16266	.32626	-.05198	-.15153	.52325
AGGRES	-.43137	.37759	-.37566	.44112	-.45563	.50547	.65474	-.33502	-.50721	.44731
ANALYT	.10524	.09060	.22604	-.27573	-.08388	.07812	.07207	.49958	.20077	.20925
ANXIO	-.15209	-.51043	.16659	-.18355	.40453	.01562	-.17965	.05023	.01766	-.37961
ATTENT	.32064	-.25528	.64123	-.55737	.35909	-.34875	-.39686	.53043	.52013	-.12882
BLOW	-.44344	.34612	-.38434	.40349	-.48994	.57451	.63696	-.25287	-.49894	.42802
BOAST	-.28430	.27554	-.29689	.24928	-.37345	.39535	.55445	-.03836	-.29439	.36292
BUBBLE	-.38399	.53453	-.26295	.21487	-.49914	.34845	.48893	-.06649	-.34752	.51296
BULLY	-.33254	.28732	-.30652	.30510	-.37850	.44835	.61334	-.20332	-.39196	.41363
CALM	1.00000	-.15474	.41939	-.35784	.34634	-.48593	-.46486	.38260	.55205	-.24903
CAFREE	-.15474	1.00000	-.29898	.31385	-.48965	.17532	.37470	-.22504	-.23467	.46750
CAFUL	.41939	-.29898	1.00000	-.73256	.50343	-.35709	-.45977	.53998	.63071	-.20537
CALESS	-.35784	.31385	-.73256	1.00000	-.47655	.30924	.46407	-.51741	-.57710	.21251
CAUTIO	.34634	-.48965	.50343	-.47655	1.00000	-.38846	-.57158	.38813	.51072	-.49621
CHANGE	-.48593	.17532	-.35709	.30924	-.38846	1.00000	.51850	-.22243	-.49856	.32910
CHEEKY	-.46486	.37470	-.45977	.46407	-.57158	.51850	1.00000	-.30286	-.57112	.44565
CONTEM	.38260	-.22504	.53998	-.51741	.38813	-.22243	-.30286	1.00000	.55995	-.14592
CONTROL	.55205	-.23467	.63071	-.57710	.51072	-.49856	-.57112	.55995	1.00000	-.27807
DARING	-.24903	.46750	-.20537	.21251	-.49621	.32910	.44565	-.14592	-.27807	1.00000
DREAMY	-.01722	-.09379	-.08962	.05658	.10471	.09869	.01308	-.07935	-.05715	-.28136

Appendix 15 (con't)

	CALM	CAFREE	CAFUL	CALESS	CAUTIO	CHANGE	CHEEKY	CONTEM	CONTROL	DARING
DISOBE	-.48589	.34901	-.58701	.57095	-.53561	.54319	.69703	-.38591	-.63838	.44475
DISORG	-.41706	.24427	-.62061	.65286	-.42335	.39796	.48179	-.53744	-.64276	.19059
DISTRA	-.49758	.30408	-.55705	.59297	-.43239	.46334	.51779	-.48759	-.63233	.32589
EASY	-.05795	.47340	-.25409	.26857	-.41548	.18531	.28272	-.14842	-.13656	.29314
EMOTION	-.40872	-.18620	-.06488	.10835	-.03003	.33173	.19454	-.12337	-.28749	-.00753
EVENTEM	.55025	-.20974	.44404	-.37000	.43698	-.52847	-.53314	.35310	.62969	-.30815
EXACT	.39662	-.27971	.65055	-.68809	.50363	-.32427	-.44127	.58427	.61147	-.26662
EXCITA	-.52632	.47369	-.39570	.34651	-.58137	.45785	.62759	-.29427	-.52845	.53438
FOOLHD	-.35302	.35149	-.40480	.47167	-.48446	.51639	.59525	-.32428	-.52028	.46832
HOSTILE	-.37896	.12177	-.29986	.30106	-.28413	.46920	.54714	-.18319	-.37062	.22975
HYACT	-.42019	.37682	-.38826	.30782	-.45140	.49590	.57617	-.17116	-.42920	.49604
IMPAT	-.48570	.32066	-.42651	.38878	-.42591	.40150	.62997	-.21519	-.49230	.40411
IMPULS	-.51778	.48580	-.40313	.38232	-.55396	.52159	.69011	-.25764	-.48470	.58487
INSENS	-.29548	.32081	-.35280	.32638	-.38117	.38184	.52251	-.26570	-.35583	.31780
IRRESP	-.36966	.32418	-.55082	.50663	-.38874	.45992	.52227	-.43770	-.53516	.30474
LIVE	-.40950	.54192	-.29117	.25104	-.56266	.38527	.54162	-.13643	-.38391	.59970
LOOK	.33261	-.25751	.42498	-.36277	.42356	-.24506	-.37977	.50909	.46714	-.32924
MOODY	-.31157	-.07817	-.17041	.12257	-.07619	.32320	.27404	-.10052	-.23064	.01185
MOTIVA	.18767	-.20229	.42935	-.39191	.16723	-.16504	-.12845	.50322	.36374	-.00723
NAUGHTY	-.54150	.39778	-.56277	.49289	-.57072	.52508	.71808	-.40883	-.64058	.48339
OPTIM	.02296	.26703	.10455	-.06866	-.19563	-.05352	.13802	.19011	.06687	.31938
ORDER	.41028	-.19874	.64678	-.63457	.40038	-.30914	-.38321	.57117	.63279	-.17768
OUTGO	-.26007	.52350	-.24382	.19979	-.51771	.17108	.42697	-.10370	-.23284	.53353
PASSIVE	.20248	-.29491	.18810	-.11864	.41283	-.19188	-.28081	-.04213	.24148	-.35177
PERSIST	.10742	.09273	.20849	-.18966	-.02604	.03542	.09941	.29263	.10628	.12611
QUICK	.01805	.20645	.14516	-.12887	-.20131	.02898	.15991	.28636	.13191	.30910
QUIET	.39341	-.46461	.42061	-.36123	.63906	-.31964	-.57101	.25492	.46845	-.55285
RASH	-.48892	.46488	-.54868	.48120	-.62340	.53655	.68240	-.35315	-.62826	.52529
REFLEC	.32699	-.21185	.56980	-.52633	.36260	-.18312	-.28293	.65693	.54948	-.17617
RELIAB	.34612	-.09046	.54440	-.48904	.34078	-.32398	-.33752	.55519	.57712	-.12305
RESER	.33854	-.43374	.40051	-.33934	.56967	-.26441	-.51085	.20745	.43969	-.42017
RESPON	.20809	.08940	.35430	-.29430	.03339	-.08178	-.01747	.46119	.26989	.17251
RESTLS	-.49287	.30713	-.58820	.53108	-.57663	.42813	.53154	-.48593	-.62742	.33915
RIGID	.07622	-.33107	.15589	-.16365	.35328	-.00329	-.30287	.04526	.21164	-.33437
SOLIT	.08743	-.30590	.15608	-.06909	.35314	-.10274	-.15072	.05505	.11288	-.37120
SPITE	-.29357	.11811	-.29029	.37559	-.34130	.37742	.55662	-.26413	-.37251	.27249
STABLE	.49726	.02336	.46829	-.40805	.27945	-.40053	-.30675	.47514	.58693	-.02329
SYSTEM	.35923	-.13379	.55813	-.57118	.31372	-.28203	-.30732	.61809	.57760	-.05120
TALK	-.40701	.41685	-.37195	.32870	-.57799	.29967	.51855	-.19287	-.43644	.45805
THINK	.44107	-.26933	.52599	-.51596	.45213	-.32942	-.43639	.55963	.61856	-.27971
THOUGHT	.31987	-.15806	.51233	-.49058	.29656	-.29066	-.31911	.64282	.53032	-.08716
TOUCHY	-.34910	-.13239	-.15583	.16481	-.13180	.49571	.24111	-.16914	-.28121	.04452
TROUBL	-.47814	.22405	-.46929	.48087	-.42139	.52201	.60621	-.37002	-.56724	.33304
UNPRED	-.49902	.15349	-.43816	.43445	-.43272	.52436	.55853	-.33886	-.60699	.22353
UNSOC	-.04319	-.31221	-.01643	.07459	.14721	.09598	.09113	-.00771	-.01601	-.26218
UNTIDY	-.33305	.25156	-.55400	.60048	-.39587	.24549	.43733	-.54124	-.53499	.18982
VIGOR	-.29184	.45743	-.24165	.19908	-.47298	.30492	.46634	-.15465	-.30812	.58515

Appendix 15 (con't)

	DREAMY	DISOBE	DISORG	DISTRA	EASY	EMOTION	EVENTEM	EXACT	EXCITA	FOOLHD
ABMIND	.44639	.29678	.52808	.45701	.10275	.11304	-.25378	-.42541	.15404	.25887
ACTION	-.22964	.29469	.09059	.24994	.31089	-.04199	-.15565	-.10583	.51173	.30204
AGGRES	.02107	.65906	.43211	.54085	.22385	.12553	-.51729	-.40054	.50617	.59083
ANALYT	-.19775	-.03885	-.32344	-.26306	.05368	.02791	.04210	.37423	.14827	-.03172
ANXIO	.27119	-.21158	-.07524	-.07786	-.35679	.32896	-.02049	.08837	-.17030	-.23160
ATTENT	-.28402	-.54862	-.59395	-.64480	-.20009	-.00533	.35019	.57188	-.29095	-.42296
BLOW	.00146	.64144	.45591	.52592	.18415	.15931	-.52556	-.36896	.52954	.61325
BOAST	-.00356	.54245	.30155	.39700	.13580	.00215	-.32567	-.22775	.36815	.47532
BUBBLE	-.21436	.35095	.19166	.29296	.33682	.13708	-.37644	-.18479	.64986	.36487
BULLY	.02771	.61049	.35844	.46124	.15417	.08770	-.41295	-.35433	.41491	.54709
CALM	-.01722	-.48589	-.41706	-.49758	-.05795	-.40872	.55025	.39662	-.52632	-.35302
CAFREE	-.09379	.34901	.24427	.30408	.47340	-.18620	-.20974	-.27971	.47369	.35149
CAFUL	-.08962	-.58701	-.62061	-.55705	-.25409	-.06488	.44404	.65055	-.39570	-.40480
CALESS	.05658	.57095	.65286	.59297	.26857	.10835	-.37000	-.68809	.34651	.47167
CAUTIO	.10471	-.53561	-.42335	-.43239	-.41548	-.03003	.43698	.50363	-.58137	-.48446
CHANGE	.09869	.54319	.39796	.46334	.18531	.33173	-.52847	-.32427	.45785	.51639
CHEEKY	.01308	.69703	.48179	.51779	.28272	.19454	-.53314	-.44127	.62759	.59525
CONTEM	-.07935	-.38591	-.53744	-.48759	-.14842	-.12337	.35310	.58427	-.29427	-.32428
CONTROL	-.05715	-.63838	-.64276	-.63233	-.13656	-.28749	.62969	.61147	-.52845	-.52028
DARING	-.28136	.44475	.19059	.32589	.29314	-.00753	-.30815	-.26662	.53438	.46832
DREAMY	1.00000	.09859	.21641	.13643	-.06653	.07002	-.09015	-.07809	-.08441	.01970
DISOBE	.09859	1.00000	.60111	.65640	.21324	.14120	-.56714	-.53631	.52512	.63990
DISORG	.21641	.60111	1.00000	.66687	.22323	.15587	-.42315	-.66198	.36854	.52738
DISTRA	.13643	.65640	.66687	1.00000	.27219	.16189	-.41528	-.60102	.49283	.60573
EASY	-.06653	.21324	.22323	.27219	1.00000	-.00728	-.04353	-.21285	.36897	.28892
EMOTION	.07002	.14120	.15587	.16189	-.00728	1.00000	-.34566	-.10804	.25750	.14010
EVENTEM	-.09015	-.56714	-.42315	-.41528	-.04353	-.34566	1.00000	.43278	-.51638	-.43981
EXACT	-.07809	-.53631	-.66198	-.60102	-.21285	-.10804	.43278	1.00000	-.38623	-.50669
EXCITA	-.08441	.52512	.36854	.49283	.36897	.25750	-.51638	-.38623	1.00000	.54298
FOOLHD	.01970	.63990	.52738	.60573	.28892	.14010	-.43981	-.50669	.54298	1.00000
HOSTILE	.19506	.54786	.38415	.46527	.08313	.19989	-.42686	-.32353	.32602	.40045
HYACT	-.12734	.60390	.35459	.53883	.24710	.08789	-.37626	-.34254	.56507	.57057
IMPAT	.08484	.61247	.40799	.44882	.18539	.24452	-.46598	-.36087	.54638	.40371
IMPULS	-.06415	.62159	.41190	.48835	.33455	.18254	-.51755	-.38912	.71564	.56363
INSENS	.10894	.59348	.40643	.46360	.12147	-.09895	-.36285	-.34338	.34088	.44727
IRRESP	.20334	.67876	.59363	.66752	.29192	.04042	-.42012	-.54969	.38340	.56596
LIVE	-.28627	.42039	.21190	.35252	.37997	.14905	-.36033	-.21728	.71880	.45721
LOOK	.06929	-.44737	-.45653	-.42794	-.14946	-.16141	.35905	.45478	-.40541	-.42931
MOODY	.28503	.32024	.21889	.18232	-.12195	.32248	-.42784	-.14239	.12424	.05665
MOTIVA	-.18094	-.30899	-.47177	-.39893	-.00266	.06100	.22199	.48051	-.04928	-.24299
NAUGHTY	.07653	.75165	.56841	.59880	.24109	.16648	-.62054	-.53128	.60608	.60258
OPTIM	-.34926	.03100	-.20005	-.01925	.23200	-.16766	.05952	.07391	.23135	.10350
ORDER	-.09433	-.46689	-.68845	-.53082	-.14225	-.17771	.43011	.71550	-.38622	-.41326
OUTGO	-.43578	.32415	.11402	.21814	.32330	.01295	-.25622	-.14168	.55388	.29932
PASSIVE	.00474	-.25526	-.01192	-.09889	-.18099	-.11509	.36142	.07153	-.48297	-.20182
PERSIST	-.22598	-.03338	-.19891	-.13814	.13881	.06383	-.03118	.25448	.13920	-.06105
QUICK	-.39284	-.00577	-.28026	-.20871	.12576	-.01104	.04010	.25169	.23053	.02764
QUIET	.30313	-.52011	-.31121	-.40341	-.36192	-.09199	.43016	.34342	-.68055	-.42704
RASH	-.10114	.70768	.50763	.58436	.30615	.16245	-.56735	-.50603	.69520	.66833

Appendix 15 (con't)

	DREAMY	DISOBE	DISORG	DISTRA	EASY	EMOTION	EVENTEM	EXACT	EXCITA	FOOLHD
REFLEC	-.03925	-.40696	-.54591	-.52027	-.11713	.00380	.34833	.64586	-.27627	-.34071
RELIAB	-.23319	-.50784	-.59585	-.52957	-.12669	-.10554	.45461	.55936	-.22100	-.42335
RESER	.29051	-.43119	-.30102	-.36287	-.38995	-.06846	.36087	.33644	-.57888	-.37094
RESPON	-.40859	-.19220	-.34924	-.28133	-.00118	-.07513	.19547	.39286	.03417	-.09611
RESTLS	-.08552	.60117	.52844	.60426	.26983	.12263	-.50363	-.54844	.55586	.55500
RIGID	.17248	-.15878	-.12442	-.12533	-.34974	-.04684	.17498	.15975	-.37383	-.25584
SPLIT	.35170	-.09973	.01268	-.05834	-.31544	.01551	.14469	.09293	-.37338	-.16806
SPITE	.00613	.54629	.41528	.44338	.10395	.12682	-.36563	-.39226	.28978	.46352
STABLE	-.20050	-.44306	-.50294	-.43681	.03102	-.35452	.56079	.47716	-.26374	-.29924
SYSTEM	-.22494	-.43425	-.67172	-.55417	-.12899	-.13913	.41029	.66774	-.25589	-.38962
TALK	-.26406	.44905	.31346	.44751	.35040	.13318	-.39806	-.31351	.62183	.41890
THINK	.02109	-.50378	-.55184	-.57886	-.22007	-.11651	.40644	.58777	-.46005	-.47819
THOUGHT	-.08636	-.44587	-.52208	-.48735	-.09139	-.07827	.37888	.57505	-.21926	-.34285
TOUCHY	.11797	.34315	.26383	.30280	.00263	.35334	-.38230	-.23313	.14968	.33264
TROUBL	.06757	.72424	.53200	.62116	.18568	.22104	-.50100	-.46521	.45625	.55965
UNPRED	.16207	.55780	.52323	.52740	.15592	.35570	-.59575	-.47562	.47218	.47371
UNSOC	.37231	.14686	.20197	.10289	-.19077	.09424	-.03614	-.02471	-.25243	.02258
UNTIDY	.03870	.46077	.57161	.47639	.14506	.07603	-.36523	-.62247	.39216	.43496
VIGOR	-.30672	.40633	.18802	.30475	.35634	.02544	-.27275	-.23591	.58762	.43515

	HOSTILE	HYACT	IMPAT	IMPULS	INSENS	IRRESP	LIVE	LOOK	MOODY	MOTIVA
ABMIND	.31791	.14691	.25364	.14067	.24131	.37270	-.07532	-.23555	.26563	-.35990
ACTION	.12508	.36890	.34860	.47953	.15629	.15941	.57306	-.17346	-.06871	.09960
AGGRES	.58311	.49172	.51941	.62456	.53414	.52999	.40121	-.36986	.21354	-.18950
ANALYT	-.03194	.09266	.09923	.20232	-.04767	-.20394	.31156	.17835	.00248	.42735
ANXIO	.01552	-.23718	-.04377	-.16516	-.22624	-.12892	-.29400	.19299	.21014	.04200
ATTENT	-.34771	-.32802	-.24437	-.26062	-.41752	-.59703	-.12543	.37130	-.13430	.56618
BLOW	.48365	.56229	.50830	.63200	.45301	.46582	.47777	-.30067	.22825	-.14041
BOAST	.48133	.53964	.53087	.53065	.54143	.42396	.39986	-.16787	.29586	-.04691
BUBBLE	.17006	.47914	.43103	.62559	.20421	.18652	.75575	-.18115	.04250	.06967
BULLY	.60868	.55638	.47938	.58220	.48372	.55761	.32994	-.32917	.14834	-.06434
CALM	-.37896	-.42019	-.48570	-.51778	-.29548	-.36966	-.40950	.33261	-.31157	.18767
CAFREE	.12177	.37682	.32066	.48580	.32081	.32418	.54192	-.25751	-.07817	-.20229
CAFUL	-.29906	-.38826	-.40651	-.40313	-.35280	-.55082	-.29117	.42498	-.17041	.42935
CALESS	.30106	.30782	.38878	.38232	.32638	.50663	.25104	-.36277	.12257	-.39191
CAUTIO	-.28413	-.45140	-.42591	-.55396	-.38117	-.38874	-.56266	.42356	-.07619	.16723
CHANGE	.46920	.49590	.40150	.52159	.38184	.45992	.38527	-.24506	.32320	-.16504
CHEEKY	.54714	.57617	.62997	.69011	.52251	.52227	.54162	-.37977	.27404	-.12845
CONTEM	-.18319	-.17116	-.21519	-.25764	-.26570	-.43770	-.13643	.50909	-.10052	.50322
CONTROL	-.37062	-.42920	-.49230	-.48470	-.35583	-.53516	-.38391	.46714	-.23064	.36374
DARING	.22975	.49604	.40411	.58487	.31780	.30474	.59970	-.32924	.01185	-.00723
DREAMY	.19506	-.12734	.08484	-.06415	.10894	.20334	-.28627	.06929	.28503	-.18094
DISOBE	.54786	.60397	.61247	.62159	.59348	.67876	.42839	-.44737	.32024	-.30899
DISORG	.38415	.35459	.40799	.41190	.40643	.59363	.21190	-.45653	.21889	-.47177
DISTRA	.46527	.53883	.44882	.48835	.46360	.66752	.35252	-.42794	.18232	-.39893

Appendix 15 (con't)

	HOSTILE	HYACT	IMPAT	IMPULS	INSENS	IRRESP	LIVE	LOOK	MOODY	MOTIVA
EASY	.08313	.24710	.18539	.33455	.12147	.29192	.37997	-.14946	-.12195	-.00266
EMOTION	.19989	.08789	.24452	.18254	-.09895	.04042	.14905	-.16141	.32248	.06100
EVENTEM	-.42686	-.37626	-.46598	-.51755	-.36285	-.42012	-.36033	.35905	-.42784	.22199
EXACT	-.32353	-.34254	-.36087	-.38912	-.34338	-.54969	-.21728	.45478	-.14239	.48051
EXCITA	.32602	.56507	.54638	.71564	.34088	.38340	.71880	-.40541	.12424	-.04928
FOOLHD	.40045	.57057	.40371	.56363	.44727	.56596	.45721	-.42931	.05665	-.24299
HOSTILE	1.00000	.47045	.56934	.46812	.52572	.59080	.16600	-.26238	.39391	-.13238
HYACT	.47045	1.00000	.59229	.63734	.46410	.54657	.60569	-.34932	.16982	-.19931
IMPAT	.56934	.59229	1.00000	.68125	.45454	.45705	.52310	-.29668	.43595	-.09180
IMPULS	.46812	.63734	.68125	1.00000	.43771	.45555	.67480	-.39320	.22167	-.08657
INSENS	.52572	.46410	.45454	.43771	1.00000	.62273	.25275	-.31291	.27423	-.24135
IRRESP	.59080	.54657	.45705	.45555	.62273	1.00000	.23255	-.41363	.18973	-.39544
LIVE	.16600	.60569	.52310	.67480	.25275	.23255	1.00000	-.31524	.03028	.02771
LOOK	-.26238	-.34932	-.29668	-.39320	-.31291	-.41363	-.31524	1.00000	-.05370	.26235
MOODY	.39391	.16982	.43595	.22167	.27423	.18973	.03028	-.05370	1.00000	-.09344
MOTIVA	-.13238	-.19931	-.09180	-.08657	-.24135	-.39544	.02771	.26235	-.09344	1.00000
NAUGHTY	.52630	.55653	.58016	.64956	.54954	.61915	.48162	-.46548	.27412	-.28645
OPTIM	-.09604	.24633	.07340	.22543	.01283	-.05265	.38424	-.01568	-.27367	.28396
ORDER	-.27556	-.26941	-.36343	-.35483	-.26365	-.47742	-.21264	.47368	-.17016	.47297
OUTGO	.05276	.46644	.37870	.54146	.20552	.13094	.73123	-.31786	-.04361	.10167
PASSIVE	-.03706	-.38326	-.24922	-.43409	-.08910	-.05758	-.58575	.20671	.07036	-.19050
PERSIST	-.11643	.22486	.08750	.11754	-.05702	-.18843	.27061	.24448	.08186	.49287
QUICK	-.03500	.21213	.20465	.27900	-.01894	-.18051	.43708	.10386	-.09580	.43501
QUIET	-.25773	-.55417	-.50735	-.61859	-.36156	-.36161	-.73860	.38728	-.09046	.00053
RASH	.42028	.63694	.57921	.73976	.49235	.55129	.63709	-.52053	.11541	-.16946
REFLEC	-.16625	-.21482	-.23006	-.25088	-.31177	-.48444	-.12842	.36915	-.08118	.55112
RELIAB	-.30019	-.23561	-.23172	-.22108	-.37028	-.59634	-.08024	.38031	-.23527	.47774
RESER	-.18621	-.46766	-.39855	-.51701	-.33122	-.32924	-.61161	.36235	-.05001	-.03961
RESPON	-.13141	.07132	.00805	.06774	-.11834	-.30623	.24797	.19285	-.18281	.48328
RESTLS	.35079	.55315	.48676	.53536	.35397	.52162	.48158	-.48845	.14251	-.27403
RIGID	-.07263	-.25177	-.33391	-.31665	.22201	-.00797	-.44899	.27645	-.02079	-.15017
SOLIT	.12249	-.26213	-.01479	-.26040	.07940	-.04549	-.46965	.13562	.32487	-.10435
SPITE	.56748	.47330	.53110	.43549	.58439	.55051	.20466	-.36299	.30633	-.20361
STABLE	-.26961	-.21908	-.31806	-.26459	-.26123	-.42092	-.10188	.36509	-.38450	.39790
SYSTEM	-.20870	-.21180	-.24889	-.22458	-.24437	-.48956	-.09171	.44584	-.18420	.51202
TALK	.23122	.51253	.48261	.58432	.29374	.30258	.65617	-.35721	-.00504	.00767
THINK	-.24738	-.38021	-.41709	-.43326	-.35303	-.50193	-.32730	.52987	-.12805	.35572
THOUGHT	-.19661	-.27588	-.22136	-.22110	-.35055	-.44716	-.11176	.41826	-.14519	.58535
TOUCHY	.36727	.24292	.23618	.25426	.29873	.33808	.05344	-.11942	.35458	-.13658
TROUBL	.56630	.56029	.57781	.57570	.59762	.64300	.37076	-.42353	.37542	-.25385
UNPRED	.48182	.38475	.50852	.47956	.45025	.47481	.34223	-.41394	.42018	-.22702
UNSOC	.29565	-.04975	.07139	-.10668	.31465	.22021	-.35552	.05653	.35163	-.12664
UNTIDY	.13483	.25632	.29635	.37559	.29181	.42898	.27553	-.45076	.12642	-.34708
VIGOR	.22636	.59499	.44892	.63152	.33166	.28089	.69230	-.34537	-.01285	.03877

Appendix 15 (con't)

	NAUGHTY	OPTIM	ORDER	OUTGO	PASSIVE	PERSIST	QUICK	QUIET	RASH	REFLEC
ABMIND	.29026	-.25733	-.42190	-.14361	.17206	-.27624	-.43563	-.05149	.17150	-.31464
ACTION	.35106	.36737	-.08852	.50695	-.33943	.16071	.31588	-.50161	.41329	-.05448
AGGRES	.66542	.03188	-.37782	.26969	-.27946	-.00336	.05346	-.45719	.58980	-.26598
ANALYT	-.03513	.34260	.35187	.30568	-.31985	.35938	.60496	-.17309	.05739	.43040
ANXIO	-.17484	-.38389	.02215	-.41747	.25152	-.05356	-.23291	.37176	-.27253	.03232
ATTENT	-.55530	.17347	.55960	-.03619	.00717	.25941	.35367	.26274	-.42780	.52740
BLOW	.61439	.28828	-.31556	.34227	-.30440	.06409	.19517	-.46745	.61247	-.24763
BOAST	.44066	.20073	-.14449	.35415	-.21089	.15158	.24141	-.40523	.47038	-.07984
BUBBLE	.44422	.35363	-.18613	.67982	-.55223	.23048	.43843	-.62646	.56479	-.07950
BULLY	.57754	.07767	-.25901	.24091	-.25255	.01357	.12400	-.39832	.56378	-.14207
CALM	-.54150	.02296	.41028	-.26007	.20248	.10742	.01805	.39341	-.48892	.32699
CAFREE	.39778	.26703	-.19874	.52350	-.29491	.09273	.20645	-.46461	.46488	-.21185
CAFUL	-.56277	.10455	.64678	-.24382	.18810	.20849	.14516	.42061	-.54868	.56960
CALESS	.49289	-.26866	-.63457	.19979	-.11864	-.18966	-.12887	-.36123	.48120	-.52633
CAUTIO	-.57072	-.19563	.40038	-.51771	.41283	-.02604	-.20131	.63906	-.62340	.36260
CHANGE	.52508	-.05352	-.30914	.17108	-.19188	.03542	.02898	-.31964	.53655	-.18312
CHEEKY	.71808	.13802	-.38321	.42697	-.28081	.09941	.15991	-.57101	.68240	-.28293
CONTEM	-.40883	.19011	.57117	-.10370	-.04213	.29263	.28636	.25492	-.35315	.65693
CONTROL	-.64058	.36687	.63279	-.23284	.24148	.10628	.13191	.46845	-.62826	.54948
DARING	.48339	.31930	-.17768	.53353	-.35177	.12611	.30910	-.55285	.52529	-.17617
DREAMY	.07653	-.34926	-.09433	-.43578	.40474	-.22598	-.39284	.30313	-.10114	-.03925
DISOBE	.75165	.03100	-.46688	.32415	-.25596	-.03338	-.00577	-.52011	.70768	-.40696
DISORG	.56841	-.20005	-.68845	.11402	-.01190	-.19891	-.28026	-.31121	.50763	-.54591
DISTRA	.59880	-.01925	-.53082	.21814	-.09889	-.13814	-.20871	-.40341	.58436	-.52027
EASY	.24109	.23200	-.14225	.32330	-.18099	.13881	.12576	-.36192	.30615	-.11713
EMOTION	.16648	-.16766	-.17771	.01295	-.11509	.06383	-.01104	-.09199	.16245	.00380
EVENTEM	-.62054	.05952	.43011	-.25822	.36142	-.03118	.04010	.43016	-.56735	.34833
EXACT	-.53128	.07391	.71550	-.14168	.07153	.25448	.25169	.34342	-.50603	.64586
EXCITA	.60608	.23135	-.38622	.55388	-.48297	.13920	.23053	-.68055	.69520	-.27627
FOOLHD	.60258	.10350	-.41326	.29932	-.20182	-.06105	.02764	-.42704	.66833	-.34071
HOSTILE	.52630	-.09604	-.27556	.05276	-.03706	-.11643	-.03500	-.25773	.42028	-.16625
HYACT	.55653	.24633	-.26941	.46644	-.38326	.02486	.21213	-.55417	.63694	-.21482
IMPAT	.58016	.07340	-.36343	.37870	-.24922	.08750	.20465	-.50735	.57901	-.23006
IMPULS	.64956	.22543	-.35483	.54146	-.43409	.11754	.27900	-.61859	.73976	-.25088
INSENS	.54954	.01083	-.26365	.20552	-.08910	-.05702	-.01894	-.36156	.49235	-.31177
IRRESP	.61915	-.05265	-.47742	.13094	-.05758	-.18843	-.18051	-.36161	.55129	-.48444
LIVE	.48162	.38424	-.21264	.73123	-.58575	.27061	.43708	-.73860	.63709	-.12842
LOCK	-.46548	-.01568	.47368	-.31786	.20671	.24448	.10386	.38728	-.52053	.36915
MOODY	.27412	-.27367	-.17016	-.04361	.07036	.08186	-.09580	-.09046	.11541	-.08118
MOTIVA	-.28645	.28396	.47297	.10167	-.19050	.49287	.43501	.00053	-.16946	.55112
NAUGHTY	1.00000	.03395	-.50979	.37011	-.27399	-.03743	.01847	-.56428	.69071	-.41512
OPTIM	.03395	1.00000	.18672	.48764	-.31443	.26025	.47681	-.34552	.19958	.20761
ORDER	-.50979	.18672	1.00000	-.15042	.09122	.22299	.25841	.30447	-.47314	.59030
OUTGO	.37011	.48764	-.15042	1.00000	-.64651	.28372	.45594	-.74391	.52496	-.08662
PASSIVE	-.27399	-.31443	.09122	-.64651	1.00000	-.28727	-.40466	.62677	-.49391	.01130
PERSIST	-.03743	.26025	.22299	.28372	-.28727	1.00000	.35856	-.21635	.03469	.29128
QUICK	.01847	.47681	.25841	.45594	-.40466	.35856	1.00000	-.29811	.16756	.33519
QUIET	-.56428	-.34552	.30447	-.74391	.62677	-.21635	-.29811	1.00000	-.68554	.25026
RASH	.69071	.19958	-.47314	.52496	-.49391	.03469	.16756	-.68554	1.00000	-.40903

Appendix 15 (con't)

	NAUGHTY	OPTIM	ORDER	OUTGO	PASSIVE	PERSIST	QUICK	QUIET	RASH	REFLEC
REFLEC	-.41512	.20761	.59030	-.08662	.01130	.29128	.33519	.25026	-.40903	1.00000
RELIAB	-.46825	.24855	.55194	-.00117	.01323	.27683	.42164	.24123	-.41181	.61152
RESER	-.46800	-.34253	.27965	-.64017	.56768	-.20715	-.25143	.75698	-.61481	.29705
RESPON	-.19069	.36165	.36904	.31537	-.28508	.41569	.58907	-.17028	-.03202	.43294
RESTLS	.62763	.09608	-.53054	.36253	-.32444	-.03356	.02870	-.55264	.65568	-.49949
RIGID	-.24770	-.27497	.20951	-.45163	.34387	-.15144	-.23773	.43746	-.32950	.05394
SOLIT	-.18410	-.39369	.02798	-.47171	.57922	-.16205	-.35273	.48623	-.35789	.08418
SPITE	.52093	-.05677	-.31091	.14553	-.04814	-.05485	-.01180	-.28538	.44356	-.29876
STABLE	-.42865	.37145	.51100	.04534	.08188	.18404	.34539	.17119	-.39191	.54474
SYSTEM	-.42647	.24267	.69419	-.00972	-.04851	.29706	.46211	.21700	-.38459	.68490
TALK	.47703	.33001	-.27994	.64073	-.56669	.16300	.35360	-.70168	.66704	-.23100
THINK	-.50917	.01932	.54414	-.25621	.17466	.13904	.09152	.42801	-.56818	.62918
THOUGHT	-.39344	.21409	.59291	-.04879	.02312	.29108	.35411	.19867	-.39279	.66381
TOUCHY	.25565	-.25891	-.17345	-.09687	-.04958	-.00771	-.11181	-.00684	.24487	-.18641
TROUBL	.65083	-.03904	-.44240	.24346	-.19815	-.09507	-.03505	-.41659	.60797	-.43716
UNPRED	.59813	-.12418	-.46213	.15028	-.20738	-.04066	-.10924	-.36769	.56343	-.37466
UNSOC	.05274	-.33001	-.04584	-.43865	.44906	-.17553	-.27772	.29741	-.13592	.02668
UNTIDY	.49273	-.06897	-.63911	.19216	-.12555	-.12619	-.12033	-.30053	.48972	-.58212
VIGOR	.45701	.41001	-.19830	.62302	-.52430	.18647	.40106	-.63662	.61426	-.10690

	RELIAB	RESER	RESPON	RESTLS	RIGID	SOLIT	SPITE	STABLE	SYSTEM	TALK
ABMIND	-.49371	-.01407	-.45875	.27687	-.07521	.24410	.25064	-.38893	-.52585	.01230
ACTION	.01005	-.38468	.22418	.29491	-.31923	-.36264	.10052	.06382	.01442	.45362
AGGRES	-.36478	-.34845	-.06322	.44324	-.17420	-.13251	.55189	-.29976	-.30400	.37062
ANALYT	.39105	-.15352	.50937	-.11771	-.14828	-.23041	-.11562	.27906	.49842	.16880
ANXIO	.02760	.33279	-.16783	-.13054	.29167	.30254	-.07697	-.22817	-.05480	-.26404
ATTENT	.60399	.23144	.51041	-.48513	.00471	.01636	-.34330	.43559	.56295	-.22179
BLOW	-.27841	-.36290	.05191	.43590	-.15918	-.15262	.49415	-.26358	-.24301	.42725
BOAST	-.15342	-.35396	.16122	.33441	-.08245	-.01929	.46800	-.11749	-.05694	.37915
BUBBLE	-.02195	-.53509	.26694	.40279	-.42230	-.41836	.10817	-.06373	-.01649	.61206
BULLY	-.28130	-.30966	.00989	.36901	-.11189	-.17473	.54555	-.10616	-.15070	.36939
CALM	.34612	.33854	.20809	-.49287	.07622	.08743	-.29357	.49726	.35923	-.40701
CAFREE	-.09046	-.43374	.08940	.30713	-.33107	-.30590	.11811	.02336	-.13379	.41685
CAFUL	.54440	.40051	.35430	-.58820	.15589	.15608	-.29029	.46829	.55813	-.37195
CALESS	-.48904	-.33934	-.29430	.53108	-.16365	-.06909	.37559	-.40805	-.57118	.32870
CAUTIO	.34078	.56967	.03339	-.57663	.35328	.35314	-.34130	.27945	.31372	-.57799
CHANGE	-.32398	-.26441	-.08178	.42813	-.00329	-.10274	.37742	-.40053	-.28203	.29967
CHEEKY	-.33752	-.51085	-.01747	.53154	-.30287	-.15072	.55662	-.30675	-.30732	.51855
CONTEM	.55519	.20745	.46119	-.48593	.04526	.05505	-.26413	.47514	.61809	-.19287
CONTROL	.57712	.43969	.26989	-.62742	.21164	.11288	-.37251	.58693	.57760	-.43644
DARING	-.12305	-.42017	.17251	.33915	-.33437	-.37120	.27249	-.02329	-.05120	.45805
DREAMY	-.23319	.29051	-.40859	-.08552	.17248	.35170	.00615	-.20050	-.22494	-.26406
DISOBE	-.50784	-.43119	-.19220	.60117	-.15878	-.09973	.54629	-.44306	-.43425	.44905
DISORG	-.59585	-.30102	-.34924	.52844	-.12442	.01268	.41528	-.50294	-.67172	.31346
DISTRA	-.52957	-.36287	-.28133	.60426	-.12533	-.05834	.44338	-.43681	-.55417	.44751

Appendix 15 (con't)

	RELIAB	RESER	RESPON	RESTLS	RIGID	SOLIT	SPITE	STABLE	SYSTEM	TALK
EASY	-.12669	-.38995	-.00118	.26983	-.34974	-.31544	.10395	.03102	-.12899	.35040
EMOTION	-.10554	-.06846	-.07513	.12263	-.04684	.01551	.12682	-.35452	-.13913	.13318
EVENTEM	.45461	.36087	.19547	-.50363	.17498	.14469	-.36563	.56079	.41029	-.39806
EXACT	.55936	.33644	.39286	-.54844	.15975	.09293	-.39226	.47716	.66774	-.31351
EXCITA	-.22100	-.57888	.03417	.55586	-.37383	-.37338	.28978	-.26374	-.25589	.62183
FOOLHD	-.42335	-.37094	-.09611	.55500	-.25584	-.16806	.46352	-.29924	-.38962	.41890
HOSTILE	-.30019	-.18621	-.13141	.35079	-.07263	.12249	.56748	-.26961	-.20870	.23122
HYACT	-.23561	-.46766	.07132	.55315	-.25177	-.26213	.47330	-.21908	-.21180	.51253
IMPAT	-.23172	-.39855	.00805	.48676	-.33391	-.01479	.53110	-.31806	-.24889	.48261
IMPULS	-.22108	-.51701	.06774	.53536	-.31665	-.26040	.43549	-.26459	-.22458	.58432
INSENS	-.37028	-.33122	-.11834	.35397	.02201	.07940	.58439	-.26123	-.24437	.29374
IRRESP	-.59634	-.32924	-.30623	.52162	-.02797	-.04549	.55051	-.42092	-.48956	.30258
LIVE	-.08024	-.61161	.24797	.48158	-.44899	-.46965	.20466	-.10188	-.09171	.65617
LOOK	.38031	.36235	.19285	-.48845	.27645	.13562	-.36299	.36509	.44584	-.35721
MOODY	-.23527	-.25001	-.18281	.14251	-.02079	.32487	.30633	-.38450	-.18420	-.00504
MOTIVA	.47774	-.03961	.48328	-.27403	-.15017	-.10435	-.20361	.39790	.51202	.00767
NAUGHTY	-.46825	-.46800	-.19069	.62763	-.24770	-.18410	.52093	-.42865	-.42647	.47703
OPTIM	.24855	-.34253	.36165	.09608	-.27497	-.39369	-.05677	.37145	.24267	.33001
ORDER	.55194	.27965	.36904	-.53054	.20951	.02798	-.31091	.51100	.69419	-.27994
OUTGO	-.00117	-.64817	.31537	.36253	-.45163	-.47171	.14553	.04534	-.00972	.64073
PASSIVE	.01323	.56768	-.28508	-.32444	.34387	.57922	-.04814	.08188	-.04851	-.56669
PERSIST	.27683	-.20715	.41569	-.03356	-.15144	-.16205	-.05485	.18404	.29706	.16300
QUICK	.42164	-.25143	.58907	.02870	-.23773	-.35273	-.01180	.34539	.46211	.35360
QUIET	.24123	.75698	-.17028	-.55264	.43746	.48623	-.28538	.17119	.21700	-.70168
RASH	-.41181	-.61481	-.03202	.65568	-.32950	-.35789	.44356	-.39191	-.38459	.66704
REFLEC	.61152	.29705	.43294	-.49949	.05394	.08418	-.29876	.54474	.68490	-.23100
RELIAB	1.00000	.24560	.56647	-.52651	-.01066	-.03241	-.40180	.64465	.66661	-.16720
RESER	.24560	1.00000	-.11241	-.54844	.40822	.48247	-.23058	.21998	.25014	-.63610
RESPON	.56647	-.11241	1.00000	-.22044	-.24363	-.22023	-.13664	.47779	.53199	.15889
RESTLS	-.52651	-.54844	-.22044	1.00000	-.27604	-.24023	.40973	-.51487	-.52633	.55757
RIGID	-.01066	.40822	-.24363	-.27604	1.00000	.27804	-.05268	-.07359	.10919	-.42304
SOLIT	-.03241	.48247	-.22023	-.24023	.27804	1.00000	.14848	-.13423	-.02580	-.47315
SPITE	-.40180	-.23058	-.13664	.40973	-.05268	.14848	1.00000	-.35874	-.31187	.27470
STABLE	.64465	.21998	.47779	-.51487	-.07359	-.13423	-.35874	1.00000	.62644	-.19321
SYSTEM	.66661	.25014	.53199	-.52633	.10919	-.02580	-.31187	.62644	1.00000	-.17905
TALK	-.16720	-.63610	.15889	.55757	-.42304	-.47315	.27470	-.19321	-.17905	1.00000
THINK	.50787	.45535	.27168	-.62218	.24679	.15905	-.43282	.49574	.58529	-.47512
THOUGHT	.63799	.24163	.46548	-.52865	.04091	.01022	-.37411	.53014	.64776	-.19669
TOUCHY	-.35769	-.02210	-.17387	.27339	.22944	.11870	.40294	-.44150	-.20843	.08743
TROUBL	-.46468	-.38830	-.13426	.57302	-.11597	.01159	.65653	-.50069	-.42763	.45207
UNPRED	-.49503	-.38078	-.23839	.54296	-.21226	.03111	.52102	-.64196	-.49280	.39506
UNSOC	-.24052	.27397	-.23576	-.06933	.39768	.60613	.34943	-.21729	-.14367	-.31872
UNTIDY	-.43509	-.36336	-.30623	.50329	-.12468	-.10735	.35920	-.46799	-.57203	.30628
VIGOR	-.04737	-.55370	.25659	.43234	-.40440	-.47246	.29872	-.01821	-.05310	.57461

Appendix 15 (con't)

	THINK	THOUGHT	TOUCHY	TROUBL	UNPRED	UNSOC	UNTIDY	VIGOR
ABMIND	-.30625	-.37203	.13497	.29703	.34399	.29090	.24559	-.08178
ACTION	-.13927	.05300	-.13600	.20500	.13965	-.30511	.07591	.53663
AGGRES	-.36936	-.30949	.33843	.58290	.49927	.05102	.33918	.46973
ANALYT	.21188	.47239	-.04295	-.05702	-.06812	-.17942	-.21932	.23583
ANXIO	.08419	.00475	.22838	-.05246	.05351	.24020	-.10856	-.31810
ATTENT	.42390	.55658	-.18365	-.43084	-.40407	-.10614	-.44737	-.11536
BLOW	-.37243	-.30512	.40480	.56244	.46707	.03779	.33030	.43624
BOAST	-.22420	-.09016	.26022	.48815	.34122	.19352	.13686	.34097
BUBBLE	-.24002	.00558	.01942	.29501	.30665	-.38984	.19396	.58444
BULLY	-.31963	-.22320	.29300	.47512	.40348	.04693	.26566	.45542
CALM	.44107	.31987	-.34910	-.47814	-.49902	-.04319	-.33305	-.29184
CAFREE	-.26933	-.15806	-.13239	.22405	.15349	-.31201	.25156	.45743
CAFUL	.52599	.51233	-.15583	-.46929	-.43816	-.01643	-.55400	-.24165
CALESS	-.51596	-.49058	.16481	.48087	.43445	.07459	.60248	.19926
CAUTIO	.45213	.29656	-.13180	-.42139	-.43272	.14721	-.39587	-.47298
CHANGE	-.32942	-.29066	.49571	.52201	.52436	.09598	.24549	.30492
CHEEKY	-.43639	-.31911	.24111	.60621	.55853	.09113	.43733	.46634
CONTEM	.55963	.64282	-.16914	-.37002	-.33886	-.00771	-.54124	-.15465
CONTROL	.61856	.53032	-.28121	-.56724	-.60699	-.01601	-.53499	-.30812
DARING	-.27971	-.08716	.04452	.33304	.22353	-.26218	.18982	.56515
DREAMY	.02109	-.08636	.11797	.06757	.16207	.37231	.03870	-.30672
DISOBE	-.50378	-.44587	.34315	.72424	.55780	.14686	.46077	.40633
DISORG	-.55184	-.52208	.26383	.53200	.52323	.20197	.57161	.18882
DISTRA	-.57886	-.48735	.30280	.62116	.52740	.10289	.47639	.30475
EASY	-.22007	-.09139	.00263	.18568	.15592	-.19077	.14506	.35634
EMOTION	-.11651	-.07827	.35334	.22104	.35570	.09424	.07603	.02544
EVENTEM	.40644	.37888	-.30230	-.50100	-.59575	-.03614	-.36523	-.27275
EXACT	.58777	.57505	-.23313	-.46521	-.47562	-.02471	-.62247	-.23591
EXCITA	-.46005	-.21926	.14968	.45625	.47218	-.25243	.39216	.58762
FOOLHD	-.47819	-.34285	.33264	.55965	.47371	.02258	.43496	.43515
HOSTILE	-.24738	-.19661	.36727	.56630	.48182	.29565	.13483	.22636
HYACT	-.38021	-.27588	.24292	.56029	.38475	-.04975	.25632	.59499
IMPAT	-.41709	-.22136	.23618	.57781	.50852	.07139	.29635	.44892
IMPULS	-.43326	-.22110	.25426	.57570	.47956	-.10668	.37559	.63152
INSENS	-.35303	-.35055	.29873	.59762	.45025	.31465	.29181	.33166
IRRESP	-.50193	-.44716	.33808	.64300	.47481	.22021	.42698	.28089
LIVE	-.32730	-.11176	.05344	.37076	.34223	-.35552	.27553	.69230
LOOK	.52987	.41826	-.11942	-.42353	-.41394	.05653	-.45076	-.34537
MOODY	-.12805	-.14519	.35458	.37542	.42018	.35163	.12642	-.01285
MOTIVA	.35572	.58535	-.13658	-.25385	-.22702	-.12664	-.34708	.03877
NAUGHTY	-.50917	-.39344	.25565	.65083	.59813	.05274	.49273	.45701
OPTIM	.01932	.21409	-.25891	-.03904	-.12418	-.33001	-.06897	.41221
ORDER	.54414	.59291	-.17345	-.44240	-.46213	-.04584	-.63911	-.19832
OUTGO	-.25621	-.04879	-.09687	.24346	.15028	-.43865	.19216	.62372
PASSIVE	.17466	.22312	-.04958	-.19815	-.20738	.44906	-.12555	-.52430
PERSIST	.13904	.29108	-.00771	-.09507	-.04066	-.17553	-.12619	.18607
QUICK	.09152	.35411	-.11181	-.03505	-.10924	-.27772	-.12033	.40186
QUIET	.42801	.19867	-.00684	-.41659	-.36769	.29741	-.30053	-.63662
RASH	-.56818	-.39279	.24487	.60797	.56343	-.13592	.48972	.61426

Appendix 15 (con't)

	THINK	THOUGHT	TOUCHY	TROUBL	UNPRED	UNSOC	UNTIDY	VIGOR
REFLEC	.62918	.66381	-.18641	-.43716	-.37466	.02668	-.58212	-.10690
RELIAB	.50787	.63799	-.35769	-.46468	-.49503	-.24052	-.43509	-.04737
RESER	.45535	.24163	-.02210	-.38830	-.38078	.27397	-.36336	-.55370
RESPON	.27168	.46548	-.17387	-.13426	-.23839	-.23576	-.30623	.25659
RESTLS	-.62218	-.52865	.27339	.57302	.54296	-.06933	.50329	.43234
RIGID	.24679	.04091	.22944	-.11597	-.21226	.39768	-.12468	-.40442
SOLIT	.15905	.01022	.11870	.01159	.03111	.60613	-.10735	-.47266
SPITE	-.43282	-.37411	.40294	.65653	.52102	.34943	.35920	.29672
STABLE	.49574	.53014	-.44150	-.50069	-.64196	-.21729	-.46799	-.01821
SYSTEM	.58529	.64776	-.20843	-.42763	-.49280	-.14367	-.57203	-.05310
TALK	-.47512	-.19669	.08743	.45207	.39506	-.31872	.30628	.57461
THINK	1.00000	.61218	-.24630	-.54523	-.53672	.08409	-.57542	-.32107
THOUGHT	.61218	1.00000	-.30429	-.42036	-.40470	-.07780	-.54720	-.13865
TOUCHY	-.24630	-.30429	1.00000	.45046	.42676	.31854	.10945	.04784
TROUBL	-.54523	-.42036	.45046	1.00000	.60923	.24177	.45183	.35284
UNPRED	-.53672	-.40470	.42676	.60923	1.00000	.14696	.42485	.27480
UNSOC	.08409	-.07780	.31854	.24177	.14696	1.00000	.03438	-.29415
UNTIDY	-.57542	-.54720	.10945	.45183	.42485	.03438	1.00000	.27998
VIGOR	-.32107	-.13885	.04784	.35284	.27480	-.29415	.27998	1.00000

Appendix 16 Correlation matrix for New Teacher's Rating Scale factoranalysis: third study

	ACTION	AGGRES	ANXIO	ATTENT	BUBBLE	BULLY	CAFUL	CHANGE	CHEEKY	CONTEM
ACTION	1.00000	.35288	-.24590	-.03027	.53539	.26834	-.09297	.17426	.27644	-.07460
AGGRES	.35288	1.00000	-.20583	-.41408	.37105	.73284	-.35211	.48731	.62312	-.28687
ANXIO	-.24590	-.20583	1.00000	.12824	-.23628	-.18610	.18090	-.04072	-.21843	.08608
ATTENT	-.03027	-.41408	.12824	1.00000	-.04266	-.34780	.67590	-.39070	-.34498	.54166
BUBBLE	.53539	.37105	-.23628	-.04266	1.00000	.33961	-.20626	.34188	.44745	-.04408
BULLY	.26834	.73284	-.18610	-.34780	.33961	1.00000	-.31744	.45753	.58909	-.21315
CAFUL	-.09297	-.35211	.18090	.67590	-.20626	-.31744	1.00000	-.39978	-.39257	.52817
CHANGE	.17426	.48731	-.04072	-.39070	.34188	.45753	-.39978	1.00000	.46128	-.28187
CHEEKY	.27644	.62312	-.21843	-.34498	.44745	.58909	-.39257	.46128	1.00000	-.16202
CONTEM	-.07460	-.28687	.08608	.54166	-.04408	-.21315	.52817	-.28187	-.16202	1.00000
DARING	.53955	.47636	-.39858	-.12875	.51815	.43441	-.20639	.33866	.44080	-.16434
DISORG	.08457	.42162	-.05944	-.60797	.17267	.35943	-.64716	.42090	.43407	-.48094
EMOTION	-.01339	.16986	.32114	-.03117	.15206	.11973	-.10366	.31505	.18999	-.08545
EVENTEM	-.17915	-.50298	-.01639	.35402	-.37900	-.44360	.42028	-.51153	-.47994	.28394
EXACT	-.10846	-.34917	.11794	.60823	-.15595	-.32732	.68608	-.37394	-.33551	.57121
EXCITA	.48967	.52529	-.16720	-.31206	.63234	.44687	-.39753	.49222	.59199	-.26988
HOSTILE	.11032	.56117	-.02915	-.33991	.15992	.58130	-.30456	.42614	.55441	-.12387
IMPULS	.45794	.60053	-.17893	-.29456	.60530	.56974	-.43322	.55479	.61719	-.26907
LIVE	.56479	.45494	-.28397	-.15997	.73163	.38865	-.30827	.40591	.52630	-.14760
MOODY	-.06017	.26173	.18086	-.18180	.03554	.20790	-.22518	.34784	.29577	-.10516
MOTIVA	.14211	-.17134	.04476	.57736	.09927	-.08271	.47246	-.22970	-.13754	.48157
ORDER	-.06050	-.35777	.03113	.60656	-.15732	-.28404	.68079	-.36781	-.34145	.54013
OUTGO	.49039	.35325	-.38482	-.07411	.68062	.31792	-.24003	.24201	.45926	-.10147
PASSIVE	-.35171	-.34255	.23150	.06064	-.55669	-.31175	.21723	-.23841	-.32280	-.01213
QUIET	-.47392	-.50419	.34771	.29891	-.60388	-.43655	.42343	-.36618	-.53743	.26315
REFLEC	-.02373	-.23492	.06699	.56760	-.04801	-.15453	.58196	-.28385	-.17677	.68002
RELIAB	-.00055	-.33873	.04831	.62484	-.01418	-.30418	.60402	-.38469	-.30879	.52039
RESER	-.37671	-.40885	.31170	.24985	-.55232	-.37073	.38229	-.31081	-.51073	.16951
RESPON	.25210	-.01227	-.09776	.51795	.29110	.01404	.37526	-.11347	-.01179	.41578
SPITE	.11339	.55348	-.09197	-.32673	.12747	.56116	-.29256	.34952	.54914	-.19244
SYSTEM	-.00220	-.27008	.00448	.58299	-.03899	-.17546	.59399	-.37449	-.19593	.63211
TALK	.41053	.42520	-.24230	-.26566	.57798	.42215	-.40156	.36702	.51563	-.18807
THOUGHT	.06086	-.26638	.04855	.57335	.02293	-.21046	.52632	-.34286	-.22451	.62471
TOUCHY	-.12166	.34694	.23781	-.18765	.02087	.33401	-.14576	.45236	.24822	-.16699
TROUBL	.19368	.57963	-.07705	-.46447	.29813	.51461	-.49599	.53515	.56226	-.35680
VIGOR	.52628	.50729	-.30545	-.13397	.58212	.48421	-.25297	.31418	.47248	-.12484

Appendix 16 (con't)

	DARING	DISORG	EMOTION	EVENTEM	EXACT	EXCITA	HOSTILE	IMPULS	LIVE	MOODY
ACTION	.53955	.08457	-.01339	-.17915	-.10846	.48967	.11032	.45794	.56479	-.06017
AGGRES	.47636	.42162	.16986	-.50298	-.34917	.52529	.56117	.60053	.45494	.26173
ANXIO	-.39858	-.05944	.32114	-.01639	.11794	-.16720	-.02915	-.17893	-.28397	.18086
ATTENT	-.12875	-.60797	-.03117	.35402	.60823	-.31206	-.33991	-.29456	-.15997	-.18180
BUBBLE	.51815	.17267	.15206	-.37900	-.15595	.63234	.15992	.60530	.73163	.03554
BULLY	.43441	.35943	.11973	-.44360	-.32732	.44687	.58130	.56974	.38865	.20790
CAFUL	-.20639	-.64716	-.10366	.42028	.68608	-.39753	-.30456	-.43322	-.30827	-.22518
CHANGE	.33866	.42090	.31545	-.51153	-.37394	.49222	.42614	.55479	.40591	.34784
CHEEKY	.44080	.43407	.18999	-.47994	-.33551	.59199	.55441	.61719	.52630	.29577
CONTEM	-.16434	-.48094	-.08545	.28394	.57121	-.26988	-.12387	-.26937	-.14760	-.10516
DARING	1.00000	.19912	-.00258	-.30337	-.25515	.52488	.24402	.57779	.61002	.02099
DISORG	.19912	1.00000	.22659	-.42200	-.67046	.40906	.38749	.45434	.25888	.27729
EMOTION	-.00258	.22659	1.00000	-.34170	-.11654	.28757	.20403	.22822	.16432	.34711
EVENTEM	-.30337	-.42200	-.34170	1.00000	.37852	-.50224	-.41918	-.50517	-.38003	-.40920
EXACT	-.25515	-.67046	-.11654	.37852	1.00000	-.39975	-.28648	-.42360	-.24458	-.15964
EXCITA	.52488	.40906	.28757	-.50224	-.39975	1.00000	.32827	.71647	.72052	.17956
HOSTILE	.24402	.38749	.20403	-.41918	-.28648	.32827	1.00000	.44584	.19099	.39559
IMPULS	.57779	.45434	.22822	-.50517	-.42360	.71647	.44584	1.00000	.67600	.25762
LIVE	.61002	.25888	.16432	-.38003	-.24458	.72052	.19099	.67600	1.00000	.06983
MOODY	.02099	.27729	.34711	-.40920	-.15964	.17956	.39559	.25762	.06983	1.00000
MOTIVA	.01252	-.51131	-.01265	.17017	.50071	-.10695	-.16151	-.14429	.00013	-.17788
ORDER	-.17470	-.71556	-.18861	.41762	.73761	-.41585	-.28222	-.39014	-.24953	-.22427
OUTGO	.55710	.16600	.08092	-.29302	-.17199	.59156	.10192	.57750	.72998	.01639
PASSIVE	-.38512	-.08484	-.15269	.37934	.11981	-.50491	-.10324	-.46770	-.60558	.02137
QUIET	-.56058	-.35144	-.13231	.43343	.37763	-.67675	-.26671	-.63014	-.73230	-.13310
REFLEC	-.15079	-.53504	-.00085	.31465	.64912	-.28419	-.14314	-.28599	-.12942	-.11560
RELIAB	-.13448	-.60492	-.12748	.42255	.57630	-.27747	-.29498	-.27420	-.13512	-.29012
RESER	-.45586	-.33299	-.11461	.38094	.33759	-.60238	-.20572	-.55170	-.62970	-.09356
RESPON	.17047	-.33810	-.02096	.16008	.37762	.05155	-.13598	.04879	.23683	-.16564
SPITE	.27163	.39804	.14153	-.39710	-.32060	.29952	.56715	.41135	.24958	.32011
SYSTEM	-.07538	-.62932	-.13748	.36894	.68084	-.29640	-.14797	-.29026	-.12708	-.21692
TALK	.46308	.36758	.22156	-.42814	-.35034	.64321	.26729	.62617	.65518	.09290
THOUGHT	-.07600	-.51996	-.08052	.33803	.59301	-.22961	-.17659	-.25568	-.11284	-.16415
TOUCHY	.04272	.25084	.33376	-.39245	-.18138	.17217	.36743	.24567	.06507	.37581
TROUBL	.34604	.55318	.24731	-.50390	-.47262	.48927	.54890	.57968	.40045	.41183
VIGOR	.58048	.23376	.09267	-.30096	-.24883	.60249	.25185	.62946	.70037	.04114

Appendix 16 (con't)

	MOTIVA	ORDER	OUTGO	PASSIVE	QUIET	REFLEC	RELIAB	RESER	RESPON	SPITE
ACTION	.14211	-.06050	.49039	-.35171	-.47392	-.02373	-.00055	-.37671	.25210	.11339
AGGRES	-.17134	-.35777	.35325	-.34255	-.50419	-.23492	-.33873	-.40885	-.01227	.55348
ANXIO	.04476	.03113	-.38482	.23150	.34771	.06699	.04831	.31170	-.09776	-.29197
ATTENT	.57736	.60656	-.07411	.06064	.29891	.56760	.62484	.24985	.51795	-.32673
BUBBLE	.09927	-.15732	.68062	-.55669	-.60388	-.04801	-.01418	-.55232	.29110	.12747
BULLY	-.08271	-.28404	.31792	-.31175	-.43655	-.15453	-.30418	-.37073	.01404	.56116
CAFUL	.47246	.68079	-.24003	.21723	.42343	.58196	.60402	.38229	.37526	-.29256
CHANGE	-.22970	-.36781	.24201	-.23841	-.36618	-.28385	-.38469	-.31081	-.11347	.34952
CHEEKY	-.13754	-.34145	.45926	-.32280	-.53743	-.17677	-.33879	-.51073	-.01179	.54914
CONTEM	.48157	.54013	-.10147	-.01213	.26315	.68002	.52039	.16951	.41578	-.19244
DARING	.01252	-.17470	.55710	-.38512	-.56058	-.15079	-.13448	-.45586	.17047	.27163
DISORG	-.51131	-.71556	.16600	-.08484	-.35144	-.53504	-.60492	-.33299	-.33810	.39604
EMOTION	-.01265	-.18861	.08092	-.15269	-.13231	-.00085	-.12748	-.11461	-.02096	.14153
EVENTEM	.17017	.41762	-.29302	.37934	.43343	.31465	.42255	.38094	.16008	-.39710
EXACT	.50071	.73761	-.17199	.11981	.37763	.64912	.57630	.33759	.37762	-.32060
EXCITA	-.10695	-.41585	.59156	-.50491	-.67675	-.28419	-.27747	-.60238	.05155	.29952
HOSTILE	-.16151	-.28222	.10192	-.10324	-.26671	-.14314	-.29498	-.20572	-.13598	.56715
IMPULS	-.14429	-.39014	.57750	-.46770	-.63714	-.28599	-.27420	-.55170	.04879	.41135
LIVE	.00013	-.24953	.72998	-.60558	-.73230	-.12942	-.13512	-.62970	.23683	.24958
MOODY	-.17788	-.22427	.01639	.02137	-.13310	-.11560	-.29012	-.09056	-.16564	.32211
MOTIVA	1.00000	.51731	.06990	-.13415	.07179	.56683	.50735	.00439	.47827	-.18770
ORDER	.51731	1.00000	-.17754	.15322	.35118	.60570	.60839	.30759	.36802	-.29572
OUTGO	.06990	-.17754	1.00000	-.65007	-.73261	-.08607	-.04565	-.68582	.31953	.18805
PASSIVE	-.13415	.15322	-.65007	1.00000	.62353	.03163	.08365	.59872	-.26862	-.12948
QUIET	.07179	.35118	-.73261	.62353	1.00000	.26302	.28217	.74670	-.14227	-.30395
REFLEC	.56683	.60570	-.08607	.03163	.26302	1.00000	.59837	.26341	.45487	-.23179
RELIAB	.50735	.60839	-.04565	.08365	.28217	.59837	1.00000	.27328	.53522	-.39794
RESER	.00439	.30759	-.68582	.59872	.74670	.26341	.27328	1.00000	-.12789	-.28815
RESPON	.47827	.36802	.31953	-.26862	-.14227	.45487	.53522	-.12789	1.00000	-.14196
SPITE	-.18770	-.29572	.18805	-.12948	-.30395	-.23179	-.39794	-.28815	-.14196	1.00000
SYSTEM	.51277	.69415	-.06963	.01096	.27029	.72666	.66271	.25120	.48904	-.23672
TALK	-.08197	-.33566	.65508	-.58441	-.71057	-.24778	-.25210	-.66409	.12536	.32435
THOUGHT	.58702	.58604	-.06044	.03258	.23703	.69345	.62530	.22767	.47503	-.31415
TOUCHY	-.14131	-.19569	-.05556	-.07784	-.03311	-.19003	-.33549	-.02973	-.17002	.39870
TROUBL	-.28823	-.47732	.29782	-.26201	-.46200	-.42091	-.50173	-.43093	-.14539	.63363
VIGOR	.01117	-.22785	.64196	-.54203	-.63736	-.08772	-.09794	-.58417	.25473	.32703

Appendix 16 (con't)

	SYSTEM	TALK	THOUGHT	TOUCHY	TROUBL	VIGOR
ACTION	-.00220	.41053	.06086	-.12166	.19368	.52628
AGGRES	-.27008	.42520	-.26638	.34694	.57963	.50729
ANXIO	.00448	-.24230	.04855	.23781	-.07705	-.30545
ATTENT	.58299	-.26566	.57335	-.18765	-.46447	-.13397
BUBBLE	-.03899	.57798	.02293	.02087	.29813	.58212
BULLY	-.17546	.42215	-.21046	.33001	.51461	.48421
CAFUL	.59399	-.40156	.52632	-.14576	-.49599	-.25297
CHANGE	-.37449	.36702	-.34286	.45236	.53515	.31418
CHEEKY	-.19593	.51563	-.22451	.24822	.56226	.47248
CONTEM	.63211	-.18807	.62471	-.16699	-.35680	-.12484
DARING	-.07538	.46308	-.07600	.04272	.34604	.58048
DISORG	-.62932	.36758	-.51996	.25084	.55318	.23376
EMOTION	-.13748	.22156	-.08052	.33376	.24731	.09267
EVENTEM	.36894	-.42814	.33803	-.39245	-.50390	-.30096
EXACT	.68084	-.35034	.59301	-.18138	-.47262	-.24883
EXCITA	-.29640	.64321	-.22761	.17217	.48927	.60249
HOSTILE	-.14797	.26709	-.17659	.36743	.54890	.25185
IMPULS	-.29026	.62617	-.25568	.24567	.57968	.62946
LIVE	-.12708	.65518	-.11284	.06507	.40045	.70037
MOODY	-.21692	.09290	-.16415	.37581	.41183	.04114
MOTIVA	.51277	-.08197	.58702	-.14131	-.28823	.01117
ORDER	.69415	-.33566	.58604	-.19569	-.47732	-.22785
OUTGO	-.06963	.65508	-.06044	-.05556	.29782	.64196
PASSIVE	.01096	-.58441	.03258	-.07084	-.26201	-.54203
QUIET	.27029	-.71057	.23703	-.03311	-.46200	-.63736
REFLEC	.72666	-.24778	.69345	-.19003	-.42091	-.08772
RELIAB	.66271	-.25210	.60530	-.33549	-.50173	-.09794
RESER	.25120	-.66409	.22767	-.02923	-.43093	-.58417
RESPON	.48904	.12536	.47503	-.17002	-.14539	.25473
SPITE	-.23672	.32435	-.31415	.39870	.63063	.32703
SYSTEM	1.00000	-.23511	.65842	-.19549	-.42473	-.06635
TALK	-.23511	1.00000	-.21099	.12839	.49789	.58774
THOUGHT	.65842	-.21099	1.00000	-.23457	-.40342	-.12421
TOUCHY	-.19549	.12839	-.23457	1.00000	.43900	.05214
TROUBL	-.42473	.49789	-.40342	.43900	1.00000	.38657
VIGOR	-.06635	.58774	-.12421	.05214	.38657	1.00000

Appendix 17 Cattell's Children Personality Questionaire

IPAT

CPQ, Form A
(1963 Edition)

Part A_1

What You Do and What You Think

Print Your Name: First__________________ Last__________________

Your Age__________________ Grade in School__________ Boy or Girl__________

Read each statement and mark an ☒ on the side that fits you better. Some questions will not have the words just the way you want them but mark every one the best you can. You may ask for help if you don't know a word. Just raise your hand and the teacher will come to your desk. Do not work long on one question. Mark it and go right on to the next one. MARK EVERY ONE. Most of the questions have two boxes to choose from but other questions have three boxes. Always look at ALL the boxes and pick just one of them for your answer.

1. When visiting a new building do you like to have someone show you around ☐ or ☐ do you like to find your own way
2. When a child laughs at you do you feel badly ☐ or ☐ do you laugh too
3. Do you think you could do well at almost anything ☐ or ☐ just a few things
4. In a game on the playground, do you stand around ☐ or ☐ run a lot
5. Does your mother think you are too lively and restless ☐ or ☐ quiet and calm
6. Do you feel nervous at school ☐ or ☐ are you happy
7. Do you work slowly ☐ or ☐ quickly
8. In your group is someone else $\boxed{\text{the leader}}$ ☐ or ☐ are you $\boxed{\text{the leader}}$
   (that is somebody with good ideas and many people follow what he suggests)
9. Do you have many friends ☐ or ☐ just a few good friends
10. Do you think you smile a great deal ☐ or ☐ do not smile much

GO RIGHT ON TO THE NEXT PAGE.

DO NOT WRITE BELOW THIS LINE.

FACTOR	A	B	C	D	E	F	G	H	I	J	N	O	Q_3	Q_4
Part A_1 Raw Score														
Part A_2 Raw Score														
Form A Raw Score = (A_1 + A_2)														
Standard Score														
PROFILE IN STENS 10	•	•	•	•	•	•	•	•	•	•	•	•	•	•
9	•	•	•	•	•	•	•	•	•	•	•	•	•	•
8	•	•	•	•	•	•	•	•	•	•	•	•	•	•
7	•	•	•	•	•	•	•	•	•	•	•	•	•	•
6	•	•	•	•	•	•	•	•	•	•	•	•	•	•
5	•	•	•	•	•	•	•	•	•	•	•	•	•	•
4	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3	•	•	•	•	•	•	•	•	•	•	•	•	•	•
2	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1	•	•	•	•	•	•	•	•	•	•	•	•	•	•
FACTOR	A	B	C	D	E	F	G	H	I	J	N	O	Q_3	Q_4

Appendix 17 (con't)

PAGE 2 *In every question, mark just one box.*

11. Usually means the same as generally ☐ or seldom ☐ or always ☐
12. Do you sometimes speak angrily to your parents ☐ or ☐ is it wrong to do so
13. Does your teacher think you are good at sitting still ☐ or ☐ that you run around too much
14. When your friends argue, do you join the argument ☐ or ☐ keep quiet till they finish
15. Foot is to leg as hand is to wrist ☐ or finger ☐ or arm ☐
16. When someone is slow does it bother you ☐ or ☐ does it not bother you
17. Would you rather hunt birds ☐ or ☐ draw pictures of birds
18. Do you go to buy your own toys ☐ or ☐ does mother do it
19. The next number in 7, 5, 3, __,is 9 ☐ or 1 ☐ or 0 ☐
20. In your family are you the happy one ☐ or ☐ the one in trouble
21. Would you rather talk with your teacher ☐ or ☐ talk with a good friend
22. If two children were fighting on the playground, would you let them fight ☐ or ☐ go and tell the teacher
23. Which one of these does not belong with the others: cold, hot, wet, warm warm ☐ or cold ☐ or wet ☐
24. If people push you in a bus, do you just smile ☐ or ☐ do you get mad
25. Would you like better to have bears here now ☐ or ☐ to hear stories about bears
26. Would you rather work with books in a library ☐ or ☐ be a General in the Army
27. If Mary's uncle is my father, what relation is Mary's sister to me cousin ☐ or niece ☐ or auntie ☐
28. Do they say you shout at people when you get excited ☐ or ☐ do they think you are patient
29. Is mother's way of doing things always better ☐ or ☐ is your own new way sometimes better
30. Would you rather be a tap dancer ☐ or ☐ a soldier

GO RIGHT ON TO THE NEXT PAGE.

Do not write here.
B____ D____ E____ F____

Appendix 17 (con't)

PAGE 3

In every question, mark just one box.

31.	Would you rather go to the movies (cinema)	☐	or	☐ to a church
32.	Are you doing as well as you should in your work	☐	or	☐ could you do better
33.	Which story would you like better, one about killing Indians	☐	or	☐ how Indians made clothing
34.	Do loud noises scare you	☐	or	☐ do you just laugh at them
35.	Do you obey the rules all the time	☐	or	☐ only when someone is looking
36.	Are your feelings easily hurt	☐	or	☐ not easily hurt
37.	Would you rather collect stamps	☐	or	☐ play football
38.	If people wanted you to do something you did not want to do, would you get angry	☐	or	☐ just go along
39.	If you begin a job and it becomes hard, do you give up	☐	or	☐ keep on working
40.	Do new teachers frighten you	☐	or	☐ do you usually like them
41.	Would you rather ride a bicycle	☐	or	☐ listen to music
42.	Do teachers scold you (tell you off)	☐	or	☐ think you are all right
43.	When mother calls, do you wait a while	☐	or	☐ do you come right away
44.	Are most children kind to you	☐	or	☐ are they sometimes unkind
45.	Would you rather read a book	☐	or	☐ play ball
46.	If someone has a new idea, do you say it is good	☐	or	☐ wait a while to make sure
47.	If you know the answer, do you raise your hand	☐	or	☐ wait to be called on
48.	Are your parents always ready to hear you talk	☐	or	☐ are they sometimes too busy
49.	In a play would you rather be a speed (test) pilot	☐	or	☐ a famous writer
50.	If a trick is played on you, do you laugh	☐	or	☐ get a little angry

GO RIGHT ON TO THE LAST PAGE.

Do not write here.
G____ H____ I____ J____

Appendix 17 (con't)

PAGE 4

In every question, mark just one box.

51. Would you like to go fishing by yourself	☐	or	☐ play games with children
52. When you say, "I bet I'm right," are you, in the end, right most of the time	☐	or	☐ wrong most of the time
53. School life is hard	☐	or	☐ easy
54. In your school work do you often forget	☐	or	☐ do you feel sure you can remember things
55. If you were a wild animal, would you rather be a lion	☐	or	☐ a fast horse
56. Can you do most things well	☐	or	☐ can others do things better
57. Would you rather go to school	☐	or	☐ work at home
58. In dreams do animals chase you	☐	or	☐ are dreams nice
59. Are grown-ups always happy to listen to you	☐	or	☐ do they get angry when you talk
60. Can you easily stand up in class and talk	☐	or	☐ do you feel shy
61. Would you rather read funny books	☐	or	☐ do (sums) ~~arithmetic~~
62. When a small thing upsets you, do you get so mad you want to throw things	☐	or	☐ can you keep calm
63. Do you like to listen to long stories	☐	or	☐ do you get tired
64. Do your plans often not work	☐	or	☐ do they work out well
65. At home would you first help wash the dishes	☐	or	☐ listen to music or TV
66. When you are hurried do you still put your clothes away	☐	or	☐ just leave them
67. Do you wish school would not be such a bother	☐	or	☐ is school all right as it is
68. Do people think that you make many mistakes	☐	or	☐ few mistakes
69. When you read, do you find it hard to keep your mind on it	☐	or	☐ can you read right on to the end
70. When (you are called) ~~mother calls you~~ in the morning, do you just jump right up	☐	or	☐ find it hard to wake up

DID YOU PUT ONE MARK DOWN FOR EVERY STATEMENT? CHECK BACK AND SEE.

Do not write here.
N____ O____ Q_1____ Q_4____

Appendix 17 (con't)

CPQ, Form A
(1963 Edition)

Part A_2

What You Do and What You Think

Print Your Name: First____________________ Last____________________

Your Age____________ Grade in School ________ Boy or Girl ________

Read each statement and mark an ☒ on the side that fits you better. Some questions will not have the words just the way you want them but mark every one the best you can. You may ask for help if you don't know a word. Just raise your hand and the teacher will come to your desk. Do not work long on one question. Mark it and go right on to the next one. MARK EVERY ONE. Most of the questions have two boxes to choose from but other questions have three boxes. Always look at ALL the boxes and pick just one of them for your answer.

1. Do you finish your school work quickly ☐ or ☐ does it take you too long
2. When losing a game, do you sometimes give up and save your energy ☐ or ☐ always play harder
3. Can you easily persuade your friends to accept your plans ☐ or ☐ is it difficult
4. Do you think many children do better work than you ☐ or ☐ are you as good as anyone else
5. If the teacher lets another child do a job you want to do, do you feel badly ☐ or ☐ soon forget about it
6. Do grown-ups think you are naughty ☐ or ☐ well-behaved
7. Do you find other children take advantage of you ☐ or ☐ are they kind to you
8. Do you make a lot of mistakes ☐ or ☐ just a few
9. Do people like your ideas ☐ or ☐ do they not like them
10. If you got lost, would you know what to do ☐ or ☐ would you be scared

GO RIGHT ON TO THE NEXT PAGE.

DO NOT WRITE BELOW THIS LINE.

FACTOR	A	B	C	D	E	F	G	H	I	J	N	O	Q_3	Q_4
Part A_1 Raw Score														
Part A_2 Raw Score														
Form A Raw Score = $(A_1 + A_2)$														
Standard Score														
PROFILE IN STENS 10	•	•	•	•	•	•	•	•	•	•	•	•	•	•
9	•	•	•	•	•	•	•	•	•	•	•	•	•	•
8	•	•	•	•	•	•	•	•	•	•	•	•	•	•
7	•	•	•	•	•	•	•	•	•	•	•	•	•	•
6	•	•	•	•	•	•	•	•	•	•	•	•	•	•
5	•	•	•	•	•	•	•	•	•	•	•	•	•	•
4	•	•	•	•	•	•	•	•	•	•	•	•	•	•
3	•	•	•	•	•	•	•	•	•	•	•	•	•	•
2	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1	•	•	•	•	•	•	•	•	•	•	•	•	•	•
FACTOR	A	B	C	D	E	F	G	H	I	J	N	O	Q_3	Q_4

Appendix 17 (con't)

PAGE 6 *In every question, mark just one box.*

11. Collect is the opposite of spread ☐ or gather ☐ or save ☐
12. If it is wrong to do something do you still do it sometimes ☐ or ☐ not do it
13. Would you rather be a school teacher ☐ or ☐ a great hunter
14. Can you work where people laugh and talk ☐ or ☐ would you rather they keep still
15. Listen is to hear as look is to walk ☐ or notice ☐ or see ☐
16. Does teacher sometimes say you are careless and untidy ☐ or ☐ does she never say so
17. On a playground do you make a lot of noise ☐ or ☐ play quietly, without so much noise
18. Do you think you could learn to fly an airplane (aeroplane) ☐ or ☐ would it be too difficult
19. The next number in 12, 9, 6, —, is 4 ☐ or 3 ☐ or 5 ☐
20. If people pester you, do you just laugh it off ☐ or ☐ do you get angry
21. Would you rather write a book ☐ or ☐ be the main actor in a play
22. Are you good at walking (along) a fence or a log ☐ or ☐ are others better
23. Which one of these does not belong with the others: swim, run, sit, fly run ☐ or fly ☐ or sit ☐
24. In class, do you sit quietly ☐ or ☐ do you like to move about
25. When you get a new game as a present, do you like to try it first yourself ☐ or ☐ have someone show you how to play it
26. Would you rather own a small, friendly dog ☐ or ☐ a big, powerful dog
27. Tom is younger than Bill. Jim is younger than Tom. Who is the oldest Bill ☐ or Jim ☐ or Tom ☐
28. Are you disappointed often ☐ or ☐ hardly ever
29. If teacher scolded you badly (got very angry with you), would you cry when you told mother (your parents) ☐ or ☐ just laugh when you told her (them)
30. Would you rather be the captain of a peaceful ocean liner ☐ or ☐ captain of a sub in war

GO RIGHT ON TO THE NEXT PAGE.

Do not write here.
B____ D____ E____ F____

Appendix 17 (con't)

PAGE 7 *In every question, mark just one box.*

31. If a dog were barking at you, would you shout, "Shut up!"	☐	or	☐	say, "He's trying to be a good dog"
32. Do you forget your troubles quickly	☐	or	☐	do you pout (sulk) for a long time
33. Can you touch a big bug (beetle)	☐	or	☐	would you dislike to touch one
34. Do you wish you were better looking	☐	or	☐	are you good-looking now
35. Do you usually go straight home (after school)	☐	or	☐	play along (on) the way
36. Do you have a hard time deciding which games to play	☐	or	☐	do you make up your mind quickly
37. Would you rather go to school	☐	or	☐	go on a long trip in a car
38. If you were high up on a big rock, would you be scared	☐	or	☐	would you like looking around
39. When Christmas presents are under the tree, do you ever try to open them	☐	or	☐	do you wait
40. Do you feel afraid of things that might happen to you	☐	or	☐	are you satisfied with things as they are
41. Would you rather be an animal doctor	☐	or	☐	a piano player
42. Do you have fainting spells (feel dizzy)	☐	or	☐	do you not
43. When mother is annoyed with you, is it often her fault	☐	or	☐	do you generally feel you were wrong
44. Does your father do things with you	☐	or	☐	do you not like to bother him when he is busy
45. When you hear a sad story, do tears come to your eyes	☐	or	☐	are you not bothered
46. Do people pay enough attention to you	☐	or	☐	do you have to do things to make them notice you
47. When children ask for help in an exam (a test) do you let them do their own work	☐	or	☐	help them unless teacher is watching
48. If people ask you to do too many things, do you find a way to do them	☐	or	☐	do you get all mixed up
49. Would you rather be a space pilot	☐	or	☐	an artist
50. First thing in the morning are you ready for fun	☐	or	☐	are you still tired and sleepy

GO RIGHT ON TO THE LAST PAGE.

Do not write here.
G____ H____ I____ J____

Appendix 17 (con't)

In every question, mark just one box.

51. Would you rather read short stories	☐	or	☐	a long book
52. Do you succeed in most things you try	☐	or	☐	do things often go wrong for you
53. If a classmate calls you a bad name, do you usually fight	☐	or	☐	pretend you do not care
54. At a loud bang, do you jump	☐	or	☐	just look around
55. Do you laugh when others make mistakes	☐	or	☐	not laugh at them
56. Would you rather be called clever	☐	or	☐	nice and kind
57. Would you rather learn a lesson in school	☐	or	☐	watch a game
58. When people talk about a place you know well, do you start telling them about it too	☐	or	☐	do you keep quiet until they finish
59. Are you good because you like to be good	☐	or	☐	because you get into trouble if you are bad
60. Are you getting along well	☐	or	☐	do you have many problems
61. Would you rather have someone else keep your room tidy	☐	or	☐	do it yourself
62. If you don't like the food, do you complain	☐	or	☐	eat it anyway
63. Do people like best those who are good	☐	or	☐	those who tell clever jokes
64. Does mother say you talk too much	☐	or	☐	are you quiet
65. Are you happy to stay with young children	☐	or	☐	won't you stay with them
66. If friends borrow your things without asking, is it all right	☐	or	☐	are you angry
67. Do you like better a teacher who is easy to get by	☐	or	☐	one who is strict
68. When a problem is too hard, do you give it up for a while and forget it	☐	or	☐	keep working on it
69. When people play a joke on you do you get all upset	☐	or	☐	take it quietly
70. If you were angry, would you go quietly to your room	☐	or	☐	would you slam the door as you went

DID YOU PUT ONE MARK DOWN FOR EVERY STATEMENT? CHECK BACK AND SEE.

Do not write here.
N____ O____ Q_4____ Q_4____

Appendix 18 The Junior Eysenck Personlaity Inventory

E ◯ N ◯ L ◯

REMEMBER TO ANSWER EACH QUESTION

	YES	NO
1. Do you like plenty of excitement going on around you?	◯	◯
2. Do you often need kind friends to cheer you up?	◯	◯
3. Do you nearly always have a quick answer when people talk to you?	◯	◯
4. Do you sometimes get cross?	◯	◯
5. Are you moody?	◯	◯
6. Would you rather be alone instead of meeting other children?	◯	◯
7. Do ideas run through your head so that you cannot sleep?	◯	◯
8. Do you always do as you are told at once?	◯	◯
9. Do you like practical jokes?	◯	◯
10. Do you ever feel "just miserable" for no good reason?	◯	◯
11. Are you rather lively?	◯	◯
12. Have you ever broken any rules at school?	◯	◯
13. Do lots of things annoy you?	◯	◯
14. Do you like doing things where you have to act quickly?	◯	◯
15. Do you worry about awful things that might happen?	◯	◯
16. Can you always keep every secret?	◯	◯
17. Can you get a party going?	◯	◯
18. Do you get thumping in your heart?	◯	◯
19. When you make new friends do you usually make the first move?	◯	◯
20. Have you ever told a lie?	◯	◯
21. Are you easily hurt when people find fault with you or the work you do?	◯	◯
22. Do you like telling jokes or funny stories to your friends?	◯	◯
23. Do you often feel tired for no good reason?	◯	◯
24. Do you always finish your homework before you play?	◯	◯
25. Are you usually happy and cheerful?	◯	◯
26. Are you touchy about some things?	◯	◯
27. Do you like mixing with other children?	◯	◯
28. Do you say your prayers every night?	◯	◯
29. Do you have "dizzy turns"?	◯	◯

	YES	NO
30. Do you like playing pranks on others?	◯	◯
31. Do you often feel fed-up?	◯	◯
32. Do you sometimes boast a little?	◯	◯
33. Are you mostly quiet when you are with others?	◯	◯
34. Do you sometimes get so restless that you cannot sit in a chair long?	◯	◯
35. Do you often make up your mind to do things suddenly?	◯	◯
36. Are you always quiet in class, even when the teacher is out of the room?	◯	◯
37. Do you have many frightening dreams?	◯	◯
38. Can you usually let yourself go and enjoy yourself at a lively party?	◯	◯
39. Are your feelings rather easily hurt?	◯	◯
40. Have you ever said anything bad or nasty about anyone?	◯	◯
41. Would you call yourself happy-go-lucky?	◯	◯
42. Do you worry for a long while if you feel you have made a fool of yourself?	◯	◯
43. Do you often like a rough and tumble game?	◯	◯
44. Do you always eat everything you are given at meals?	◯	◯
45. Do you find it very hard to take no for an answer?	◯	◯
46. Do you like going out a lot?	◯	◯
47. Do you sometimes feel life is just not worth living?	◯	◯
48. Have you ever been cheeky to your parents?	◯	◯
49. Do other people think of you as being very lively?	◯	◯
50. Does your mind often wander off when you are doing a job?	◯	◯
51. Would you rather sit and watch than play at parties?	◯	◯
52. Do you find it hard to get to sleep at nights because you are worrying about things?	◯	◯
53. Do you usually feel fairly sure you can do the things you have to?	◯	◯
54. Do you often feel lonely?	◯	◯
55. Are you shy of speaking first when you meet new people?	◯	◯
56. Do you often make up your mind when it is too late?	◯	◯
57. When children shout at you, do you shout back?	◯	◯
58. Do you sometimes feel specially cheerful and at other times sad without any good reason?	◯	◯
59. Do you find it hard to really enjoy yourself at a lively party?	◯	◯
60. Do you often get into trouble because you do things without thinking first?	◯	◯

PLEASE CHECK TO SEE THAT YOU HAVE ANSWERED *ALL* THE QUESTIONS

Appendix 19a Eysenck's Personality Questionnaire(Junior)

E.P.Q. (Junior)

Age........................Sex ....

INSTRUCTIONS Please answer each question by putting a circle around the "YES" or the "NO" following the question. There are no right or wrong answers, and no trick questions. Work quickly and do not think too long about the exact meaning of the questions.

REMEMBER TO ANSWER EACH QUESTION

1	Do you like plenty of excitement going on around you?..........................	YES	NO
2	Are you moody?	YES	NO
3	Do you enjoy hurting people you like?	YES	NO
4	Were you ever greedy by helping yourself to more than your share of anything?...	YES	NO
5	Do you nearly always have a quick answer when people talk to you?	YES	NO
6	Do you very easily feel bored?..	YES	NO
7	Would you enjoy practical jokes that could sometimes really hurt people?	YES	NO
8	Do you always do as you are told at once?...................................	YES	NO
9	Would you rather be alone instead of meeting other children?..................	YES	NO
10	Do ideas run through your head so that you cannot sleep?......................	YES	NO
11	Have you ever broken any rules at school?....................................	YES	NO
12	Would you like other children to be afraid of you?............................	YES	NO
13	Are you rather lively?..	YES	NO
14	Do lots of things annoy you?..	YES	NO
15	Would you enjoy cutting up animals in Science class?.........................	YES	NO
16	Did you ever take anything (even a pin or button) that belonged to someone else?...	YES	NO
17	Have you got lots of friends?	YES	NO
18	Do you ever feel "just miserable" for no good reason?	YES	NO
19	Do you sometimes like teasing animals?......................................	YES	NO
20	Did you ever pretend you did not hear when someone was calling you?	YES	NO

PLEASE TURN OVER

Appendix 19a (con't)

21	Would you like to explore an old haunted castle?	YES	NO
22	Do you often feel life is very dull?	YES	NO
23	Do you seem to get into more quarrels and scraps than most children?	YES	NO
24	Do you always finish your homework before you play?	YES	NO
25	Do you like doing things where you have to act quickly?	YES	NO
26	Do you worry about awful things that might happen?	YES	NO
27	When you hear children using bad language do you try to stop them?	YES	NO
28	Can you get a party going?	YES	NO
29	Are you easily hurt when people find things wrong with you or the work you do?	YES	NO
30	Would it upset you a lot to see a dog that has just been run over?	YES	NO
31	Do you always say you are sorry when you have been rude?	YES	NO
32	Is there someone who is trying to get their own back for what they think you did to them?	YES	NO
33	Do you think water ski-ing would be fun?	YES	NO
34	Do you often feel tired for no reason?	YES	NO
35	Do you rather enjoy teasing other children?	YES	NO
36	Are you always quiet when older people are talking?	YES	NO
37	When you make new friends do you usually make the first move?	YES	NO
38	Are you touchy about some things?	YES	NO
39	Do you seem to get into a lot of fights?	YES	NO
40	Have you ever said anything bad or nasty about anyone?	YES	NO
41	Do you like telling jokes or funny stories to your friends?	YES	NO
42	Are you in more trouble at school than most children?	YES	NO
43	Do you generally pick up papers and rubbish others throw on the classroom floor?	YES	NO
44	Have you many different hobbies and interests?	YES	NO
45	Are your feelings rather easily hurt?	YES	NO
46	Do you like playing pranks on others?	YES	NO
47	Do you always wash before a meal?	YES	NO
48	Would you rather sit and watch than play at parties?	YES	NO
49	Do you often feel "fed-up"?	YES	NO
50	Is it sometimes rather fun to watch a gang tease or bully a small child?	YES	NO
51	Are you always quiet in class, even when the teacher is out of the room?	YES	NO
52	Do you like doing things that are a bit frightening?	YES	NO
53	Do you sometimes get so restless that you cannot sit still in a chair for long?	YES	NO

Appendix 19a (con't)

54	Would you like to go to the moon on your own?	YES	NO
55	At prayers or assembly, do you always sing when the others are singing?	YES	NO
56	Do you like mixing with other children?	YES	NO
57	Are your parents far too strict with you?	YES	NO
58	Would you like parachute jumping?	YES	NO
59	Do you worry for a long while if you feel you have made a fool of yourself?	YES	NO
60	Do you always eat everything you are given at meals?	YES	NO
61	Can you let yourself go and enjoy yourself a lot at a lively party?	YES	NO
62	Do you sometimes feel life is just not worth living?	YES	NO
63	Would you feel very sorry for an animal caught in a trap?	YES	NO
64	Have you ever been cheeky to your parents?	YES	NO
65	Do you often make up your mind to do things suddenly?	YES	NO
66	Does your mind often wander off when you are doing some work?	YES	NO
67	Do you enjoy diving or jumping into the sea or a pool?	YES	NO
68	Do you find it hard to get to sleep at night because you are worrying about things?	YES	NO
69	Did you ever write or scribble in a school or library book?	YES	NO
70	Do other people think of you as being very lively?	YES	NO
71	Do you often feel lonely?	YES	NO
72	Are you always specially careful with other people's things?	YES	NO
73	Do you always share all the sweets you have?	YES	NO
74	Do you like going out a lot?	YES	NO
75	Have you ever cheated at a game?	YES	NO
76	Do you find it hard to really enjoy yourself at a lively party?	YES	NO
77	Do you sometimes feel specially cheerful and at other times sad without any good reason?	YES	NO
78	Do you throw waste paper on the floor when there is no waste paper basket handy?	YES	NO
79	Would you call yourself happy-go-lucky?	YES	NO
80	Do you often need kind friends to cheer you up?	YES	NO
81	Would you like to drive or ride on a fast motor bike?	YES	NO

PLEASE MAKE SURE YOU HAVE ANSWERED ALL THE QUESTIONS

Appendix 19b   Standardization norms of the JEPI and the EPQ from Eysenck, S.B.G. (1965) and Eysenck and Eysenck (1975)

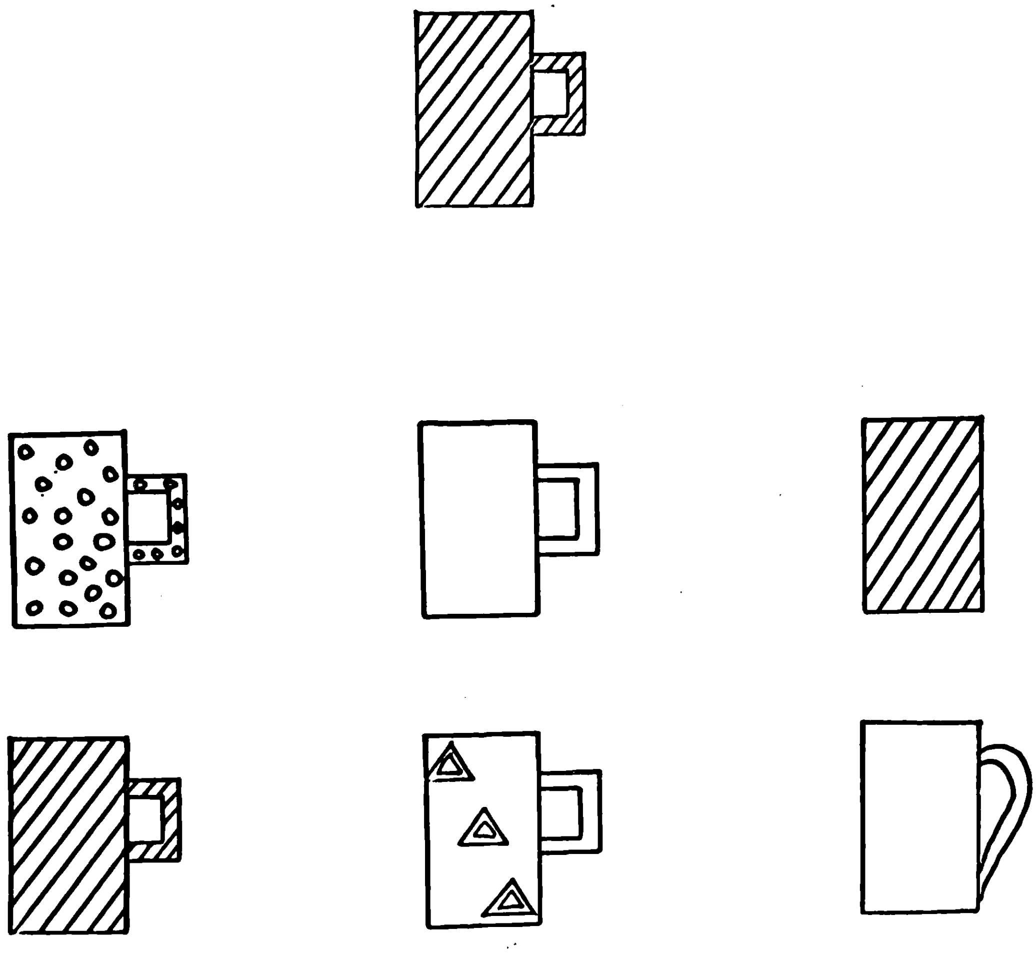
JEPI

		Female			Male		
		N	$\overline{X}$	S.D.	N	$\overline{X}$	S.D.
Age: 8 years							
	E	433	16.08	3.27	433	10.66	3.13
	N	433	11.44	4.78	433	11.52	4.85
	L	148	7.76	2.33	138	6.67	2.66
Age: 9 years							
	E	519	16.45	3.56	520	17.05	3.41
	N	519	12.27	4.81	520	11.38	4.65
	L	143	7.31	2.59	135	5.79	2.67
Age: 10 years							
	E	569	16.81	3.17	565	17.79	3.34
	N	569	12.19	5.03	565	11.22	4.99
	L	149	5.62	2.72	141	4.85	2.67

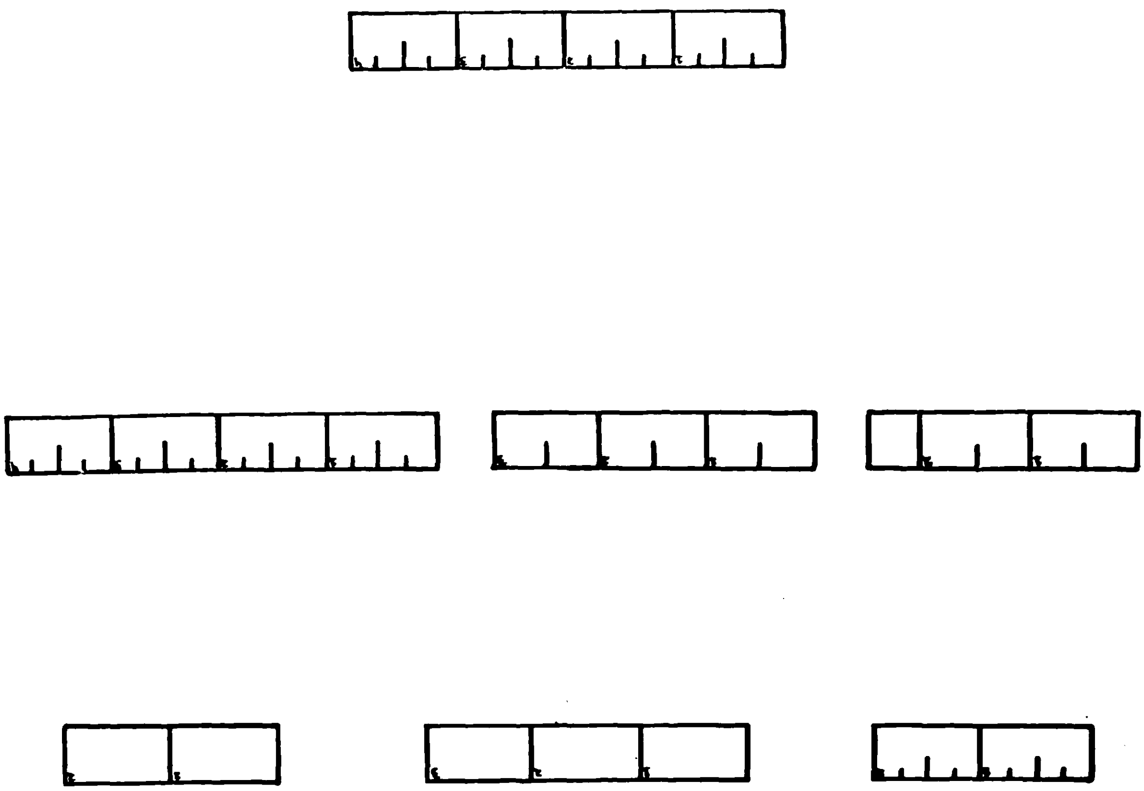
EPQ

		Female			Male		
		N	$\overline{X}$	S.D.	N	$\overline{X}$	S.D.
Age: 8 years							
	P	155	2.32	2.14	200	4.62	2.92
	E	155	16.89	3.37	200	18.20	3.29
	N	155	11.05	4.41	200	10.48	3.91
	L	155	15.08	3.87	200	12.76	4.38
Age: 9 years							
	P	202	1.89	1.94	193	4.23	2.70
	E	202	16.57	3.65	193	18.04	3.25
	N	202	11.05	4.81	193	10.70	4.66
	L	202	13.23	5.02	193	11.14	5.10
Age: 10 years							
	P	120	1.95	1.86	156	3.82	2.92
	E	120	17.62	3.40	156	18.21	3.26
	N	120	11.30	4.63	156	10.00	4.61
	L	120	11.87	4.66	156	9.53	4.59

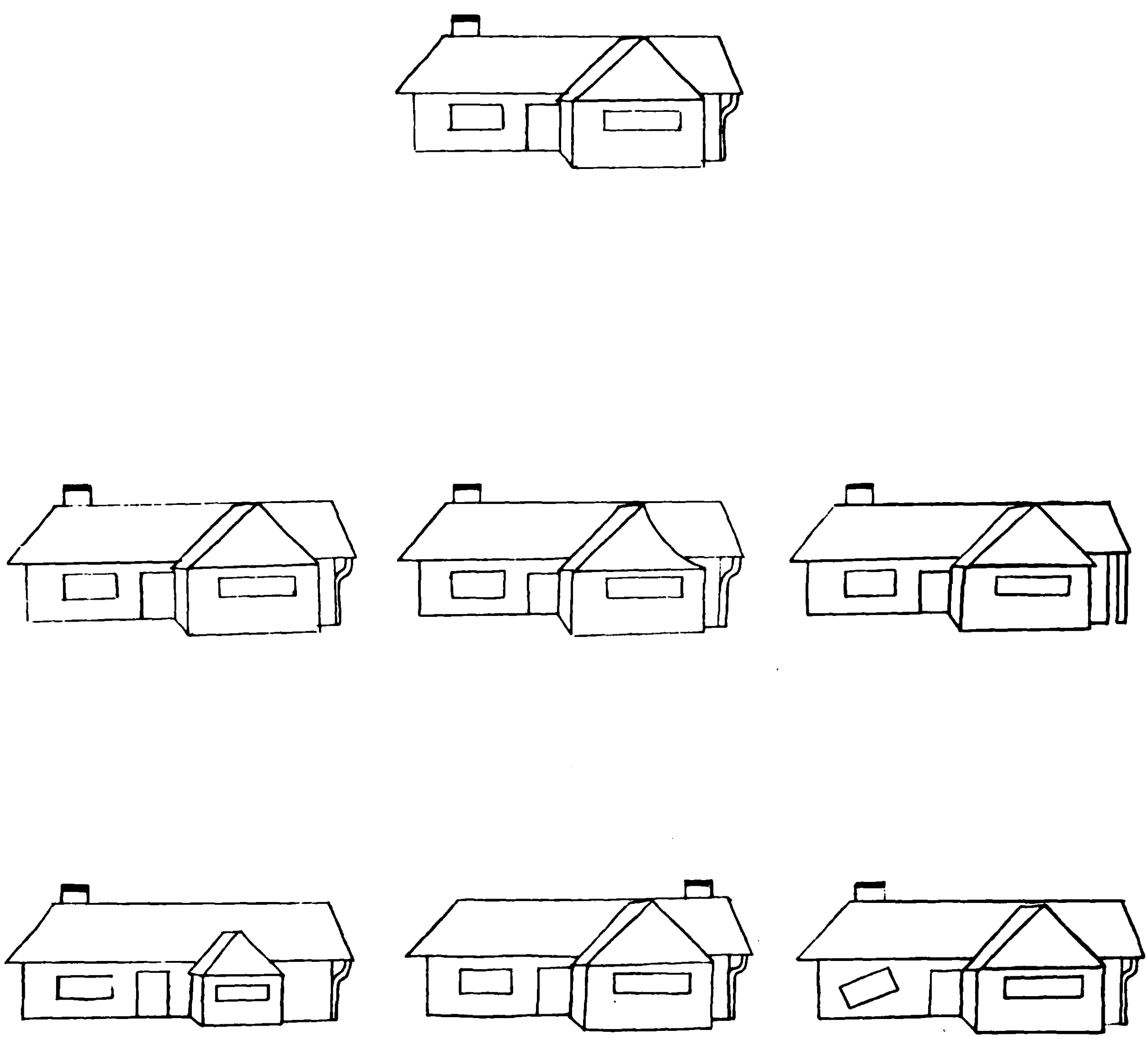
Appendix 20 Matching Familiar Figure Test (MFFT) Practice Item 1



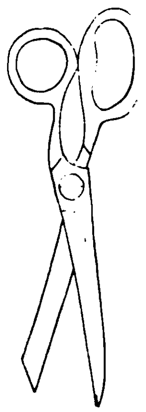
Appendix 20 (Con't) MFFT Practice Item 2

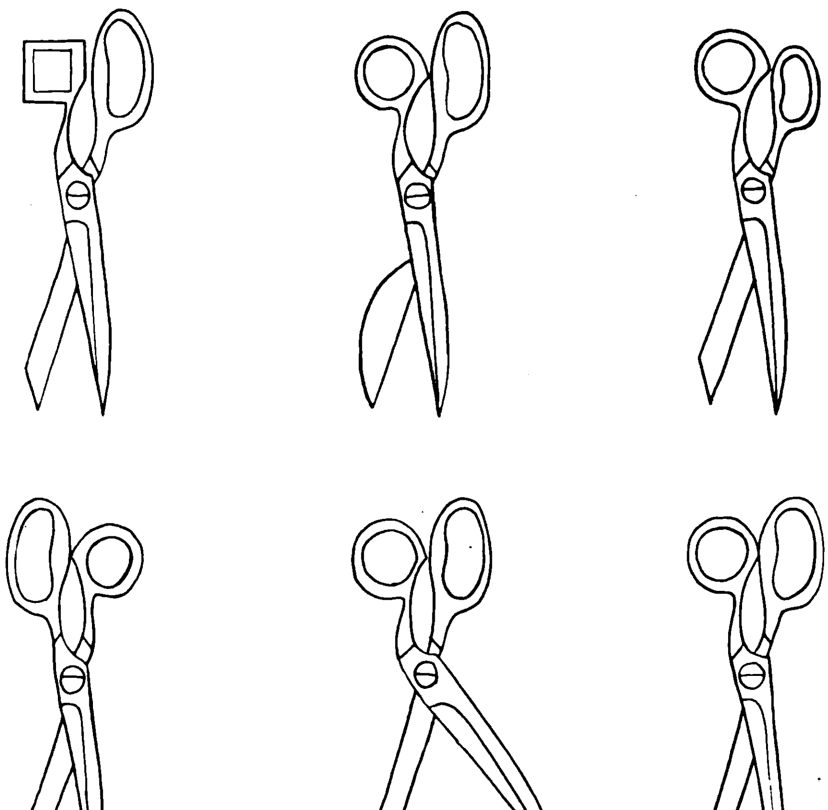


Appendix 20 (Con't) MFFT Item 1

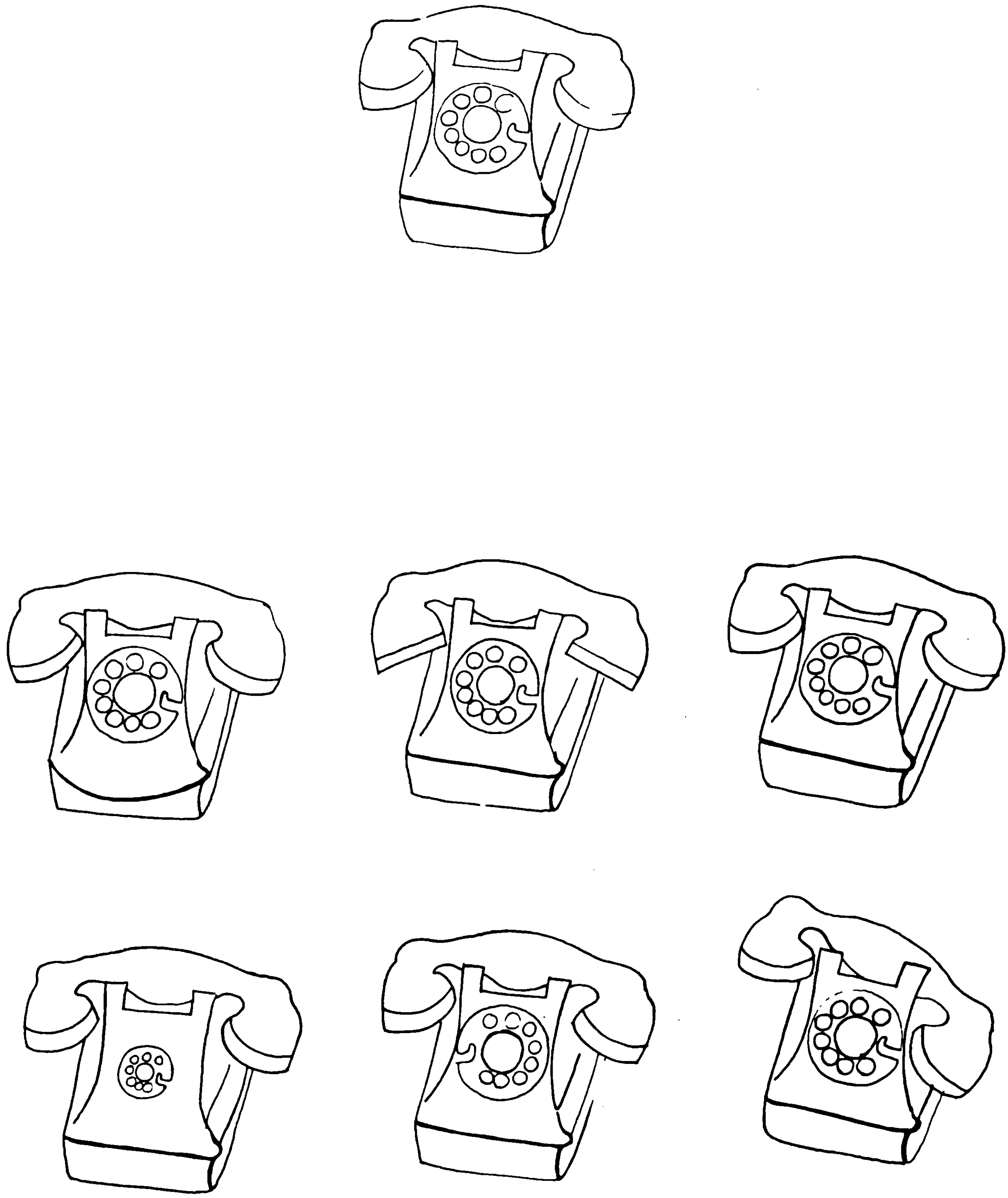


Appendix 20 (Con't) MFFT Item 2

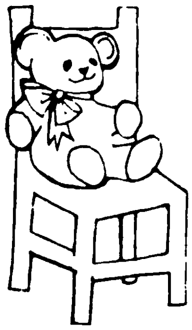


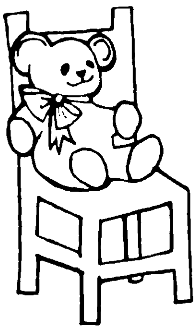


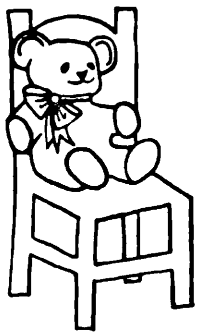
Appendix 20 (Con't) MFFT Item 3

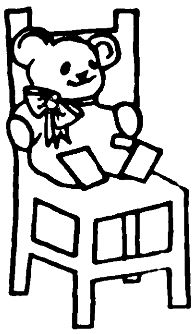


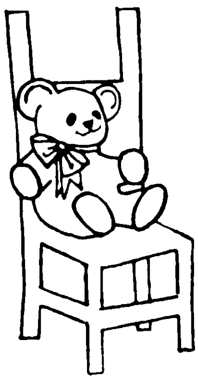
Appendix 20 (Con't) MFFT Item 4

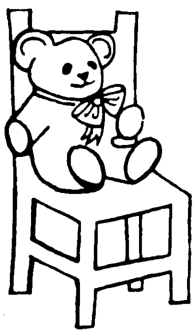


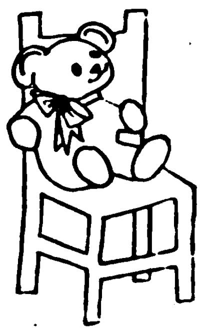




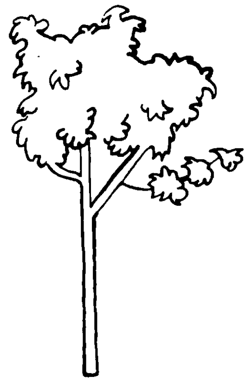


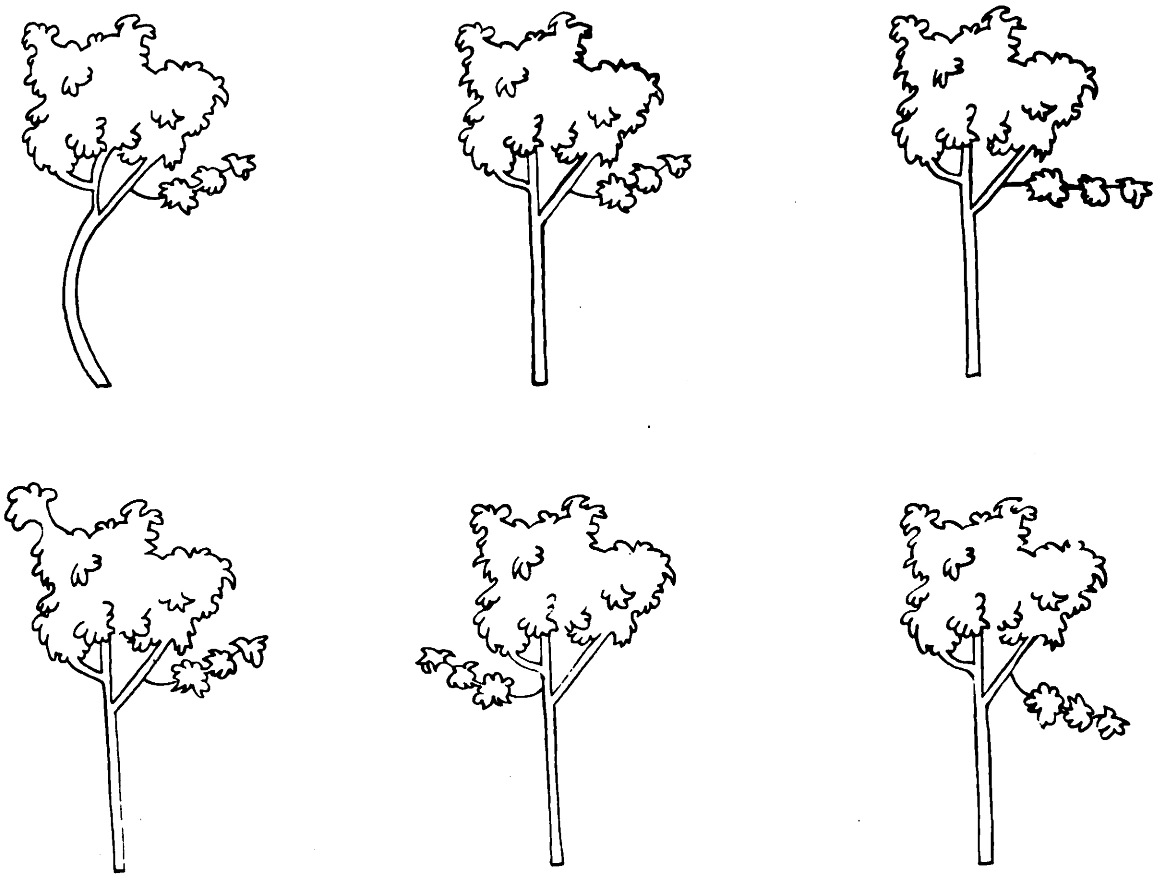




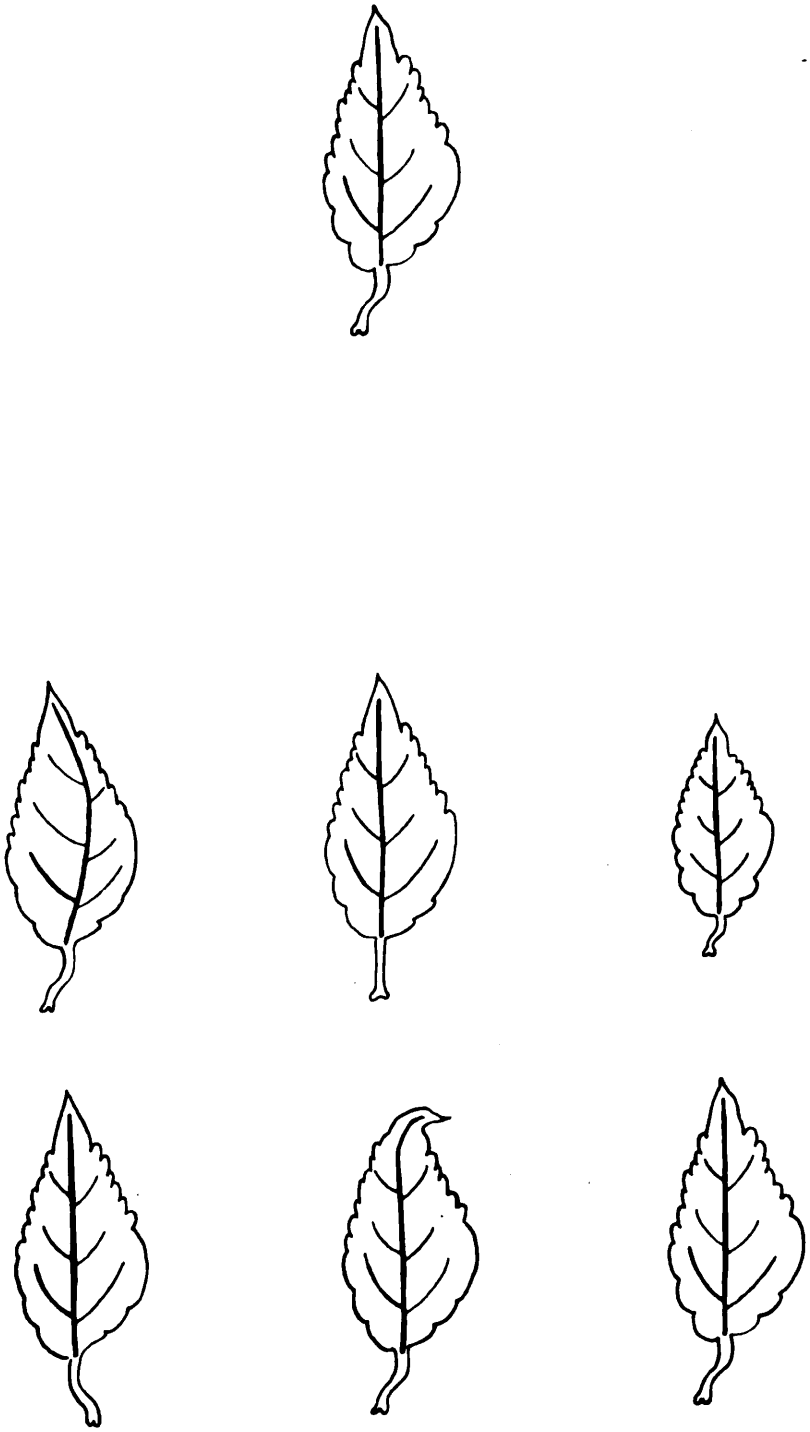


Appendix 20 (Con't) MFFT Item 5

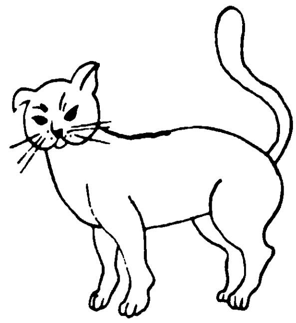


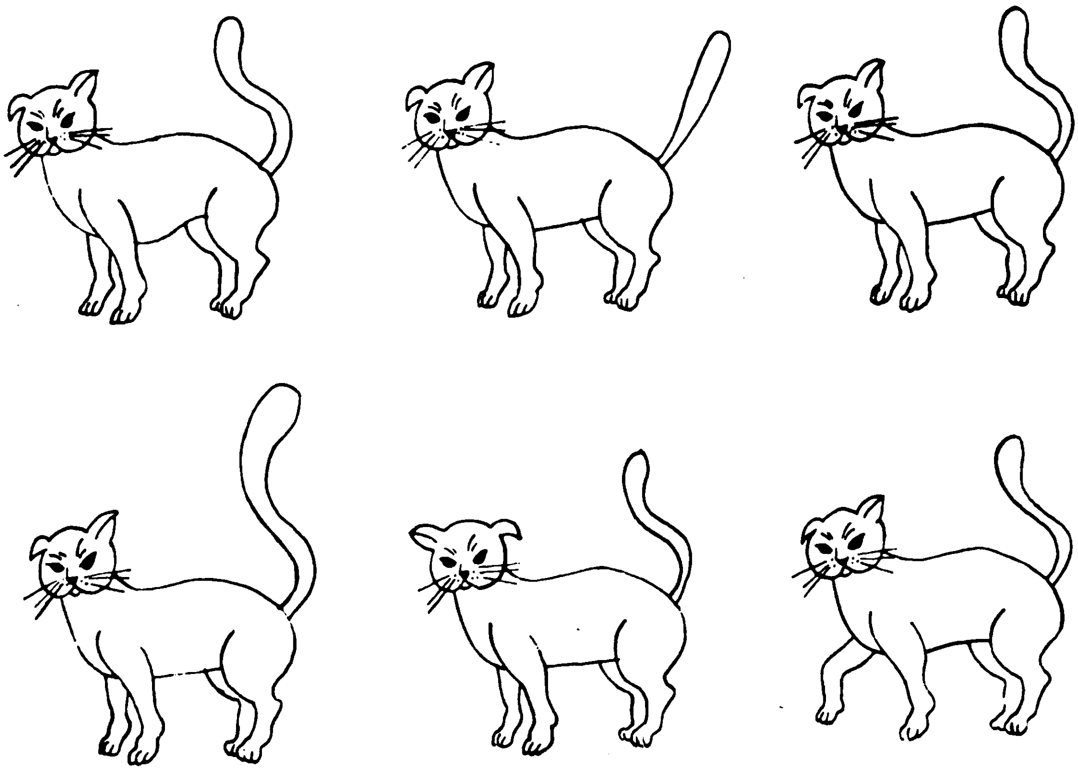


Appendix 20 (Con't) MFFT Item 6

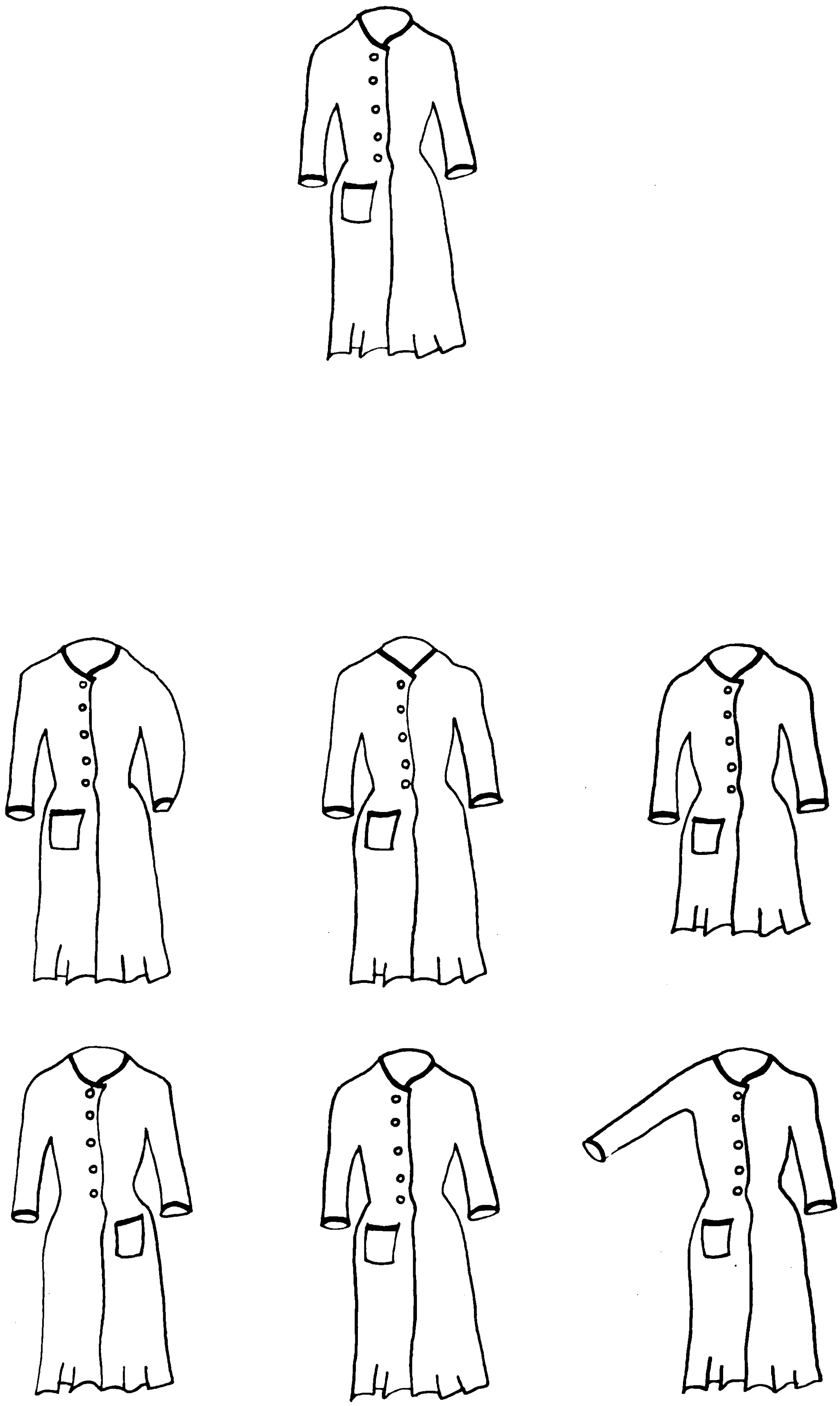


Appendix 20 (Con't) MFFT Item 7

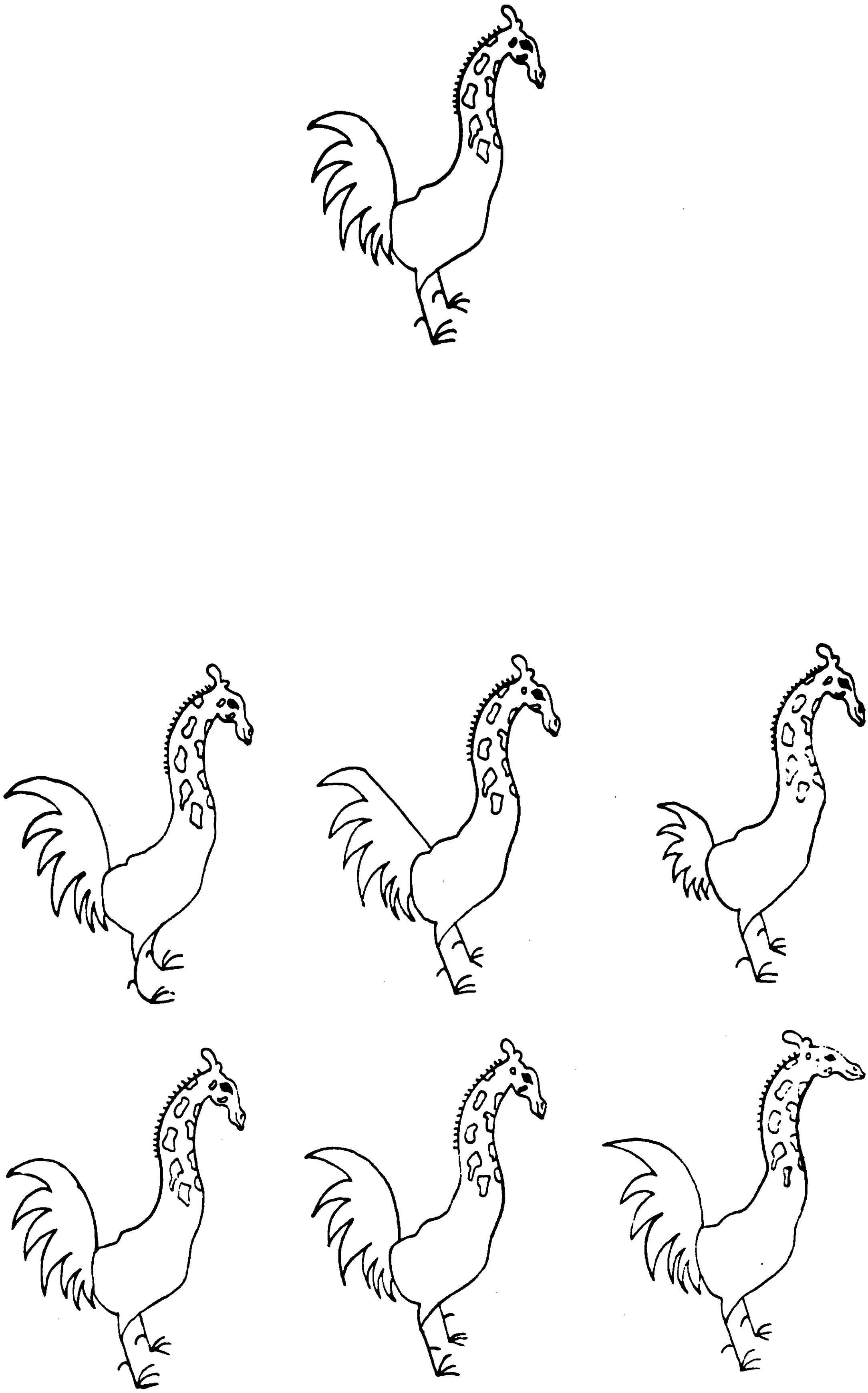




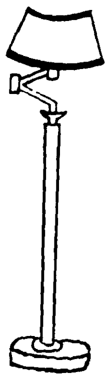
Appendix 20 (Con't) MFFT Item 8

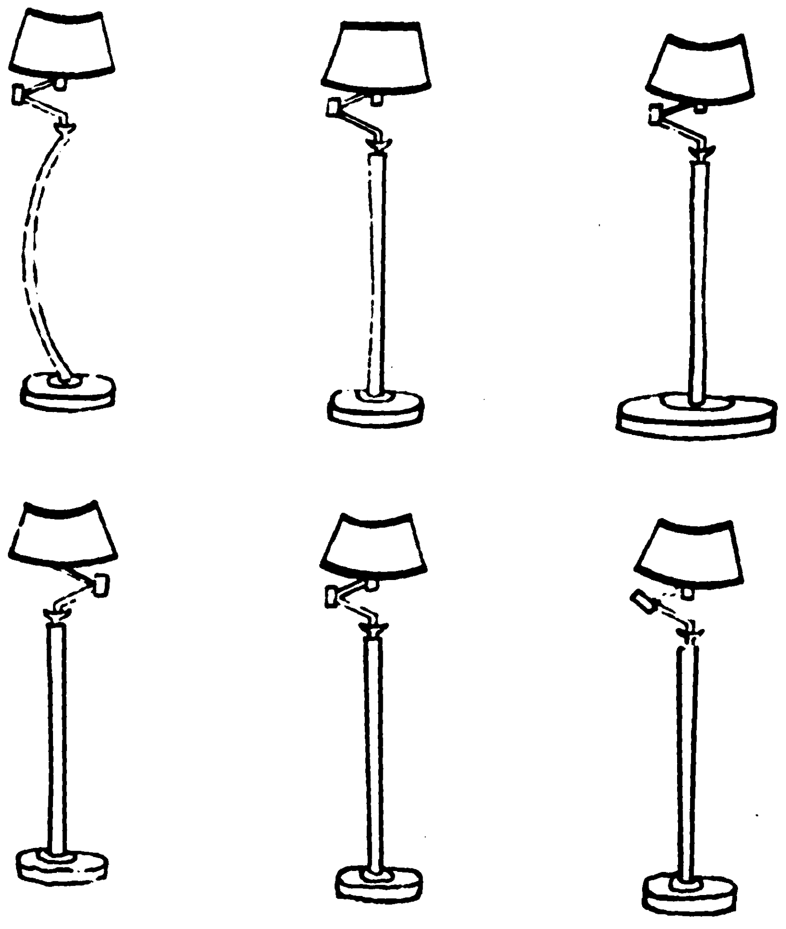


Appendix 20 (Con't) MFFT Item 9

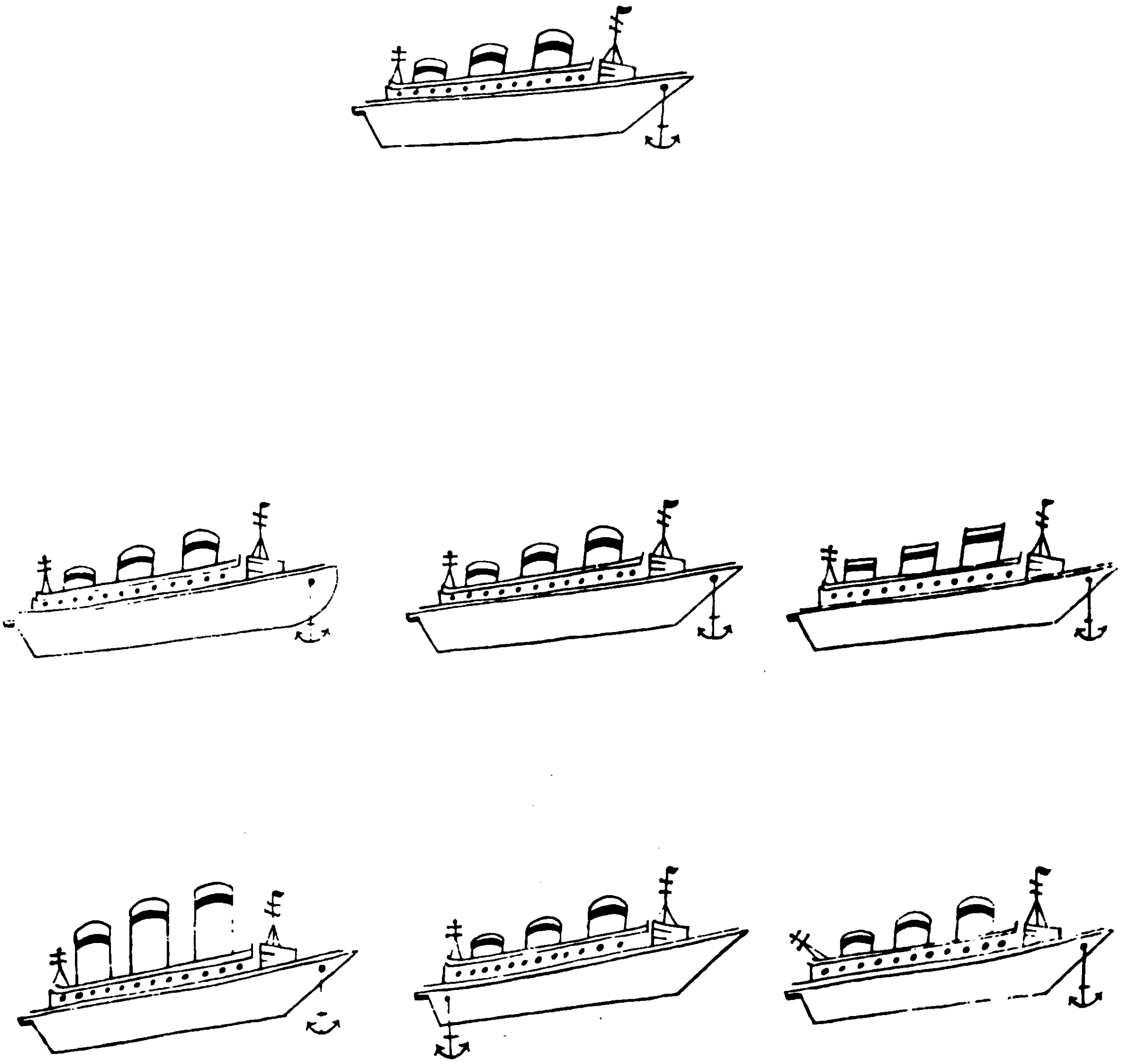


Appendix 20 (Con't) MFFT Item 10

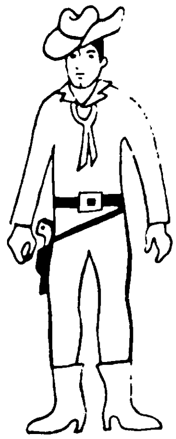


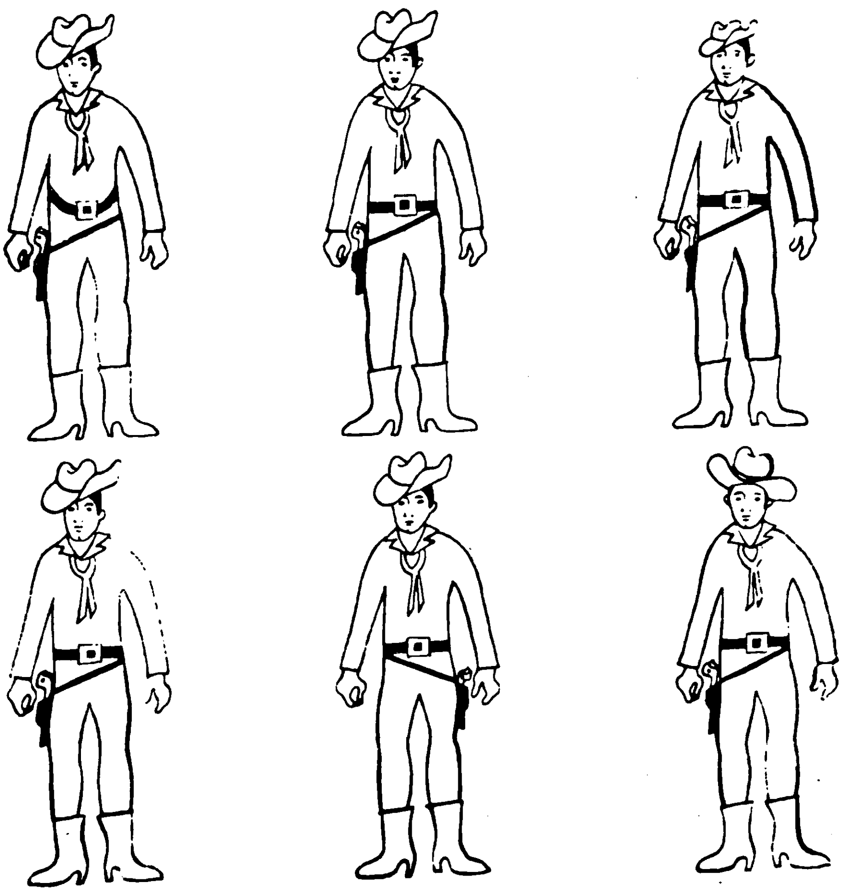


Appendix 20 (Con't) MFFT Item 11



Appendix 20 (Con't) MFFT Item 12





APPENDIX 20 (con't)

Name: ______________________ Sex: __________ Age: __________

Group: ______________________ Date: __________

MFF Test (Elementary)

ITEM	RESPONSES						LATENCY	COMMENTS
A (4)							______ secs.	__________
B (6)							______ secs.	__________
1 (1)							______ secs.	__________
2 (6)							______ secs.	__________
3 (3)							______ secs.	__________
4 (1)							______ secs.	__________
5 (2)							______ secs.	__________
6 (6)							______ secs.	__________
7 (3)							______ secs.	__________
8 (5)							______ secs.	__________
9 (4)							______ secs.	__________
10 (5)							______ secs.	__________
11 (2)							______ secs.	__________
12 (4)							______ secs.	__________

Others:

Appendix 21 "Simon Says" and "Do and Don't" Data

Order of Presentation and Condition

SS	DD (1) Accuracy	DD (1) Commission	DD (1) Omission	SS (2) Accuracy	SS (2) Commission	SS (2) Omission
OF Imp						
132	15	2	3	16	4	0
113	16	4	0	15	5	0
109	20	0	0	20	0	0
112	18	2	0	16	4	0
172	17	3	0	18	2	0
168	20	0	0	18	2	0
84	19	0	1	18	1	1
73	18	0	2	17	3	0
OF Ref						
255	19	1	0	19	1	0
101	18	2	0	17	3	0
108	20	0	0	20	0	0
105	19	1	0	20	0	0
164	19	1	0	20	0	0
137	19	1	0	17	3	0
136	18	2	0	18	2	0
107	19	1	0	18	2	0
YF Imp						
220	17	3	0	16	4	0
218	17	2	1	16	4	0
27	16	4	0	11	9	0
18	17	3	0	16	4	0
43	18	2	0	15	5	0
39	16	4	0	16	4	0
233	17	3	0	17	3	0
226	19	1	0	14	4	2
YF Ref						
28	18	1	1	18	2	0
20	17	3	0	18	2	0
33	20	0	0	20	0	0
34	18	2	0	18	2	0
235	20	0	0	20	0	0
232	18	2	0	17	2	1
223	16	2	2	17	2	1
198	16	4	0	17	3	0

Appendix 21 (Con't)

SS	DD (1)			SS (2)		
	Accuracy	Commission	Omission	Accuracy	Commission	Omission
OM Imp						
67	17	3	0	16	4	0
247	18	2	0	17	3	0
251	16	2	2	11	8	1
127	19	1	0	17	3	0
125	16	4	0	14	5	1
70	18	2	0	17	2	1
66	16	3	1	19	1	0
60	17	1	2	16	4	0
OM Ref						
95	20	0	0	18	2	0
122	20	0	0	18	2	0
116	19	1	0	18	2	0
158	20	0	0	19	1	0
157	18	2	0	20	0	0
145	18	2	0	19	1	0
59	17	0	3	17	2	1
248	18	0	2	16	4	0
YM Imp						
51	16	4	0	15	5	0
13	15	5	0	18	2	0
56	14	5	1	14	5	1
50	18	2	0	15	3	2
36	13	4	3	14	5	1
213	15	3	2	12	7	1
203	18	1	1	15	4	1
185	14	4	2	12	7	1
YM Ref						
209	18	2	0	17	3	0
243	17	3	0	17	3	0
14	19	1	0	18	2	0
9	19	1	0	14	6	0
6	18	2	0	17	3	0
5	20	0	0	16	4	0
202	16	2	2	15	4	1
210	19	1	0	18	2	0

Appendix 21 (Con't)

SS	SS (1)			DD (2)		
	Accuracy	Commission	Omission	Accuracy	Commission	Omission
OF Imp						
171	16	4	0	18	2	0
143	17	3	0	18	2	0
135	15	5	0	19	1	0
111	17	3	0	17	2	1
139	12	8	0	13	6	1
253	16	2	2	20	0	0
133	18	2	0	17	2	1
170	20	0	0	20	0	0
OF Ref						
142	18	2	0	20	0	0
141	18	2	0	19	1	0
254	18	2	0	19	1	0
140	19	1	0	16	0	4
165	19	1	0	18	2	0
79	18	2	0	19	1	0
82	18	2	0	19	1	0
76	19	1	0	20	0	0
YF Imp						
200	17	3	0	17	3	0
22	15	5	0	18	2	0
21	15	5	0	17	1	2
25	17	3	0	19	1	0
17	18	2	0	19	1	0
47	14	5	1	16	4	0
35	18	2	0	18	2	0
196	11	8	1	17	1	2
YF Ref						
19	18	2	0	19	1	0
245	15	5	0	20	0	0
41	15	4	1	20	0	0
38	18	2	0	17	3	0
231	17	3	0	19	1	0
222	18	2	0	17	2	1
194	18	1	1	19	0	1
192	17	3	0	15	4	1

Appendix 21 (Con't)

SS	SS (1) Accuracy	SS (1) Commission	SS (1) Omission	DD (2) Accuracy	DD (2) Commission	DD (2) Omission
OM Imp						
118	15	4	1	16	4	0
92	11	6	3	15	5	0
149	16	4	0	15	3	2
146	13	7	0	19	1	0
98	14	5	1	18	1	1
123	15	4	1	17	3	0
156	14	4	2	18	0	2
68	17	2	1	15	4	1
OM Ref						
250	18	2	0	17	2	1
120	16	4	0	20	0	0
128	16	2	2	18	1	1
129	19	1	0	19	1	0
124	16	4	0	19	1	0
121	19	1	0	20	0	0
159	18	2	0	17	2	1
69	19	0	1	15	2	3
YM Imp						
205	17	3	0	16	4	0
15	17	3	0	16	4	0
40	11	5	4	16	3	1
29	13	6	1	15	3	2
180	17	3	0	19	0	1
182	10	6	4	18	1	1
188	11	8	1	14	4	2
239	19	1	0	17	1	2
YM Ref						
189	17	3	0	18	1	1
11	17	3	0	19	1	0
241	18	1	1	17	2	1
54	16	4	0	16	4	0
32	19	1	0	19	1	0
215	16	3	1	17	2	1
214	19	1	0	20	0	0
190	14	4	2	16	1	3

Appendix 22 Means and standard deviations of variables in SS and DD intercorrelation (N = 128)

Variables	$\overline{X}$	S.D.
SSACC	16.55	2.26
SSCOM	3.04	1.90
SSOMI	.39	.76
DDACC	17.66	1.68
DDCOM	1.78	1.42
DDOMI	.56	.90

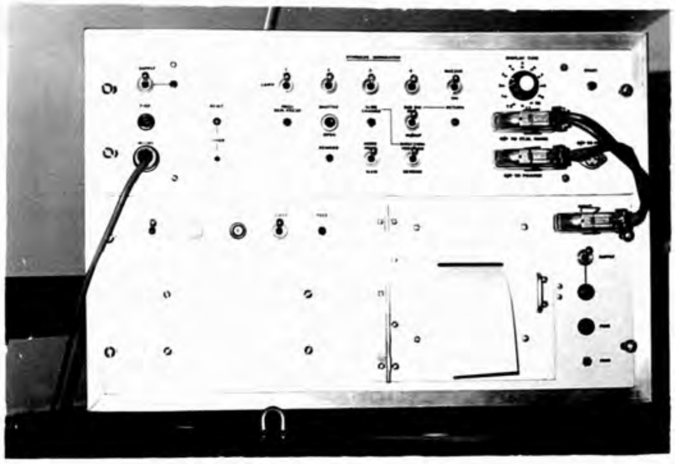
Appendix 23a Means and standard deviations of variables in correlation between SS, DD and MFFT and Personality measures

		N	Mean	S.D.
Simon Says (SS)				
SS Accuracy		128	16.55	2.26
SS Commission		128	3.06	1.93
SS Omission		128	0.38	0.75
Do and Don't (DD)				
DD Accuracy		128	17.66	1.68
DD Commission		128	1.78	1.42
DD Omission		128	0.56	0.90
CPQ	A	126	5.15	1.93
	B	126	5.67	1.95
	C	126	5.27	1.68
	D	126	6.30	1.84
	E	126	6.00	2.41
	F	126	6.10	2.71
	G	126	4.16	1.72
	H	126	5.03	1.72
	I	126	4.74	2.62
	J	126	7.02	1.65
	N	126	6.59	2.28
	O	126	5.44	2.06
	Q3	126	4.63	1.94
	Q4	126	6.44	1.87
	BGANX	126	6.08	1.25
	BGEXT	126	5.43	1.23
New TRS	G	89	-1.33	10.55
	E	106	-0.49	10.51
	N	117	-0.51	4.99
	P	106	.57	5.59
MFFT	Time	128	848.03	1132.78
	error	128	11.16	6.78
Age		128	109.37	14.28

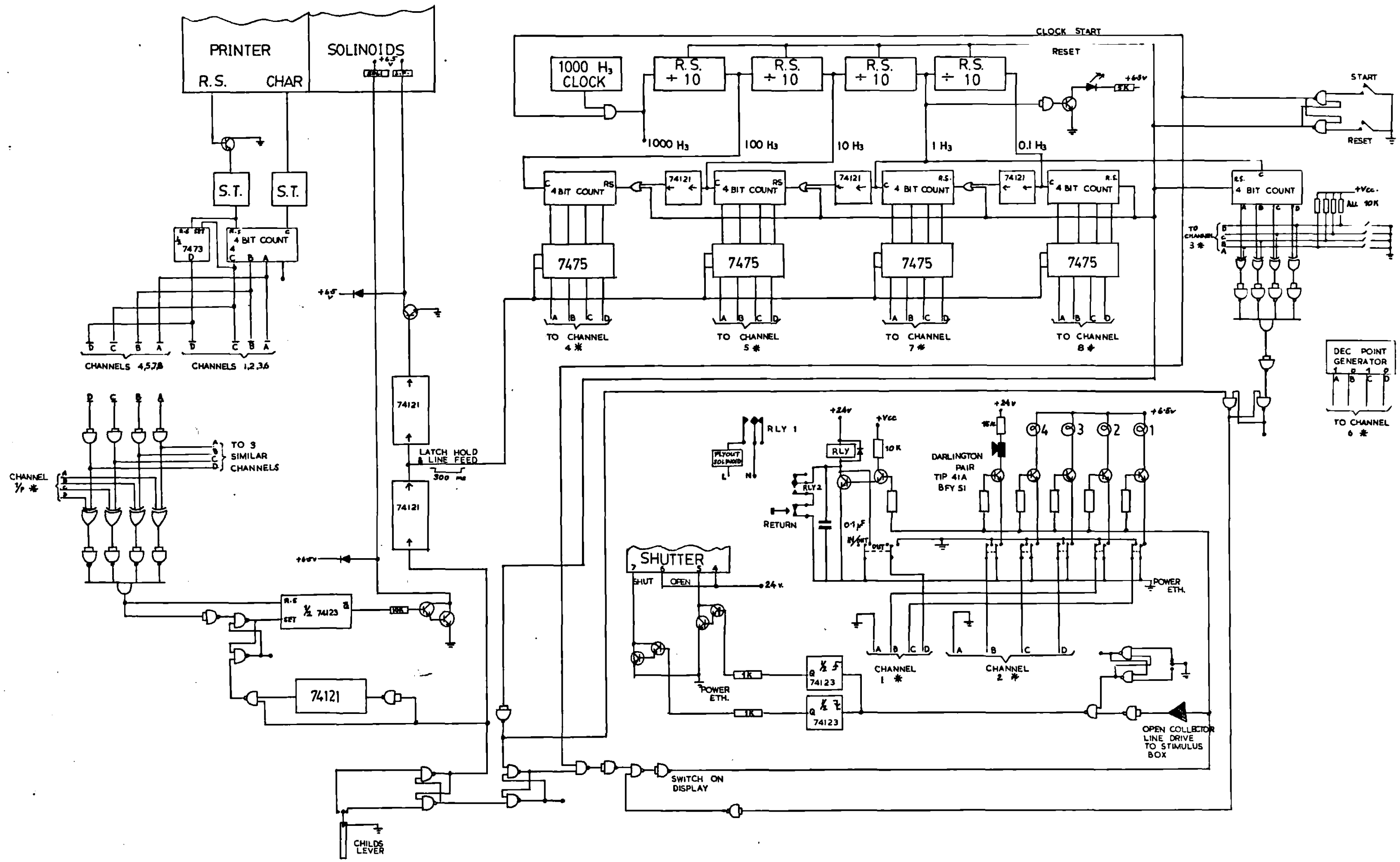
Appendix 23b Means and standard deviations of "Simon Says" and "Do and Don't" variables for correlation with personality measures

Variables	CPQ (N=126)		NEW TRS G (N=89)		NEW TRS C (N=106)		NEW TRS N (N=117)		NEW TRS P (N=106)	
	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.
"Simon Says"										
Accuracy	16.58	2.22	16.26	2.18	16.49	2.22	16.53	2.27	16.49	2.21
Commission	3.02	1.90	3.27	1.82	3.08	1.87	3.05	1.89	3.08	1.87
Omission	.37	.72	.44	.78	.40	.75	.39	.77	.40	.75
"Do and Don't"										
Accuracy	17.67	1.67	17.43	1.74	17.57	1.71	17.62	1.71	17.57	1.71
Commission	1.76	1.40	1.93	1.48	1.85	1.43	1.82	1.45	1.85	1.43
Omission	.57	.91	.64	.97	.57	.93	.55	.90	.57	.93

Appendix 24a The control unit of DRL experiments



Appendix 24b The responding unit of DRL experiments



APPENDIX 25 CIRCUIT DIAGRAM OF THE APPARATUS IN THE DRL EXPERIMENTS

Appendix 26

Means and Standard Deviations of Variables in DRLABA Correlation with Personality Variables (Table 126)

Variables	N	X	S.D.
DRLABA	96	0.89	0.36
TERR	96	11.22	7.11
TTIME	96	904.01	1249.99
AGE	96	107.94	14.57
CPQ A	96	5.19	2.02
B	96	5.79	1.94
C	96	5.26	1.65
D	96	6.30	1.78
E	96	6.14	2.43
F	96	6.01	2.77
G	96	4.13	1.61
H	96	5.00	1.65
I	96	4.81	2.68
J	96	7.04	1.61
N	96	6.54	2.29
O	96	5.50	2.01
Q3	96	4.63	1.97
Q4	96	6.39	1.83
AND	96	6.09	1.21
EXT	96	5.41	1.26
DRLABA	67	0.92	0.40
NTRS-G	67	-.76	10.87
DRLABA	81	0.92	0.37
NTRS-E	81	0.27	10.98
NTRS-P	81	0.18	5.42
DRLABA	90	0.90	0.36
NTRS-N	90	-.98	5.19

Appendix 27a

Means and Standard Deviations of Variables in Correlation (Table 127)

Variables		N	X	S.D.
MFFT	errors	48	10.52	6.81
	time	48	741.03	825.63
CPQ	A	48	5.19	2.27
	B	48	5.60	1.84
	C	48	5.46	1.17
	D	48	6.04	1.89
	E	48	6.02	2.38
	F	48	6.17	2.55
	G	48	4.22	1.57
	H	48	4.98	1.50
	I	48	5.08	2.75
	J	48	6.63	1.48
	N	48	6.65	2.19
	O	48	5.50	1.81
	Q3	48	4.77	2.05
	Q4	48	6.44	2.01
	ANX	48	6.00	1.29
	EXT	48	5.45	1.25
NEWTRS	G	35	-.28	11.79
	E	42	-.65	11.54
	N	46	-1.11	5.09
	P	42	-.28	4.55
AGE		48	106.90	14.79

Appendix 27b

Means and S.D.S. of DRL and New TRS variables (Table 127)

Variables	NEW TRS G (N = 35)		NEW TRS E (N = 42)		NEW TRS N (N = 46)		NEW TRS P (N = 42)	
	X	S.D.	X	S.D.	X	S.D.	X	S.D.
DRLABA	0.85	0.35	0.86	0.33	0.84	0.33	0.86	0.33
DRLALKN	7.81	6.71	7.72	6.43	7.85	6.30	7.72	6.43
DA2 TSC	13.29	9.63	14.64	10.07	14.17	9.74	14.64	10.07
DA2 TP	995.60	846.09	915.17	847.19	962.44	824.73	915.17	847.19
DA2 CP	68.49	50.82	66.33	46.95	67.50	45.63	66.33	46.95
DA2 EF1	0.19	0.20	0.22	0.24	0.21	0.23	0.22	0.24
DA2 EF2	0.21	0.16	0.24	0.18	0.23	0.19	0.24	0.18
NEW TRS G	-.28	11.79	-	-	-	-	-	-
E	-	-	-.65	11.54	-	-	-	-
N	-	-	-	-	-1.11	5.10	-	-
P	-	-	-	-	-	-	-.28	4.55

Appendix 27c

Means and S.D.S. of DRL and New TRS variables (Table 127)

Variables	NEW TRS G (N = 27)		NEW TRS E (N = 33)		NEW TRS N (N = 37)		NEW TRS P (N = 33)	
	X	S.D.	X	S.D.	X	S.D.	X	S.D.
DA6 TSC	10.15	7.85	10.06	7.39	9.92	7.28	10.06	7.39
DA6 TP	554.44	398.95	549.73	372.53	569.30	387.34	549.73	372.53
DA6 CP	18.30	11.91	20.64	14.41	20.92	13.91	20.64	14.41
DA6 EF1	0.07	0.11	0.07	0.10	0.07	0.10	0.07	0.10
DA6 EF2	0.11	0.07	0.12	0.08	0.12	0.08	0.12	0.08
NEW TRS G	0.33	13.02	-	-	-	-	-	-
E	-	-	-.42	12.54	-	-	-	-
N	-	-	-	-	-1.36	5.31	-	-
P	-	-	-	-	-	-	0.08	4.97
	NEW TRS G (N = 20)		NEW TRS E (N = 25)		NEW TRS N (N = 28)		NEW TRS P (N = 25)	
	X	S.D.	X	S.D.	X	S.D.	X	S.D.
DA12 TSC	21.10	7.43	20.80	6.97	20.50	7.06	20.80	6.97
DA12 TP	131.75	149.45	144.32	161.89	158.86	170.36	144.32	161.89
DA12 CP	8.90	3.21	9.76	3.50	9.64	3.35	9.76	3.50
DA12 EF1	0.20	0.20	0.19	0.18	0.18	0.18	0.19	0.18
DA12 EF1	0.27	0.16	0.27	0.16	0.26	0.16	0.27	0.16
NEW TRS G	2.45	12.33	-	-	-	-	-	-
E	-	-	-.64	12.58	-	-	-	-
N	-	-	-	-	-1.87	5.36	-	-
P	-	-	-	-	-	-	-.49	4.39

Appendix 27d

Means and Standard Deviations for correlations (Table 127).

Variables	DA6 (N = 39) X	DA6 (N = 39) S.D.	DA12 (N = 30) X	DA12 (N = 30) S.D.
CPQ A	5.28	2.37	5.13	2.39
B	5.87	1.89	6.03	1.92
C	5.49	1.73	5.63	1.63
D	6.00	1.86	5.90	1.99
E	6.10	2.40	6.03	2.40
F	6.13	2.46	5.87	2.46
G	4.26	1.62	4.40	1.67
H	5.15	1.50	5.13	1.61
I	5.28	2.83	5.30	2.79
J	6.54	1.55	6.50	1.55
N	6.64	2.35	6.47	2.42
O	5.41	1.86	5.30	1.97
Q3	4.92	2.11	4.83	2.17
Q4	6.49	2.06	6.57	2.14
ANX	5.93	1.31	5.91	1.44
EXT	5.53	1.20	5.38	1.23
MFFT errors	9.49	5.77	8.90	4.48
time	704.28	788.46	738.92	812.97
AGE	109.67	14.44	109.03	14.89

Appendix 28a

Means and Standard Deviations of Variables in Correlation (Table 128)

Variables		N	X	S.D.
MFFT errors		48	11.92	7.40
MFFT time		48	1066.99	1556.38
CPQ	A	48	5.21	1.77
	B	48	5.98	2.02
	C	48	5.06	1.58
	D	48	6.56	1.65
	E	48	6.27	2.50
	F	48	5.85	3.00
	G	48	4.04	1.65
	H	48	5.02	1.80
	I	48	4.54	2.62
	J	48	7.46	1.65
	N	48	6.44	2.40
	O	48	5.50	2.20
	Q3	48	4.50	1.90
	Q4	48	6.35	1.66
	ANX	48	6.18	1.14
	EXT	48	5.38	1.29
NEW TRS	G	32	-1.28	9.93
	E	39	1.27	10.40
	N	44	-.84	5.33
	P	39	0.68	6.25
AGE		48	108.94	14.47

Appendix 28b

Means and S.D.S. of the variables in correlation table with New TRS (Table 128)

Variables	NEW TRS G (n = 32)		NEW TRS E (N = 39)		NEW TRS N (N = 44)		NEW TRS P (N = 39)	
	X	S.D.	X	S.D.	X	S.D.	X	S.D.
DRLABA	0.98	0.44	0.97	0.41	0.97	0.39	0.97	0.41
DRLALRN	9.41	5.11	9.40	4.77	9.04	4.95	9.40	4.77
DA2 TSC	27.41	1.76	27.05	2.76	27.09	2.63	27.05	2.76
DA2 TP	44.25	50.16	57.28	106.69	54.29	100.68	57.28	106.69
DA2 CP	31.38	12.77	33.00	19.36	32.66	18.30	33.00	19.36
DA2 EF1	0.87	0.18	0.86	0.20	0.87	0.19	0.86	0.20
DA2 EF2	0.41	0.16	0.39	0.16	0.39	0.16	0.39	0.16
DA6 TSC	27.34	1.79	27.73	1.98	27.38	1.90	27.33	1.98
DA6 TP	30.00	27.32	31.03	31.00	29.98	29.65	31.03	31.00
DA6 CP	13.63	5.95	13.28	5.48	13.36	5.31	13.28	5.48
DA6 EF1	0.60	0.23	0.60	0.24	0.62	0.23	0.60	0.24
DA6 EF2	0.43	0.10	0.43	0.11	0.44	0.11	0.43	0.11
DA12 TSC	26.31	2.63	26.41	2.47	26.61	2.39	26.41	2.47
DA12 TP	28.19	32.32	27.03	29.54	25.34	28.19	27.03	29.54
DA12 CP	9.22	4.20	9.05	3.96	8.71	3.87	9.05	3.96
DA12 EF1	0.50	0.24	0.48	0.24	0.48	0.23	0.48	0.24
DA12 EF2	0.44	0.11	0.43	0.12	0.43	0.12	0.43	0.12
NEW TRS G	-1.28	9.93	-	-	-	-	-	-
E	-	-	1.27	10.40	-	-	-	-
N	-	-	-	-	-0.84	5.33	-	-
P	-	-	-	-	-	-	0.68	6.25

Appendix 29a Means and S.D.s of variable in correlations between DRLB Baseline rate and MFFT, personality and developmental variables (Table 143)

Variables	N	$\overline{X}$	S.D.
DRLBBA	96	1.08	.48
MFFT			
error	96	8.26	5.51
time	96	159.33	92.64
Age	96	114.77	7.80
RQ	96	111.60	16.72
DRLBBA	92	1.08	.48
CPQ			
A	92	5.02	1.96
B	92	6.16	1.91
C	92	5.40	1.33
D	92	6.09	1.83
E	92	6.82	2.13
F	92	7.26	2.29
G	92	4.24	1.61
H	92	5.58	2.20
I	92	4.21	2.22
J	92	6.13	1.90
N	92	6.29	1.86
O	92	5.38	2.15
Q3	92	4.00	1.58
Q4	92	6.40	1.44
ANX	92	6.08	1.18
EXT	92	5.95	1.64
EPQ			
P	92	5.33	4.56
E	92	19.32	3.42
N	92	10.23	4.94
L	92	8.26	4.53

con't

Appendix 29a(con't)

DRLBBA	42	1.11	.44
JEPI			
E	42	18.74	3.99
N	42	13.36	5.66
L	42	2.95	2.19
DRLBBA	39	1.12	.43
NEW TRS			
G	39	4.16	10.17
E	39	-.32	9.04
N	39	-.03	3.60
P	39	.59	4.46

Appendix 29b

Means and Standard Deviations of SSDD Variables in Correlation with DRL

	No Speech Conditions						Speech Conditions	
	DA2 (N = 48)		DA6 (N = 39)		DA12 (N = 30)		DA2, 6, 12 (N = 48)	
	X	S.D.	X	S.D.	X	S.D.	X	S.D.
"Simon Says"								
accuracy	16.54	1.96	16.62	2.02	16.90	1.79	16.90	2.13
commission	3.20	1.77	3.13	1.84	3.00	1.64	2.67	1.80
omission	0.25	0.53	0.26	0.55	0.10	0.31	0.38	0.76
"Do and Don't"								
accuracy	17.68	1.62	17.92	1.44	18.17	1.42	17.50	1.71
commission	1.68	1.40	1.51	1.32	1.50	1.33	2.04	1.43
omission	0.63	1.04	0.56	1.02	0.33	10.76	0.46	0.74

Appendix 30a — Means and S.D.s of variables in correlation between DRLB measures and MFFT, personality, and developmental variables (Table 144)

Variables		N	$\overline{X}$	S.D.
DRLB	DRLBBA	12	1.05	.40
	DB1RT	12	1.00	.74
	DBEF1	12	.14	.06
	DBEF2	12	.16	.08
	DBRAT1	12	.96	.29
	DBRAT2	12	1.51	.60
	DRLBLRN	12	.64	.57
CPQ	A	12	4.27	2.19
	B	12	6.64	1.91
	C	12	5.55	1.69
	D	12	6.63	1.36
	E	12	6.82	2.04
	F	12	6.73	2.37
	G	12	4.18	.98
	H	12	5.18	2.40
	I	12	5.09	2.55
	J	12	6.64	1.21
	N	12	6.18	1.40
	O	12	6.36	1.96
	Q3	12	3.27	1.19
	Q4	12	6.18	1.33
	ANX	12	6.51	.97
	EXT	12	5.40	1.97
EPQ	P	12	7.73	8.94
	E	12	19.55	4.23
	N	12	12.82	4.79
	L	12	11.00	5.20
MFFT	ERRORS	12	9.25	5.12
	TIME	12	165.21	87.04
	AGE	12	115.25	6.28
	RQ	12	108.57	13.80

Appendix 30b

Means and S.D.s of variables in DRL-B correlation with MFTT, personality and developmental variables (Table 144)

Variables		N	$\overline{X}$	S.D.
JEPI	E	8	17.25	4.71
	N	8	15.38	6.48
	L	8	3.50	2.39
DRLABA		8	1.18	.41
DB1RT		8	1.00	.76
DBEF1		8	.16	.04
DBEF2		8	.18	.05
DBRAT1		8	.98	.18
DBRAT2		8	1.50	.58
DRLBLRN		8	.66	.65
NEW TRS	G	7	2.66	13.77
	E	7	-1.38	9.95
	N	7	.84	4.53
	P	7	-.46	4.20
DRLBBA		7	1.09	.36
DB1RT		7	1.00	.82
DBEF1		7	.16	.04
DBEF2		7	.17	.05
DBRAT1		7	.98	.19
DBRAT2		7	1.50	.63
DRLDLRN		7	.68	.70

Appendix 31a   Means and S.D.s of variables in correlation between DRL-B measures and MFFT personality and developmental variables (Table 145)

Variables		N	$\overline{X}$	S.D.
DRLB	DRLQBA	12	1.00	.48
	DBIRT	12	14.00	2.41
	DBEF1	12	.84	.11
	DBEF2	12	.29	.08
	DBRAT1	12	5.27	2.01
	DBRAT2	12	18.99	3.89
	DRLBLRN	12	13.73	4.84
CPQ	A	12	5.08	1.38
	B	12	7.00	2.26
	C	12	5.33	1.23
	D	12	5.92	1.78
	E	12	7.17	2.25
	F	12	7.25	2.05
	G	12	4.33	1.30
	H	12	6.17	1.80
	I	12	3.92	2.19
	J	12	5.50	2.39
	N	12	6.25	2.26
	O	12	5.58	2.07
	Q3	12	3.75	1.66
	Q4	12	6.00	1.76
	ANX	12	6.00	1.31
	EXT	12	6.17	1.45
EPQ	P	12	6.58	3.75
	E	12	19.83	2.76
	N	12	7.25	5.01
	L	12	6.75	5.89
MFFT	ERRORS	12	8.42	5.45
	TIME	12	162.13	70.75
	AGE	12	112.33	8.39
	RQ	12	111.48	19.99

Appendix 31b   Means and S.D.s of variables in the correlation between DRL-B measures and MFFT, personality and developmental variables (Table 145)

Variables		N	$\bar{X}$	S.D.
JEP1	E	5	18.40	3.13
	N	5	11.00	6.93
	L	5	2.60	1.52
DRLBBA		5	1.10	.36
DB1RT		5	13.60	3.29
DBEF1		5	.81	.15
DBEF2		5	.36	.05
DBRAT1		5	4.14	1.39
DBRAT2		5	18.89	3.95
DRLBLRN		5	14.76	3.88
NEW TRS	G	5	6.35	12.33
	E	5	4.21	5.29
	N	5	-1.15	2.90
	P	5	1.80	2.36
DRLBBA		5	1.19	.34
DBIRT		5	13.50	3.79
DBEF1		5	.79	.16
DBEF2		5	.35	.06
DBRAT1		5	4.10	1.60
DBRAT2		5	17.62	3.16
DRLBLRN		5	13.51	3.14

Appendix 32a Means and S.D.s of correlation between DRL-B measures and MFFT, personality and developmental variables (Table 146)

Variables		N	$\bar{X}$	S.D.
DRLB	DRLBBA	36	1.17	.48
	DB1RT	36	2.69	1.82
	DBEF1	36	.30	.15
	DBEF2	36	.27	.11
	DBRAT1	36	1.45	.35
	DBRAT2	36	3.36	2.40
	DRLBLRN	36	1.93	2.22
CPQ	A	36	4.67	2.10
	B	36	5.80	1.97
	C	36	5.25	1.25
	D	36	6.08	2.88
	E	36	6.72	2.09
	F	36	7.19	2.38
	G	36	3.97	1.68
	H	36	5.08	1.96
	I	36	4.33	2.23
	J	36	6.94	1.51
	N	36	6.72	1.70
	O	36	5.50	1.98
	Q3	36	4.06	1.62
	Q4	36	6.64	1.50
	ANX	36	6.20	1.19
	EXT	36	5.65	1.47
EPQ	P	36	5.43	3.82
	E	36	18.91	3.03
	N	36	10.77	5.00
	L	36	0.86	3.89
MFFT	ERROR	36	8.03	6.40
	TIME	36	146.77	94.50
AGE		36	115.47	8.27
RQ		36	114.78	15.92

Appendix 32b — Means and S.D.s of correlation between DRL-B measures and MFFT, personality and developmental variables (Table 146)

Variables		N	$\overline{X}$	S.D.
DRLB	DRLBBA	18	1.22	.50
	DBIRT	18	2.72	2.11
	DBEFF1	18	.28	.15
	DBEF2	18	.26	.11
	DBRAT1	18	1.45	.35
	DBRAT2	18	3.31	2.83
	DRLBLRN	18	1.86	2.63
JEPI	E	18	19.28	4.75
	N	18	13.33	5.25
	L	18	2.61	2.03
NEW TRS	G	18	4.22	9.39
	E	18	-1.44	9.44
	N	18	-.88	3.45
	P	18	-.72	4.12

Appendix 33a   Means and S.D.s of variables in correlations between DRL-B measures and MFFT, personality, and developmental variables (Table 149)

Variable		N	X	S.D.
DRLB	DRLBBA	36	1.02	.50
	DBIRT	36	8.97	3.94
	DBEF1	36	.69	.17
	DBEF2	36	.43	.10
	DBRAT1	36	2.71	1.57
	DBRAT2	36	10.54	5.34
	DRLBLRN	36	7.83	5.02
CPQ	A	36	5.50	1.80
	B	36	6.11	1.62
	C	36	5.44	1.36
	D	36	5.97	1.73
	E	36	6.67	2.24
	F	36	7.42	2.36
	G	36	4.42	1.76
	H	36	6.06	2.41
	I	36	4.11	2.26
	J	36	5.50	2.03
	N	36	5.92	1.93
	O	36	4.86	2.26
	Q3	36	4.31	1.56
	Q4	36	6.39	1.25
	ANX	36	5.83	1.14
	EXT	36	6.32	1.73
EPQ	P	36	4.22	3.08
	E	36	19.33	4.02
	N	36	10.08	4.64
	L	36	9.00	4.00
MFFT	ERORR	36	8.03	4.80
	TIME	36	169.47	99.46
	AGE	36	114.33	7.67
	RQ	36	109.55	17.36

Appendix 33b — Means and S.D.s of variables in correlations between DRL-B measures and MFFT, personality and developmental variables (Table 149)

Variables		N	$\overline{X}$	S.D.
DRLB	DRLBBA	11	.90	.35
	DBIRT	11	7.45	2.98
	DBEF1	11	.62	.17
	DBEF2	11	.45	.08
	DBRAT1	11	1.73	.71
	DBRAT2	11	8.57	3.93
	DRLBLRN	11	6.85	3.99
JEPI	E	11	19.09	2.21
	N	11	13.00	5.46
	L	11	3.27	2.65
DRLB	DRLBBA	10	.94	.35
	DBIRT	10	7.20	3.01
	DBEF1	10	.60	.16
	DBEF2	10	.44	.08
	DBRAT1	10	1.79	.73
	DBRAT2	10	8.43	4.11
	DRLBLRN	10	6.66	4.15
NEW TRS	G	10	4.27	9.41
	E	10	.65	9.38
	N	10	1.33	3.37
	P	10	3.20	5.06

Appendix 34a

Means and S.D.S. of MFFT, Personality, and age variables (Table 148)

Variables		All subjects N	All subjects $\bar{X}$	All subjects S.D.	M N	M $\bar{X}$	M S.D.	F N	F $\bar{X}$	F S.D.
MFFT	ERROR	256	10.57	5.75	134	10.96	5.64	122	10.15	5.85
	TIME	256	757.48	912.55	134	828.51	914.28	122	679.45	907.97
CPQ	A	243	5.22	1.85	127	4.89	1.90	116	4.98	1.66
	B	243	5.58	1.97	127	5.45	3.60	116	6.05	1.84
	C	243	5.30	1.56	127	5.29	1.72	116	5.38	1.57
	D	243	6.40	1.84	127	6.70	1.87	116	6.13	1.97
	E	243	6.33	2.39	127	6.46	1.94	116	6.44	1.98
	F	243	6.25	2.75	127	6.57	2.09	116	6.05	1.79
	G	243	4.04	1.74	127	4.39	1.89	116	4.51	1.85
	H	243	4.88	1.79	127	4.85	1.78	116	4.90	1.85
	I	243	4.73	2.58	127	4.43	1.89	116	4.97	1.68
	J	243	6.92	1.72	127	7.03	1.73	116	6.71	1.70
	N	243	6.65	2.32	127	7.14	1.71	116	6.33	1.93
	O	243	5.46	1.92	127	5.65	1.82	116	5.32	1.78
	Q3	243	4.42	1.90	127	4.30	1.83	116	4.73	1.81
	Q4	243	6.75	1.93	127	7.11	1.96	116	6.64	2.14
	ANX	243	6.22	1.22	127	6.42	1.18	116	6.04	1.22
	EXT	243	4.46	1.28	127	5.44	1.20	116	5.32	1.08
NEW TRS	G	165	-1.11	10.45	91	-4.20	9.53	74	2.69	10.33
	E	208	- .63	10.14	107	1.39	10.94	101	-2.77	8.77
	N	238	- .31	4.60	122	.29	5.05	116	.94	4.00
	P	208	.20	5.51	107	1.47	5.86	101	-1.14	1.66
AGE		256	109.60	13.73	134	109.20	13.3	122	110.03	14.23
					(M step scores CPQ)			(F step scores CPQ		

Appendix 34b Means and standard deviations of variables in correlations (Table 148)

Variables		CPQ (N= 243) $\overline{X}$	CPQ S.D.	TRS G (N= 165) $\overline{X}$	TRS G S.D.	TRS E (N= 208) $\overline{X}$	TRS E S.D.	TRS N (N= 238) $\overline{X}$	TRS N S.D.	TRS P (N=208) $\overline{X}$	TRS P S.D.
MFFT	errors	10.54	5.76	11.39	6.29	10.86	5.93	10.67	5.86	10.89	5.93
	time	763.17	926.69	723.26	875.39	753.01	948.57	753.81	922.78	753.01	948.53
Age		109.69	13.71	105.03	13.22	106.61	12.55	109.14	13.54	106.61	12.55
TRS	G			-1.11	10.45	-	-	—	—	—	—
	E			-.46	10.33	-.63	10.14	—	—	-.63	10.14
	N			-.26	4.69	-.59	4.83	.31	4.60	-.59	4.83
	P			1.27	5.54	.20	5.51	—	—	.20	5.51

Variables		TRS G (N=156) $\overline{X}$	TRS G S.D.	TRS E (N=198) $\overline{X}$	TRS E S.D.	TRS N (N=226) $\overline{X}$	TRS N S.D.	TRS P (N=198) $\overline{X}$	TRS P S.D.
CPQ	A	5.10	1.88	5.15	1.88	5.23	1.85	5.15	1.88
	B	5.18	1.88	5.46	1.97	5.59	1.99	5.46	1.97
	C	5.23	1.54	5.22	1.53	5.25	1.54	5.22	1.53
	D	6.28	1.78	6.46	1.78	6.36	1.84	6.46	1.78
	E	6.13	2.29	6.34	2.40	6.26	2.36	6.34	2.40
	F	6.40	2.78	6.27	2.68	6.19	2.67	6.27	2.68
	G	4.17	1.66	4.02	1.67	4.09	1.75	4.02	1.67
	H	4.83	1.71	4.80	1.74	4.87	1.77	4.80	1.74
	I	4.66	2.64	4.76	2.54	4.81	2.54	4.76	2.54
	J	6.92	1.71	6.98	1.69	6.93	1.68	6.98	1.69
	N	6.78	2.25	6.74	2.25	6.62	2.30	6.74	2.25
	O	5.35	1.96	5.36	1.97	5.44	1.91	5.36	1.97
	Q3	4.31	1.69	4.38	1.86	4.47	1.91	4.38	1.86
	Q4	6.61	1.87	6.79	1.94	6.72	1.94	6.79	1.94
	ANX	6.18	1.16	6.24	1.20	6.20	1.22	6.24	1.20
	EXT	5.45	1.31	5.41	1.28	5.44	1.26	5.41	1.28
TRS	G	-.77	10.36	—	—	—	—	—	—
	E	—	—	-.56	10.15	—	—	—	—
	N	—	—	—	—	-.41	4.64	—	—
	P	—	—	—	—	—	—	.19	5.53

Appendix 35a Means and standard deviations of variables in correlations (Table 149 - Female Subjects)

Variables		CPQ (N= 116)		TRS G (N= 74)		TRS E (N= 101)		TRS N (N= 116)		TRS P (N= 101)	
		$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.
MFFT	errors	10.15	5.98	11.12	6.68	10.55	6.09	10.22	5.92	10.55	6.09
	time	698.79	922.44	566.48	679.59	641.90	926.14	671.91	917.21	641.90	926.14
Age		110.02	14.13	105.64	14.13	107.02	12.90	109.65	13.82	107.02	12.90
TRS	G			2.69	10.33	—	—	—	—	—	—
	E			-3.05	8.91	-2.76	8.77	—	—	-2.76	8.77
	N			-1.10	4.06	-1.27	4.18	-.94	4.00	-1.27	4.18
	P			-.12	4.50	-1.15	4.80	—	—	-1.15	4.80
				TRS G (N= 70)		TRS E (N= 96)		TRS N (N= 111)		TRS P (N= 96)	
				$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.
CPQ	A			4.80	1.71	4.87	1.71	4.99	1.69	4.87	1.71
	B			5.63	1.63	5.94	1.78	6.11	1.62	5.94	1.78
	C			5.40	1.78	5.39	1.63	5.39	1.60	5.39	1.63
	D			5.96	1.91	6.33	1.99	6.14	1.98	6.33	1.99
	E			6.26	1.74	6.67	1.91	6.49	1.97	6.67	1.91
	F			6.16	1.72	6.33	1.62	6.17	1.69	6.33	1.62
	G			4.64	1.77	4.36	1.81	4.51	1.87	4.36	1.81
	H			4.73	1.83	4.73	1.79	4.88	1.84	4.73	1.79
	I			4.97	1.87	4.87	1.66	4.93	1.68	4.87	1.66
	J			6.67	1.67	6.77	1.73	6.67	1.68	6.77	1.73
	N			6.36	1.78	6.54	1.91	6.39	1.93	6.54	1.91
	O			5.37	2.01	5.28	1.90	5.31	1.80	5.78	1.90
	Q3			4.73	1.65	4.58	1.85	4.68	1.82	4.58	1.85
	Q4			6.39	2.05	6.79	2.19	6.64	2.16	6.79	2.19
	ANX			5.99	1.20	6.15	1.25	6.05	1.23	6.15	1.25
	EXT			5.24	1.06	5.32	1.04	5.35	1.05	5.32	1.04
TRS	G			3.36	9.74	—	—	—	—	—	—
	E			—	—	-2.74	8.49	—	—	—	—
	N			—	—	—	—	-1.08	3.94	—	—
	P			—	—	—	—	—	—	-1.24	4.69

Appendix 35b Means and standard deviations of variables in correlations (Table 149 - Male Subjects)

Variables		CPQ (N=127) $\overline{X}$	CPQ S.D.	TRS G (N=91) $\overline{X}$	TRS G S.D.	TRS E (N=107) $\overline{X}$	TRS E S.D.	TRS N (N=122) $\overline{X}$	TRS N S.D.	TRS P (N=107) $\overline{X}$	TRS P S.D.
MFFT	errors	10.71	5.56	11.60	5.98	11.20	5.78	11.11	5.79	11.20	5.78
	time	821.97	930.29	850.74	992.54	857.89	961.73	831.69	925.07	857.84	961.73
Age		109.39	13.35	104.54	12.50	106.22	12.25	108.65	13.24	106.22	12.25
TRS	G			-4.20	9.53	—	—	—	—	—	—
	E			1.66	10.94	1.39	10.92	—	—	1.39	10.92
	N			.43	5.06	.04	5.31	.29	5.05	.04	5.31
	P			2.39	5.73	1.47	5.85	—	—	1.47	5.85

Variables				TRS G (N=86) $\overline{X}$	TRS G S.D.	TRS E (N=102) $\overline{X}$	TRS E S.D.	TRS N (N=115) $\overline{X}$	TRS N S.D.	TRS P (N=102) $\overline{X}$	TRS P S.D.
CPQ	A			4.87	1.93	4.84	1.93	4.89	1.89	4.84	1.93
	B			4.92	1.84	5.45	3.94	5.42	3.74	5.45	3.94
	C			5.14	1.47	5.12	1.59	5.19	64	5.12	1.59
	D			6.49	1.95	6.59	1.89	6.63	1.88	6.59	1.89
	E			6.24	1.78	6.45	1.96	6.37	1.94	6.45	1.96
	F			6.62	1.97	6.50	2.12	6.44	2.08	6.50	2.12
	G			4.62	1.90	4.49	1.89	4.45	1.93	4.49	1.89
	H			4.90	1.68	4.85	1.74	4.84	1.74	4.85	1.74
	I			4.44	1.95	4.48	1.97	4.50	1.91	4.48	1.97
	J			7.01	1.77	7.08	1.68	7.08	1.68	7.08	1.68
	N			7.17	1.71	7.09	1.68	7.06	1.69	7.09	1.68
	O			5.44	1.73	5.58	1.83	5.65	1.79	5.58	1.83
	Q3			4.33	1.63	4.36	1.78	4.41	1.87	4.36	1.78
	Q4			7.02	1.87	7.02	2.00	7.03	1.98	7.02	2.00
	ANX			6.32	1.10	6.37	1.16	6.38	1.18	6.37	1.16
	EXT			5.46	1.17	5.41	1.21	5.40	1.18	5.41	1.21
TRS	G			-4.13	9.66	—	—	—	—	—	—
	E			—	—	1.49	11.15	—	—	—	—
	N			—	—	—	—	.23	5.16	—	—
	P			—	—	—	—	—	—	1.53	5.93

Appendix 36a

Means and standard deviations of MFFT, personality and development variables (Table 150)

Variables		All subjects N	All subjects X̄	All subjects S.D.	M N	M X̄	M S.D.	F N	F X̄	F S.D.
MFFT	ERROR	164	8.22	4.77	77	8.31	5.00	87	8.14	4.58
	TIME	164	152.46	79.26	77	157.36	86.97	87	148.12	71.98
CPQ	A	128	5.01	1.85	59	5.07	1.84	69	4.33	1.59
	B	128	6.15	1.84	59	5.93	1.73	69	6.22	1.94
	C	128	5.52	1.39	59	5.71	1.52	69	5.57	1.72
	D	128	6.13	1.81	59	6.37	1.67	69	6.09	2.08
	E	128	6.83	2.08	59	7.03	1.52	69	7.07	1.68
	F	128	7.21	2.26	59	7.59	1.88	69	7.30	1.25
	G	128	4.20	1.61	59	4.48	1.55	69	4.58	1.68
	H	128	5.78	2.16	59	6.53	1.95	69	5.17	2.16
	I	128	4.28	2.26	59	3.98	1.25	69	4.12	1.53
	J	128	6.05	2.03	59	6.01	1.69	69	6.04	2.25
	N	128	6.16	1.89	59	6.30	1.42	69	6.36	1.50
	O	128	5.40	2.06	59	5.10	1.77	69	5.74	2.02
	Q3	128	4.08	1.53	59	4.08	1.28	69	3.96	1.32
	Q4	128	6.41	1.51	59	6.24	1.51	69	6.80	1.76
	ANX	128	6.04	1.20	59	5.90	1.04	69	6.26	1.37
	EXT	128	6.00	1.58	59	6.39	1.40	69	5.61	1.31
NEW TRS	G	67	2.13	10.37	26	1.34	11.66	41	2.70	9.46
	E	67	.90	8.91	26	3.23	10.35	41	- .77	7.41
	N	67	.03	3.46	26	- .03	3.86	41	.07	3.19
	P	67	1.12	4.38	26	1.44	4.95	41	.90	3.97
EPQ	P	162	4.89	4.09	76	7.07	4.73	85	2.97	2.00
	E	162	19.52	3.35	76	19.50	3.42	85	19.53	3.30
	N	162	10.21	4.90	76	9.59	4.79	85	10.76	4.96
	L	162	8.89	4.93	76	7.67	4.83	85	9.97	4.80
JEPI	E	73	19.00	3.54	28	19.39	3.62	45	18.76	3.50
	N	73	13.30	5.73	28	11.43	5.61	45	14.47	5.55
	L	73	3.32	2.30	28	3.25	2.66	45	3.36	2.07
AGE		164	114.64	7.55	77	115.26	6.50	87	114.07	8.40
RQ		164	123.54	163.47	74	109.32	17.43	87	136.47	225.08

Appendix 36b

Means and standard deviations of variables in correlation (Table 150 - all subjects)

Variables		CPQ (N=128)		TRS (N=67)		EPQ (N=161)		JEPI (N=73)	
		$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
MFFT	error	8.41	5.18	8.30	5.09	8.21	4.78	8.29	4.91
	time	157.27	85.78	163.29	89.83	151.56	78.23	164.23	89.16
Age		114.40	7.92	116.17	7.98	114.35	7.50	114.07	9.16
RQ		129.01	187.72	115.91	14.83	124.02	116.98	145.36	246.68

Appendix 36c Means and standard deviations of variables in correlations (Table 150 - All subjects)

Variables		TRS & CPQ (N=65)		EPQ & CPQ (N= 125)		EPQ & JEPI (N= 70)		JEPI & CPQ (N= 73)		TRS & EPQ (N= 65)		TRS & JEPI (N= 65)	
		$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.
CPQ	A	5.11	1.84	5.03	1.87			5.18	1.82				
	B	6.32	1.87	6.15	1.86			6.33	1.88				
	C	5.55	1.36	5.52	1.38			5.68	1.46				
	D	6.06	1.84	6.15	1.82			5.97	1.88				
	E	6.75	2.11	6.84	2.06			6.79	2.06				
	F	6.80	2.37	7.21	2.24			6.89	2.28				
	G	4.11	1.71	4.21	1.63			4.15	1.69				
	H	5.90	2.21	5.74	2.15			5.97	2.20				
	I	4.66	2.39	4.25	2.22			4.64	2.40				
	J	5.98	2.07	6.05	1.99			5.95	2.01				
	N	6.08	1.88	6.18	1.89			5.96	1.84				
	O	5.28	2.02	5.42	2.08			5.21	1.96				
	Q3	3.92	1.51	4.05	1.54			4.00	1.49				
	Q4	6.37	1.52	6.44	1.46			6.37	1.54				
	ANX	6.01	1.21	6.07	1.18			5.95	1.23				
	EXT	5.94	1.57	5.99	1.57			6.01	1.56				
NEW TRS	G	2.18	9.54							2.38	9.88	2.67	9.57
	E	.69	8.57							.77	8.87	.37	8.82
	N	.35	3.20							.22	3.32	.19	3.27
	P	1.17	4.22							1.14	4.31	1.07	3.59
EPQ	P			4.91	4.27	4.43	4.56			4.52	4.69		
	E			19.57	3.32	19.74	3.62			19.63	3.70		
	N			9.73	5.12	9.24	5.79			9.71	5.66		
	L			8.63	4.76	8.57	4.98			7.74	4.53		
JEPI	E					18.93	3.57	19.00	3.54			18.92	3.59
	N					13.16	5.81	13.30	5.73			13.78	5.51
	L					3.36	2.30	3.32	2.30			3.03	2.14

Appendix 37a Means and standard deviations of variables in correlations (Table 151 - Male subjects)

Variables		TRS & CPQ (N= 25)		EPQ & CPQ (N=58)		EPQ & JEPI (N= 27)		JEPI & CPQ (N=28)		TRS & EPQ (N= 25)		TRS & JEPI (N= 25)	
		$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.
CPQ	A	5.16	1.95	5.09	1.85			5.33	1.98				
	B	6.12	1.88	5.91	1.74			6.22	1.85				
	C	5.84	1.70	5.71	1.53			5.85	1.63				
	D	6.44	1.78	6.38	1.68			6.26	1.83				
	E	7.24	1.59	7.02	1.53			7.11	1.60				
	F	7.48	2.12	7.60	1.90			7.44	2.06				
	G	4.28	1.70	4.48	1.56			4.41	1.69				
	H	6.84	2.08	6.50	1.96			6.81	2.00				
	I	3.88	1.42	4.00	1.26			3.89	1.40				
	J	5.96	1.77	6.03	1.70			5.89	1.72				
	N	6.32	1.41	6.29	1.43			6.22	1.42				
	O	4.80	1.50	5.10	1.78			4.78	1.45				
	Q3	3.88	1.24	4.12	1.27			3.96	1.22				
	Q4	6.00	1.66	6.21	1.51			6.07	1.62				
	ANX	5.80	1.10	5.89	1.05			5.76	1.07				
	EXT	6.49	1.47	6.40	1.41			6.53	1.42				
NEW TRS	G	.58	9.91							1.46	10.55	1.29	10.37
	E	4.01	9.87							2.87	10.55	3.22	10.48
	N	.79	3.16							.57	3.47	.51	3.41
	P	1.85	4.55							1.37	4.78	1.53	4.75
EPQ	P			7.07	5.13	6.63	6.45			6.96	6.59		
	E			19.67	3.32	19.70	3.83			19.48	3.89		
	N			8.84	4.84	8.63	6.36			9.00	6.47		
	L			7.29	4.66	8.29	5.35			7.40	4.44		
JEPI	E					19.33	3.68	19.39	3.62			19.23	3.71
	N					11.22	5.61	11.43	5.61			11.88	5.52
	L					3.33	2.67	3.25	2.66			2.81	2.17

Appendix 37b Means and standard deviations of variables in correlations (Table 151 - Female subjects)

Variables		TRS & CPQ (N= 40)		EPQ & CPQ (N= 67)		EPQ & JEPI (N= 43)		JEPI & CPQ (N= 45)		TRS & EPQ (N= 40)		TRS & JEPI (N= 40)	
		$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.
CPQ	A	4.43	1.55	4.36	1.60			4.44	1.48				
	B	6.25	1.90	6.24	1.92			6.22	1.93				
	C	5.58	1.55	5.61	1.72			5.80	1.77				
	D	6.13	2.08	6.06	2.08			6.11	2.10				
	E	7.13	1.67	7.13	1.66			7.27	1.66				
	F	7.18	1.38	7.34	1.24			7.33	1.35				
	G	4.40	1.84	4.61	1.69			4.47	1.83				
	H	5.30	2.14	5.18	2.18			5.44	2.70				
	I	4.28	1.62	4.06	1.52			4.20	1.63				
	J	6.00	2.27	6.03	2.26			5.93	2.17				
	N	6.40	1.61	6.36	1.52			6.33	1.55				
	O	5.70	2.05	5.76	2.04			5.62	1.98				
	Q3	3.83	1.38	3.99	1.33			3.84	1.33				
	Q4	6.90	1.65	6.78	1.78			6.87	1.77				
	ANX	6.29	1.33	6.24	1.38			6.23	1.35				
	EXT	5.64	1.28	5.63	1.33			5.74	1.29				
NEW TRS	G	3.17	9.30							2.96	9.54	3.59	9.03
	E	-1.38	7.01							-.54	7.49	-1.53	7.03
	N	.08	3.24							.001	3.25	- .025	3.21
	P	.74	4.00							.99	4.04	.76	4.04
EPQ	P			3.10	2.01	3.05	1.84			3.00	1.78		
	E			19.54	3.35	19.77	3.53			19.73	3.62		
	N			10.48	5.24	9.63	5.45			10.15	5.14		
	L			9.73	4.59	8.74	4.80			7.95	4.63		
JEPI	E					18.67	3.52	18.76	3.50			18.82	3.54
	N					14.37	5.66	14.47	5.55			15.05	5.19
	L					3.37	2.07	3.36	2.07			3.17	2.14

Appendix 37c

Means and standard deviations of variables in correlations (Table 151 - Male subjects)

Variables	CPQ (N=59)		TRS (N=26)		EPQ (N=76)		JEPI (N=28)	
	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.
MFFT error	8.54	5.47	8.31	5.00	8.30	5.03	8.36	4.85
time	162.87	95.55	175.69	103.92	156.22	86.96	183.11	103.67
Age	115.27	6.44	116.40	6.15	114.91	6.40	114.39	7.15
RQ	111.60	17.91	116.17	15.66	108.95	17.84	117.05	17.78

Means and standard deviation of variables in correlations (Table 151 - Female Subjects

Variables	CPQ (N=69)		TRS (N=41)		EPQ (N=85)		JEPI (N=45)	
	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.	$\overline{X}$	S.D.
MFFT error	8.29	4.97	8.29	5.20	8.12	4.56	8.24	5.01
time	152.48	76.83	155.43	80.01	147.40	69.77	152.49	77.75
Age	116.00	9.14	116.00	9.14	113.86	8.37	113.87	10.28
RQ	115.73	14.40	115.73	14.40	137.16	227.67	162.98	313.92

Appendix 38

Means and standard deviation of variables in multiple regression analysis (N=20) Tables 152-155

	VARIABLE	MEAN	S.D.
	TERR	8.60	4.45
	TIME	749.00	856.94
	AGE	104.80	16.08
CPQ	A	4.80	2.52
	B	5.85	1.93
	C	5.55	1.82
	D	5.70	1.89
	E	5.60	2.23
	F	5.55	2.74
	G	4.75	1.52
	H	4.75	1.37
	I	5.75	2.73
	J	6.45	1.50
	N	6.60	2.37
	O	5.40	2.13
	Q3	4.65	1.73
	Q4	6.55	1.89
	ANX	5.97	1.40
	EXT	5.04	1.03
New TRS	G	2.45	12.33
	E	-1.48	13.39
	N	-2.35	5.39
	P	.19	4.19
	DDACC	18.05	1.43
	DDCOM	1.65	1.31
	DDOMI	.30	.73
	SSACC	16.70	1.63
	SSCOM	3.15	1.39
	SSOMI	.15	.37
	DRLABA	.98	.39
	DRLALRN	13.04	3.53
	DA2TSC	19.30	5.19
	DA2EF1	.25	.20
	DA2EF2	.26	.15
	DA6TSC	13.35	6.53
	DAGEF1	.09	.11
	DA6EF2	.14	.05
	DA12TSC	21.10	7.43
	DA12EF1	.20	.20
	DA12EF2	.27	.16

Appendix 39 Correlation matrix for multiple correlation and regression analysis (N=2[illegible])

	DDACC	DDCOM	DDOMI	SSACC	SSCOM	SSOMI	DRLABA	DRLALRN	DA2TSC	DA2TP	DA2CP	DA2EF1
SSCOM	-.40153	.17540	.47130	-.98285								
SSOMI	-.21573	.11525	.21569	-.71592	.57488							
DRLABA	-.09586	-.00751	.20075	.04962	-.02908	-.11009						
DRLALRN	.37725	-.48024	.12070	.03420	.05140	-.34634	.23402					
DA2TSC	-.34196	.52741	-.27393	.07359	-.07966	-.02490	-.05444	-.31354				
DA2TP	.43757	-.57902	.17929	.01582	-.00732	-.04250	-.19782	.42880	-.84521			
DA2CP	.26300	-.19387	-.16760	.16288	-.16812	-.08622	-.44305	-.04309	-.53631	.45201		
DA2EF1	-.34253	.55978	-.33063	.06374	-.08409	.03553	-.46670	-.36474	.70534	-.45630	-.06354	
DA2EF2	-.39840	.60981	-.31084	.01219	-.03239	.06853	-.36428	-.60206	.73971	-.68580	.05956	.82482
DA6TSC	.33008	-.43972	.08688	.26324	-.19202	-.44102	.21985	.51105	.14728	.01212	-.35825	-.11469
DA6TP	-.22375	.27503	-.05407	-.24125	.15922	.46760	-.38949	-.58034	-.08884	.04245	.35046	.16181
DA6CP	-.03514	.03131	.01274	-.22593	.16418	.38087	-.28918	-.24095	-.41279	.20357	.76019	-.21432
DA6EF1	.34711	-.33772	-.07501	-.24112	.13836	.54603	.01468	.10774	-.32420	.32957	.28966	-.16430
DA6EF2	.21277	-.30425	.12774	.06703	-.07633	-.00844	.28768	.21329	-.17242	.06167	.19799	-.14774
DA12TSC	.30117	-.36948	.07151	.45564	-.36399	-.64361	.43870	.60170	-.26265	.29933	-.14448	-.42259
DA12TP	-.16966	.26806	-.14732	-.35348	.26680	.55828	-.45401	-.64335	.31537	-.24878	.04269	.35229
DA12CP	-.33093	.42965	-.12083	-.10692	.07447	.19244	-.06313	-.17208	.09663	-.08034	.13200	.13409
DA12EF1	.06007	-.01972	-.08214	.33544	-.30668	-.32726	.34311	.30394	.11199	-.04075	-.33329	-.01459
DA12EF2	.09336	-.04064	-.10984	.42626	-.38947	-.41678	.50605	.27753	.05591	.00915	-.36762	-.18726

	DA2EF2	DA6TSC	DA6TP	DA6CP	DA6EF1	DA6EF2	DA12TSC	DA12TP	DA12CP	DA12EF1
DA6TSC	-.31100									
DA6TP	.35855	-.91413								
DA6CP	.12871	-.61301	.50726							
DA6EF1	-.14806	-.19506	.19178	.32780						
DA6EF2	-.19682	.48995	-.54310	.29474	.16306					
DA12TSC	-.54540	.64751	-.71138	-.53062	-.17753	.19285				
DA12TP	.48544	-.48259	.60942	.37472	.02854	-.17198	-.88174			
DA12CP	.25811	-.45007	.29878	.23978	.33077	-.25258	-.36349	.27706		
DA12EF1	-.17595	.26738	-.40282	-.43353	-.13480	-.08179	.66686	-.62024	-.30458	
DA12EF2	-.27249	.33630	-.47294	-.52781	-.15222	-.04310	.77443	-.61728	-.12025	.87878

Appendix 39 (con't)

	TERR	TTIME	SEX	AGE	AA	BB	CC	DD	EE	FF	GG	HH
DA12TSC	-.07028	-.00904	.35929	-.18076	.62349	-.02094	.50920	-.31916	-.36834	-.45975	.00700	.06969
DA12TP	.04009	-.11403	-.40864	.18095	-.52666	.00169	-.49284	.37037	.43862	.47528	-.10612	-.08505
DA12CP	-.13180	.08253	-.29315	-.33679	-.48946	-.35990	-.17024	-.05711	.13359	.22773	.21069	-.14901
DA12EF1	.00982	-.00101	.44914	.03354	.44916	-.02627	.37144	-.22398	-.33649	-.54769	-.20817	-.07365
DA12EF2	-.10748	.10892	.43434	-.10723	.37460	-.12066	.31199	-.28473	-.31877	-.47159	-.21599	-.19687

	II	JJ	NN	OO	QQ3	QQ4	BGANX	BGEXT	GOODTR	ACTTR	NEUTR	PSYTR
JJ	-.17622											
NN	-.52016	.14174										
OO	-.21637	.39962	.41752									
QQ3	.50541	-.15928	-.65367	-.35969								
QQ4	-.29348	.38363	.61921	.52816	-.66279							
BGANX	-.45610	.41543	.71481	.79431	-.74528	.84512						
BGEXT	-.33145	-.30276	.00571	-.39427	-.11084	-.12865	-.21863					
GOODTR	.59938	-.12176	-.25478	-.30920	.18926	.07017	-.29397	.03233				
ACTTR	-.34066	-.04950	.13833	.37808	-.01824	-.11710	.25133	.00485	-.48155			
NEUTR	.15702	.21149	-.24436	-.06151	-.26164	.00182	.10088	-.20394	-.05964	.07420		
PSYTR	-.27333	.29885	.02518	.27429	.36253	.02046	.26630	-.21053	-.47666	.77736	.34490	
DDACC	.38019	-.10880	-.31939	-.26485	.32707	-.13974	-.29934	.03427	.32945	-.08472	-.11521	.06649
DDCOM	-.29076	.24472	.27476	.18437	-.22026	.26016	.29922	-.05559	-.13030	.03793	.12231	-.05476
DDOMI	-.22354	-.22455	.13331	.18820	-.24566	-.19169	.05042	.03233	-.41101	.09779	.00663	-.03211
SSACC	.50382	-.13568	-.07375	-.03939	.31719	.02119	-.08534	-.32689	.33120	.11575	.12610	.28344
SSCOM	-.51751	.04164	.05122	-.03906	-.30684	-.05063	.02147	.41116	-.29564	-.14525	-.14350	-.30873
SSOMI	-.27614	.44433	.13331	.32263	-.24566	.09765	.29736	-.10624	-.35023	.03636	-.01624	-.08874
DRLABA	.23140	-.00564	-.14981	-.35708	.33847	-.28377	-.39161	-.21248	.29201	-.21107	.07641	-.01138
DRLALRN	.24550	-.35421	-.43026	-.46916	.52540	-.59708	-.67579	.34312	.10453	-.22695	-.17845	-.15237
DA2TSC	.03155	.17732	-.05815	.03604	-.04054	.01378	.10948	-.03129	.22938	.09154	.43183	.07993
DA2TP	-.02550	-.16773	.00504	-.13522	.09447	-.17224	-.24697	.20193	-.22157	-.12930	-.43067	-.15488
DA2CP	-.27975	-.05264	.33831	.37726	-.14627	.40509	.38712	.01164	-.36159	.13682	-.33773	.19855
DA2EF1	-.14830	.13772	.08278	.26146	-.15088	.12221	.25255	.02219	-.01849	.21679	.17018	.07055
DA2EF2	-.33441	.21168	.29389	.41072	-.34587	.40193	.53305	-.06805	-.06155	.30111	.26253	.24552
DA6TSC	.29723	-.50996	-.25559	-.61377	.24031	-.53088	-.53551	.31427	.25655	-.05389	.10877	-.09454
DA6TP	-.35342	.06405	.31917	.63915	-.26660	.53633	.57971	-.16967	-.28391	.19852	-.16473	.16587
DA6CP	-.34088	.23701	.35574	.65863	-.21076	.43431	.54096	-.26254	-.41158	.03379	-.38744	.04867
DA6EF1	-.05245	.19758	-.13679	-.05312	.20077	-.22791	-.16218	-.11002	-.26109	.04779	-.03622	.12115
DA6EF2	.00968	-.24841	.13325	-.05303	.12892	-.19126	-.08381	-.08001	-.05791	-.04403	-.27610	-.05286
DA12TSC	.36681	-.43750	-.13798	-.60557	.23681	-.42103	-.52354	.13158	.17664	-.10065	.17785	.01859
DA12TP	-.41250	.48797	.23782	.50403	-.38066	.48385	.55914	-.04603	-.07856	.00243	-.12297	-.08092
DA12CP	-.26111	.30424	.09128	.12120	-.08258	.15767	.12376	-.26251	-.13967	-.14620	.04593	-.06032
DA12EF1	.49294	.04590	-.26325	-.28553	.20005	-.36872	-.34372	-.15075	.10965	-.12086	.53245	.09845
DA12EF2	.40151	.09022	-.08034	-.42992	.11815	-.23368	-.32590	-.19853	.22116	-.24926	.46942	.05138

DDCOM	-.86080		
DDOMI	-.41641	-.10427	
SSACC	.39124	-.17564	-.45076

	TERR	TTIME	SEX	AGE	AA	BB	CC	DD	EE	FF	GG	HH
TTIME	-.15796											
SEX	-.06838	-.16755										
AGE	-.35133	-.04812	.08090									
AA	-.14408	.05801	.09986	.00597								
BB	-.38691	.01582	.22519	.47391	.17806							
CC	-.04720	-.04850	.05566	.00176	.43622	.12507						
DD	.02179	-.00552	-.27949	.12755	-.24502	-.04194	-.26637					
EE	-.06164	.07250	-.49239	.12911	.02141	.08862	.16683	.34815				
FF	-.02237	.15571	-.71370	.05546	-.06017	-.06563	.09805	.40195	.64949			
GG	-.05731	-.03555	.23619	-.02124	.11578	-.00303	.16781	-.33395	-.37278	-.32712		
HH	-.08653	-.10103	-.10281	.20128	.33943	.16983	.45092	-.24546	.24917	.18906	.04805	
II	-.03972	-.16267	.63500	.03014	-.07718	.09557	-.11119	-.27643	-.57365	-.76376	.25365	-.18266
JJ	.12905	.02681	-.07618	-.14855	-.31796	-.27088	-.39176	.39656	-.06734	.01804	-.19235	-.43743
NN	.12402	.04511	-.52856	-.11317	-.14415	-.24672	-.14248	.43776	.42867	.54757	-.41883	-.12518

	TERR	TTIME	SEX	AGE	AA	BB	CC	DD	EE	FF	GG	HH
OO	.06617	-.15065	.06273	.05432	-.44439	-.13215	-.49728	.27829	-.10594	-.15073	-.15933	-.41807
QQ3	-.08318	.06877	.40657	.11544	.14202	.17159	.20009	-.36150	-.38764	-.40404	.44763	.06059
QQ4	-.02436	.04719	-.19056	.02765	-.19289	-.13246	-.28989	.40761	.17054	.22575	-.34605	-.28403
BGANX	.06540	-.03476	-.22704	-.00021	-.43502	-.18986	-.59536	.70033	.16963	.21104	-.41642	-.54178
BGEXT	-.11647	.07700	-.44967	.12877	.55488	.11412	.45743	.03269	.52912	.68545	-.13218	.72141
GOODTR	-.30543	-.02185	.31245	.09251	.16709	.45948	.09823	-.33544	-.18225	-.29386	.12967	.18744
ACTTR	-.04066	.03202	-.24352	.14539	-.00153	-.01196	.05721	.25907	.16871	.23716	-.01019	.25182
NEUTR	.04797	.05764	-.14553	.10243	-.09403	-.10586	-.05288	.22040	.07783	.11721	-.00000	-.07296
PSYTR	-.02011	.04429	-.21676	.20837	-.03512	-.02654	-.08219	.30238	.14638	.25208	.05475	-.03029

	II	JJ	NN	OO	QQ3	QQ4	BGANX	BGEXT	GOODTR	ACTTR	NEUTR
JJ	.00398										
NN	-.52836	.29947									
OO	.16774	.36856	.12751								
QQ3	.40352	-.23605	-.57164	-.13294							
QQ4	-.15181	.37032	.43179	.24624	-.47895						
BGANX	-.14368	.54664	.50796	.66690	-.61818	.72944					
BGEXT	-.59488	-.32680	.22269	-.47907	-.16312	-.07228	-.30471				
GOODTR	.30598	-.26410	-.34144	-.14690	.23121	-.17373	-.31564	-.02554			
ACTTR	-.18607	.05238	.05398	-.01789	-.04949	-.03896	.05979	.17131	-.36969		
NEUTR	-.11982	.12785	.08228	.05023	-.17650	.03844	.16475	-.00099	-.35206	.34129	
PSYTR	-.22726	.10724	.15766	-.01388	-.09561	.04887	.14531	.12863	-.45680	.67203	.57259

Appendix 40

Means and standard deviations of variables in multiple regression analysis (N=221) - Tables 156 & 157

VARIABLE	MEAN	S.D.
TERR	10.56	6.12
TTIME	555.68	788.67
AGE	108.24	12.80
CPQ A	5.10	1.87
B	5.51	1.94
C	5.32	1.49
D	6.21	1.80
E	6.31	2.25
F	6.51	2.67
G	4.15	1.67
H	5.14	1.93
I	4.66	2.56
J	6.64	1.87
N	6.57	2.17
O	5.33	1.98
Q3	4.20	1.65
Q4	6.54	1.77
ANX	6.13	1.17
EXT	5.59	1.41
NEW TRS G	1.00	10.19
E	-.09	9.86
N	-.12	4.36
P	1.25	5.19

Appendix 41 Correlation matrix formultble correlation and regression analysis (N=221)

	TERR	TTIME	SEX	AGE	AA	BB	CC	DD	EE	FF	GG	HH
TTIME	-.37692											
SEX	-.24544	.11022										
AGE	-.12168	-.07349	.07821									
AA	-.01685	-.00289	.21230	.09873								
BB	-.47963	.16961	.24883	.56787	.37201							
CC	.19739	-.29651	.33707	-.29807	.54037	-.05027						
DD	.29693	-.43871	-.36465	.31055	-.31017	.10236	-.08699					
EE	.32169	-.20946	-.44316	-.05069	-.24816	-.05136	.01812	.72879				
FF	.28179	-.13966	-.71614	-.22285	-.37075	-.18272	-.00053	.60058	.66488			
GG	-.07789	-.21547	.05096	.01078	.01373	.03450	.37634	-.24715	-.31055	.08535		
HH	-.22402	.00804	.35707	-.01670	.30384	.28375	.31093	-.47592	-.41226	-.40916	.47410	
II	-.39375	-.07067	.74559	.14736	.19836	.27249	.15615	-.44242	-.62973	-.76748	.08571	.41791
JJ	-.10533	.26973	-.06515	.34780	-.33541	.07902	-.44137	.17922	.04075	.15378	-.17879	-.37642
NN	.22831	-.01035	-.59149	-.17887	-.33927	-.26727	-.30002	.53430	.54462	.65070	-.39499	-.66353
OO	.12828	-.16878	-.40524	.38366	-.58888	-.07412	-.65477	.48609	.16756	.25675	-.14605	-.32313
OO3	-.29321	.14077	.70827	-.16767	.04348	.18919	.36622	-.37197	-.46163	-.42431	.30659	.51709
OO4	-.14243	.17664	-.41793	.35291	-.32316	.18771	-.59763	.45178	.43183	.32799	-.38856	-.35256
BGANX	.14864	-.11740	-.59597	.38407	-.46744	-.00959	-.64549	.69874	.52414	.48002	-.39373	-.59494
BGEXT	.13604	-.12197	-.30169	-.12373	.61908	.26639	.57547	.06788	.20303	.40039	.29552	.32692
GCODTR	-.62365	.12438	.28266	-.03264	.19518	.36524	.04062	-.47898	-.40101	-.33253	.09017	.37887
ACTTR	.06537	-.21007	-.33089	.15415	-.20595	-.06141	-.06598	.51419	.13307	.38692	.06784	-.38349
NEUTR	.04723	-.18871	.21699	.43288	.26612	.12648	.03767	.10964	-.03024	-.32510	-.14485	-.30231
PSYTR	-.10843	.08936	-.05601	.43750	-.13356	.18225	-.20616	.44753	.06138	.10634	-.05144	-.44411
DDACC	-.58277	.08624	.32048	.19929	.35222	.47977	-.03130	-.26581	-.24027	-.43622	.05451	.30148
DDCOM	.27269	.01218	-.24816	-.24601	-.43624	-.29319	.01878	.33747	.36364	.46692	-.15237	-.25650
DDOMI	.65167	-.19028	-.18295	.05002	.09101	-.41378	.02762	-.08341	-.18009	.01833	.16568	-.13092
SSACC	-.55550	.00344	.39966	.07811	-.05385	.23693	-.04803	.02051	-.29572	-.38601	-.01067	.12983
SSCOM	.54706	.01630	-.42005	-.09768	.12921	-.22745	.13238	-.06209	.29220	.37837	.06877	-.06224
SSOMI	.39358	-.07695	-.18295	.02322	-.25028	-.19012	-.28809	.14408	.20581	.28022	-.21302	-.34039
DRLABA	-.07702	.33658	.37780	-.22318	.20987	-.03887	.06126	-.45185	-.47095	-.36956	-.24992	-.12922
DRLALRN	.02625	-.11210	.31551	-.18150	.54051	.08368	.59215	-.41758	-.34444	-.32212	.47308	.42692
DA2TSC	.00774	-.29899	.03376	.09340	-.23198	.16255	.13199	.31996	.28772	.25389	.07682	-.15149
DA2TP	.02778	.15481	.02547	-.20137	.27315	-.21639	.09884	-.33301	-.25897	-.17511	.18152	.30509
DA2CP	-.17182	.21476	-.28161	.04696	-.12141	.17921	-.37222	.26413	.27773	.12512	-.16582	-.00026
DA2EF1	.11022	-.12859	-.24083	-.07800	-.36525	.01851	-.04471	.32268	.33851	.39736	.10601	-.07175
DA2EF2	-.03435	-.06159	-.35762	.07980	-.44185	.11979	-.23752	.52625	.56405	.50134	-.13138	-.34324
DA6TSC	.04849	-.29793	.23918	-.09098	.49261	.22184	.46550	-.19522	-.22078	-.21695	.28543	.23939
DA6TP	-.04646	.20245	-.24775	.19008	-.47219	-.12636	-.40400	.33789	.39442	.35033	-.19328	-.21585
DA6CP	.07993	.17201	-.40344	.03347	-.43785	-.04280	-.65457	.23326	.27541	.18211	-.32644	-.15315
DA6CF1	-.14149	.24639	.18277	-.18026	.02579	.04337	-.13114	-.22931	-.07614	-.07895	-.02407	-.13907
DA6EF2	.15474	-.00712	-.05806	-.22862	.01296	.13210	-.24323	-.06467	-.05468	-.07956	-.22522	-.04619

Appendix 42 DRL Experiment Data (Experiment 5) Young Females

Condition & Subjects	Baseline IRT	DRL 2 Time	DRL 2 Total Presses	DRL 2 Correct Presses	DRL 6 Time	DRL 6 Total Presses	DRL 6 Correct Presses	DRL 12 Time	DRL 12 Total Presses	DRL 12 Correct Presses
Impulsive (Speech)										
39	0.44	3	33	32	3	23	13	4	19	8
35	0.60	3	33	33	4	13	10	6	18	13
18	1.44	3	32	31	3	23	12	4	21	6
25	1.25	3	20	20	2	9	9	2	8	5
200	1.25	2	20	20	3	19	14	6	30	13
218	1.41	2	27	21	6	35	16	4	12	8
Impulsive (No Speech)										
43	0.96	30	1884	15	-	-	-	-	-	-
47	0.85	30	1546	56	-	-	-	-	-	-
27	0.62	28	1106	252	30	774	12	-	-	-
17	0.63	11	862	49	8	160	14	3	13	6
21	0.92	30	1651	0	-	-	-	-	-	-
22	0.81	14	609	73	16	333	18	5	30	7
Reflective (Speech)										
192	1.38	3	44	28	11	98	42	5	28	12
198	2.10	3	23	19	4	25	9	8	63	8
194	0.98	2	33	32	4	47	18	3	17	6
33	0.38	6	118	59	3	33	15	3	9	8
245	1.34	2	32	28	3	28	15	2	8	5
232	1.12	3	20	20	4	17	13	7	37	13
Reflective (No Speech)										
231	1.13	16	532	58	22	356	38	7	39	14
28	0.98	30	1719	19	-	-	-	-	-	-
34	1.87	8	186	45	6	112	14	4	43	7
38	1.79	16	501	47	28	468	22	4	19	10
41	0.91	18	822	107	26	575	33	17	182	14
20	0.94	8	266	89	23	474	29	16	164	13

Appendix 42 (Con't) Young Males

Condition & Subjects	Baseline IRT	DRL 2 Time	DRL 2 Total Presses	DRL 2 Correct Presses	DRL 6 Time	DRL 6 Total Presses	DRL 6 Correct Presses	DRL 12 Time	DRL 12 Total Presses	DRL 12 Correct Presses
Impulsive (Speech)										
291	0.43	2	41	41	3	26	14	4	16	10
40	0.79	3	33	32	3	21	13	3	10	6
50	1.52	6	21	21	5	31	21	3	11	6
56	0.46	9	90	56	4	18	13	7	44	13
15	0.56	3	36	30	2	10	10	3	7	6
51	0.47	6	30	30	4	39	14	5	29	12
Impulsive (No Speech)										
239	0.85	5	170	59	23	459	28	18	295	7
205	0.83	6	180	95	20	374	21	6	36	12
203	0.65	24	1771	86	30	826	4	-	-	-
213	1.30	15	389	29	19	280	31	16	179	11
36	0.88	30	2773	11	-	-	-	-	-	-
13	0.45	30	3138	80	-	-	-	-	-	-
Reflective (Speech)										
214	0.77	3	30	30	3	12	10	5	22	11
215	0.49	2	38	32	3	28	13	3	15	8
241	0.64	2	43	33	6	75	22	2	8	5
6	1.08	5	21	21	3	10	10	2	6	6
14	1.39	2	28	24	3	14	11	4	18	7
190	0.69	4	34	34	6	77	20	5	28	10
Reflective (No Speech)										
210	0.55	30	2625	4						
32	0.47	18	629	149	18	337	42	7	45	8
54	0.66	2	49	36	21	412	16	20	247	14
5	1.30	12	406	44	11	233	16	6	71	5
9	0.93	5	137	73	30	1402	3	-	-	-
11	0.76	13	735	76	14	290	21	8	331	14

Appendix 42 (con't) Old Females

Condition & Subjects	Baseline IRT	DRL 2 Time	DRL 2 Total Presses	DRL 2 Correct Presses	DRL 6 Time	DRL 6 Total Presses	DRL 6 Correct Presses	DRL 12 Time	DRL 12 Total Presses	DRL 12 Correct Presses
Impulsive (Speech)										
139I	1.03	3	24	23	3	19	14	5	43	9
170	0.76	2	35	31	3	32	15	3	15	9
133	1.21	3	24	23	3	17	12	2	7	5
112	0.88	5	37	35	3	18	13	3	16	6
135	0.74	3	36	30	2	19	12	4	25	7
132	1.30	4	69	35	4	39	10	6	56	7
Impulsive (No Speech)										
168	0.97	5	261	52	18	669	47	8	104	15
172	0.98	2	43	38	23	702	23	16	572	13
109	0.56	23	1377	121	21	537	32	16	357	10
73	1.39	11	417	50	13	271	21	5	29	8
111	0.45	21	1584	80	30	1495	9	-	-	-
113	0.55	22	1305	66	25	617	26	20	461	9
Reflective (Speech)										
82R	1.76	3	30	24	3	21	10	4	18	10
165	1.34	2	31	21	2	15	10	3	16	5
107	0.73	3	36	33	2	11	10	2	7	5
164	0.58	5	33	33	2	16	13	3	14	7
105	0.75	3	31	31	5	48	21	3	15	6
101	1.30	5	20	20	3	14	12	3	11	5
Reflective (No Speech)										
140	0.50	25	1531	127	30	822	17	-	-	-
79	0.64	30	1646	2	-	-	-	-	-	-
136	0.89	9	339	63	18	405	20	15	233	11
137	1.16	5	117	30	9	126	12	2	7	5
141	1.16	13	505	36	19	391	11	3	19	8
142	0.68	14	481	77	13	289	16	9	118	6

Appendix 42 (con't) Old Males

Condition & Subjects	Baseline IRT	DRL 2 Time	DRL 2 Total Presses	DRL 2 Correct Presses	DRL 6 Time	DRL 6 Total Presses	DRL 6 Correct Presses	DRL 12 Time	DRL 12 Total Presses	DRL 12 Correct Presses
Impulsive (Speech)										
661	1.27	2	37	37	3	31	13	3	12	6
68	0.64	3	35	33	2	15	11	2	8	6
70	0.97	5	41	34	3	23	13	8	46	22
98	0.97	2	31	31	3	18	14	3	12	8
247	0.69	6	30	30	2	10	10	2	8	6
125	0.42	8	95	79	7	139	12	13	178	16
Impulsive (No Speech)										
60	0.80	19	896	87	17	474	17	5	34	5
156	0.93	7	272	70	30	858	7	-	-	-
123	0.44	3	86	51	28	718	31	30	615	6
149	0.63	30	2271	55	-	-	-	-	-	-
146	0.88	2	44	35	21	279	60	18	181	15
67	0.48	29	1653	104	30	847	1	-	-	-
Reflective (Speech)										
157R	0.80	17	644	126	10	141	11	5	32	8
159	1.09	3	25	22	3	18	10	3	14	6
158	0.97	7	30	30	2	11	10	5	24	10
121	1.22	4	20	20	3	14	13	2	5	5
129	1.11	2	20	20	2	12	9	12	71	20
250	0.70	4	110	58	5	45	16	2	10	5
Reflective (No Speech)										
69	0.38	28	2296	78	30	1546	1	-	-	-
248	0.73	3	85	63	14	264	35	14	208	7
145	0.77	5	168	81	14	307	12	8	77	9
124	0.78	19	689	162	26	490	49	17	220	8
128	0.42	7	206	95	30	1541	2	-	-	-
95	0.79	21	1569	52	13	274	26	3	22	7

Appendix 43 DRL Experiment Data (Experiment 6)

SS	Sex 1=M 2=F	Impulsive(1)/ Reflective(2)	Experimental Groups	Baseline IRT	IRT reached	Total presses	Correct presses
1	1	2	7	0.39	2	816	266
3	1	1	1	1.00	0	1531	155
7	1	1	2	0.89	14	190	153
8	1	2	8	1.17	6	233	130
9	1	2	8	0.83	8	235	165
10	1	1	5	1.36	2	647	218
11	1	1	5	0.97	1	895	135
13	1	2	2	0.97	8	323	187
15	1	2	1	1.75	1	1165	208
19	2	1	6	0.78	8	395	204
20	2	1	7	1.62	1	686	95
22	2	1	5	1.40	1	881	124
24	2	2	8	0.48	4	390	181
27	2	2	4	1.43	6	368	194
30	2	1	5	1.45	8	328	222
31	2	2	5	0.64	4	554	195
32	2	1	3	0.97	2	860	140
33	2	1	6	1.10	4	371	189
36	2	2	6	0.51	10	232	197
38	2	1	2	0.73	14	172	156
39	1	2	6	0.73	10	227	190
42	1	2	6	1.50	14	219	205
45	1	2	1	0.88	2	761	150
47	1	2	1	1.47	1	839	140
48	1	1	3	1.07	2	776	144
49	1	2	3	1.50	2	586	236
51	1	1	4	0.70	6	448	245
52	1	1	3	2.29	3	432	168
56	2	1	8	0.63	6	442	215
57	2	2	3	1.36	2	749	170
58	2	1	3	0.53	4	500	200
59	2	1	5	0.73	2	681	169
61	2	1	2	1.65	16	141	118
64	2	2	5	1.36	2	686	181
66	2	2	1	0.55	2	868	181
67	2	2	7	0.81	2	598	151

Appendix 43 (Con't)

SS	Sex 1=M 2=F	Impulsive(1)/ Reflective(2)	Experimental Groups	Baseline IRT	IRT reached	Total presses	Correct presses
68	2	2	7	1.59	1	1300	112
72	2	2	7	2.00	8	391	178
74	2	2	1	1.25	1	1404	265
75	2	2	2	1.25	16	125	120
78	2	2	1	0.94	0	1416	261
80	2	1	1	1.58	1	1164	110
82	1	2	3	1.03	3	476	209
83	1	1	6	0.63	10	166	124
85	1	2	7	1.18	2	821	188
86	1	2	4	0.43	14	168	139
87	1	2	4	0.70	10	153	104
88	1	2	5	0.49	4	543	245
89	1	2	5	1.86	3	669	204
90	1	2	2	0.64	16	82	81
91	1	1	7	0.70	2	741	122
92	1	1	2	0.37	14	107	88
93	1	1	2	0.48	12	120	89
95	1	2	3	0.95	1	972	144
97	2	1	4	0.53	4	317	128
98	2	1	8	0.60	3	515	193
100	2	2	8	0.83	6	357	187
102	2	2	3	0.93	1	916	118
104	2	1	8	0.37	10	210	141
108	2	1	6	2.00	6	249	147
109	2	2	2	0.94	12	124	99
112	1	1	8	1.00	14	177	158
113	1	2	7	1.15	2	584	135
114	1	1	5	1.50	6	273	181
115	1	1	8	1.26	10	243	206
117	1	2	8	1.90	16	155	146
118	1	1	8	1.67	4	345	214
120	2	1	4	1.06	16	158	148
121	2	2	6	1.92	10	239	171
122	2	2	4	0.81	6	354	183
124	2	1	1	1.07	2	666	165
125	2	2	2	1.00	14	91	76

Appendix 43 (Con't)

SS	Sex 1=M 2=F	Impulsive(1)/ Reflective(2)	Experimental Groups	Baseline IRT	IRT reached	Total presses	Correct presses
127	2	1	7	2.00	2	547	241
131	2	2	4	1.60	6	237	122
132	2	1	2	2.10	16	140	129
133	2	2	8	0.94	12	231	180
134	1	1	6	1.50	6	273	165
137	1	1	1	0.69	0	1817	68
138	1	2	5	0.46	6	409	195
139	1	1	1	0.46	1	1711	127
140	1	1	7	1.80	1	1059	83
141	1	1	4	0.61	12	235	201
144	1	2	4	1.20	16	117	1108
148	2	2	5	1.36	3	628	184
149	2	2	6	0.94	14	239	203
152	2	1	3	0.70	3	541	220
154	2	1	4	0.38	4	300	196
156	2	1	1	1.00	1	849	88
157	2	1	7	1.00	2	549	164
158	2	2	3	0.73	2	539	170
159	1	2	2	0.97	16	120	113
160	1	1	4	0.61	8	269	2210
163	1	1	6	2.11	14	188	168
165	1	1	7	1.36	4	380	165
166	1	2	6	1.36	10	200	162
169	1	1	3	0.93	1	840	110

Appendix 44

GLOSSARY

DRMACC	Delayed Response	Motor Accuracy
DRMLAT		Motor Latency
DRMCOM		Motor Commission
DRMOMI		Motor Omission
DRVACC		Verbal Accuracy
DRVLAT		Verbal Latency
DRVCOM		Verbal Commission
DRVOMI		Verbal Omission
DRGEAC		General Accuracy Index
RTMACC	Reaction Time	Motor Accuracy
RTMLAT		Motor Latency
RTMOMI		Motor Omission
RTMCOM		Motor Commission
RTVACC		Verbal Accuracy
RTVLAT		Verbal Latency
RTVOMI		Verbal Omission
RTVCOM		Verbal Commission
RTGEAC		General Accuracy Index
DSIMACC	Discrimination Response to Positive Stimulus	Motor Accuracy
DSIMCOM		Motor Commission
DSIMOMI		Motor Omission
DSIVACC		Verbal Accuracy
DSIVCOM		Verbal Commission
DSIVOMI		Verbal Omission
DSOMACC	Discrimination Response to Negative Stimulus	Motor Accuracy
DSOMCOM		Motor Commission
DSOVACC		Verbal Accuracy
DSOVCOM		Verbal Commission
DSOVOMI		Verbal Omission

TERM Matching Familiar Figures Test Errors

TIME Matching Familiar Figures Test Response Time

SSACC	"Simon Says"	Accuracy
COM		Commission response
OMI		Omission response
DDACC	"Do and Don't"	Accuracy
COM		Commission response
OMI		Omission response

Appendix 44 (Con't)

DRL	Differential Reinforcement of Low Rate Behaviour	
DRLABA	First DRL experiment	Baseline interresponse time
DRLALRN	First DRL experiment	Learning Index
DA2TSC	DRL-2	Time SCore
DA2EF1	DRL-2	Efficiency Index 1
DA2EF2	DRL-2	Efficiency Index 2
DA6TSC	DRL-6	Time Score
DA6EF1	DRL-6	Efficiency Index 1
DA6EF2	DRL-6	Efficiency Index 2
DA12TSC	DRL-12	Time Score
DA12EF1	DRL-12	Efficiency Index 1
DA12EF2	DRL-12	Efficiency Index 2
DRLBBA	Second DRL experiment	Baseline interresponse time
DRLBLRN	Second DRL experiment	Learning Index
DBEF1		Efficiency Index 1
DBEF2		Efficiency Index 2
DBIRT		Interresponse Time reached
NTRS-G	New Teacher's Rating Scales	"Good" subscale
E		Extraversion subscale
N		Neuroticism subscale
P		Psychoticism subscale