

A FIELD-DESCRIPTIVE AND EXPERIMENTAL STUDY OF VERBAL
BEHAVIOUR IN ONE YEAR OLD CHILDREN

by

Elza Marilene Stella

Thesis presented in the University of London for the
Degree of Doctor of Philosophy in the Faculty of Science

November 1974

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ABSTRACT

This investigation consisted of field-descriptive and experimental analysis of young children's verbal behaviour, aiming at the identification and description of parental verbal stimulation and assessment of reinforcement variables. Five 21-month-old children and their respective mothers participated in the field-descriptive study. Observational sessions were carried out at the subjects' home and in a playroom; the situation was one of free-play. Verbal behaviour was taped; non-verbal behaviour was recorded according to selected categories. The audio-tapes were submitted to a technique designed to record the kind and frequency of utterances and the temporal interval between them. The interactive sequences of mother-child utterances were analysed with regard to these three aspects. Indices were computed to describe the characteristics of the patterns of interaction with regard to maternal verbal behaviour and to the child's verbal performance. The results indicated relationships among the categories and descriptive indices of maternal behaviour and the child's speech: 1) the frequency of the child's verbalisations did not relate to the total amount of maternal verbal output in itself but to the mother's utterances which consisted of a direct response, within 4 sec, to the child's previous utterance; 2) the child's usage of speech correlated with the degree in which the mother responded selectively to the child's utterances; 3) the mother presented different verbal responses as consequences to the child's utterances, which had significant differential effects on the child's verbal performance as related to initiation, maintenance and ending of verbal chains of interaction. Two out of these five children participated in the experimental study which tested the effectiveness of 'repetition' (plus praise and/or the subject's name) as compared with the effectiveness of a material reinforcer (a small toy) on the emission of "correct utterances" as opposed to "incorrect utterances". The verbal reinforcer was delivered by a 'talking clown' and the material reinforcer by feeder. The results indicated that the verbal reinforcer was relatively more effective in controlling the subjects' rate of 'correct' verbal responses. When reinforcement was delayed the main effect observed was the decrease of rate of responses during the verbal periods to a level similar to that observed during the periods of contingent material reinforcement. The results were discussed within a reinforcement theory framework, and suggestions concerning certain methodological requirements to analyse parental stimulation in relation to children's language development were presented.

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CHAPTER 1

Introduction

1.1 Theoretical Background and Review of the Literature

This dissertation describes a study of some aspects of verbal behaviour in one-year-old children. It aims at the identification and assessment of the specifics of environmental stimulation on the child's usage of speech, in both natural and controlled settings.

The literature in this field mainly consists of experimental studies, built around the operant conditioning paradigm, and of naturalistic studies, identified with developmental psycholinguistics. These studies differ enormously in the way they approach the problem, the questions they ask and the methodology they use, and, with no surprise, the results they report are contradictory as concerns some common variables they focus.

I do not intend to oppose them from a philosophical point of view and discuss their discrepancies, since this would be out of the aim of the present work. I will only discuss their contribution and/or shortcomings as far as the assessment of environmental stimulation in relation to language development is concerned.

The general aim of the naturalistic studies has been to achieve an adequate description of the child's linguistic competence, which might lead to the understanding of how language is acquired and developed. Samples of speech have been taken from one or more children over different periods of weeks or months, in order to cumulate a sizeable corpus of utterances. The cumulated corpus of utterances has been analysed either with the purpose of writing a grammar for the utterances obtained (Braine, 1963; Brown and Fraser, 1963; Miller and Ervin, 1964 and several further studies summarised by Brown, 1973), or with the purpose of describing the emergence of a particular grammatical system as it is produced at different times during the child's development (Bellugi, 1965; Brown, 1968; Brown and Bellugi, 1964; Cazden, 1968; Fraser, Bellugi and Brown, 1963; Miller and Ervin, 1964).

From these studies, children's linguistic performance has been described with regard to development of syntactic structures and morphological inflections. The standardised use of mean length of utterance (MLU) as a measure of development has allowed the comparison between children from different studies. From such comparisons certain basic observations have been reported: a) similarity between children in the order of acquisition, from simple to gradually more complex forms

of utterances (Braine, 1963, Brown and Bellugi, 1964; Miller and Ervin, 1964); b) some evidence in such similarity of a cross cultural constant (McNeill, 1966; studies summarised by Brown, 1973 and by Slobin, 1971); c) regularities in deviations from the adult's speech for some patterns of syntactic and morphological inflections (Brown and Bellugi, 1964; Ervin, 1964; Miller and Ervin, 1964).

Among the social factors which might affect language development, some attention has been given to the characteristics of the patterns of interaction in which the child is engaged. In this respect, the child's linguistic performance has been analysed, in relation to the mother's, or adult's, speech to which he is exposed, with the focus on the acquisition of linguistic rules and use of linguistic structures. The analyses, processed from the corpus of utterances collected, have been almost exclusively based on correlation data. Some descriptive evidence has been reported concerning the possible functions of imitation (Brown and Bellugi, 1964; Brown and Fraser, 1963; Ervin, 1964, Miller and Ervin, 1964), social reinforcement (Brown, Cazden and Bellugi, 1968; Brown and Hanlon, 1970) and parental expansion (Brown, et al, 1968; Cazden, 1965).

There seems to be a general agreement that children do imitate their parent's speech. However, Brown and Fraser (1963) and Brown and Bellugi (1964) reported that the child's imitations are 'reductions' from the adult verbal form, as characterised by the 'telegraphic speech'. In spite of their statement that the child's reductions contain the verbal forms (contentives rather than functors) stressed on the mother's sentences, Brown and Bellugi conclude that children are able to understand and construct sentences which they have never heard but that are well-formed. Therefore, imitation cannot be the process at work on the child's progressions. This is extended by Ervin (1964) and Miller and Ervin (1964) who found no differences in the grammatical organisation of children's imitations and spontaneous speech and also reported children as regularising irregular plurals, simply by adding a 's', which indicates the production of an inflectional pattern unlikely to be modelled by adults or parents.

These data have been considered as evidence against imitative mechanisms on language acquisition, since they meant that children were producing a language apparently different from that they were exposed to. One should, however, consider that, first, the grammaticality of imitations and non-imitations and of the 'telegraphic speech' was assessed on the basis of the grammar written for the children's speech and there is not, yet, a general consensus about what should be an adequate grammar (Braine, 1971; Brown, Fraser and Bellugi, 1964). Second, it is not clear why the

errors made by 'overgeneralisation' of new patterns of speech should outweigh an imitative mechanism. In spite of careful descriptions of the linguistic systems focused, the child's verbal performance has not been described in enough detail to allow the observation of gradual changes over successive emissions of the same system, or class of utterances. As yet, the order of changes described is too rough to allow considerations about the accuracy of the imitative response. One knows that the difficulties to define and limit a verbal response are great (Salzinger, 1973; Skinner, 1957) and this should be taken into account in the assessment of imitative responses and imitative mechanisms.

This misleading way of assessing parental, or adult's, stimulation is also noted in the analyses aiming at evaluating the role of social reinforcement in the child's progressions to mature verbal forms.

One analysis (Brown, Cazden and Bellugi, 1968; Brown and Hanlon, 1970) was concerned with the instances of syntactic correctness followed by parental 'approval' ('that is right', 'correct', 'that is good') or 'disapproval' ('that is wrong', 'that is not right', 'no'). Samples corresponding to the stages II and V of the three subjects used by Brown and collaborators were analysed. The authors reported that 'approval' and 'disapproval' were not presented without reference to the child's speech, but they were linked with the true value of the child's utterance rather than with the grammatical form of the utterance. However, the way in which the analysis was planned seems to be rather inadequate as far as social reinforcement is concerned. The data refer to the stages II and V of the children's development, and there is no detailed description of mother-child verbal interaction to indicate: a) that the selected verbal forms of 'approval' are indeed the ones used by mothers; b) that they act as social reinforcers for all the children; c) that they are as effective as other possible forms of verbal behaviour contingently presented to the child's utterances. Therefore, the contingencies which the authors assumed as possibly operating in mother-child verbal interaction were not found to exist, considering the 'variables' which they selected: approval and syntactical correctness. However, they did not describe the other maternal responses to the instances of syntactical correctness. In this case, the analysis is not even taking into account one basic possibility that any long-term empirical-descriptive study would certainly point out, that is, that the child's behaviour, as well as the maternal behaviour in interaction with him, change as development occurs.

The other form of social reinforcement analysed (Brown and Hanlon, 1970) was related to the 'selective communication effectiveness of the child's well-formed

utterances'. The basic rationale was that parental differential reaction to the child's utterances would be expected to stimulate the progression of well-formed constructions. Parental reactions were categorised in 'sequiturs' ('clearly relevant and comprehending answers') and 'non-sequiturs' ('queries, irrelevancies, misunderstandings, non-responses and doubtful classification'). The child's categories were 'Yes-no, Wh and tag questions and negatives'. They were analysed at the points in which they were immature (stage III) and well-formed (stages IV and/or V). The results gave no support for the notion that a 'communication pressure' could favour mature constructions. However, the same comments about the arbitrary choice of 'stages', as mentioned above, apply here. Besides, if on the one hand, the child's categories were (grammatically) descriptive, on the other hand, the parental categories were basically interpretative. Therefore, the data were relying on the observer's understanding of the particular instance of verbal interchange and on his own evaluation of parental behaviour that would or would not be relevant for the child. They did not present any observational data which could have informed about some parental categories as being more or less 'relevant' to the child. The non-existence of a more objective criterion for categorising the parental behaviours could have been a primary source of biased results in analysing those particular instances of verbal interaction. That seems clear from the authors' comment that 'in some cases the child was talking fast and scarcely seemed to expect or leave time for an answer'. Nevertheless, these results are pointed again and again as negative evidence of environmental stimulation in language development (Cazden, 1971, Brown, 1973; McNeill, 1970).

Another form of consequence presented by parents to the child's utterances was suggested by Brown and Bellugi (1964) as 'expansions', referring to the parental utterances which were filling the missing parts of the child's telegraphic speech. This study stimulated the experiment carried out by Cazden (1965) which provided no support to the notion that 'expansions' could be helpful in the child's grammatical progression, although the study has been criticised as concerns the amount and kind of expansions applied (Brown, Cazden and Bellugi, 1968; McNeill, 1970). Nevertheless, Brown (1973) concludes that all the evidence, both naturalistic and experimental, offers no support for the effectiveness of expansion, and according to Cazden (1971) for the importance of social reinforcement, on the child's verbal development.

It is readily conceded that the naturalistic studies, stimulated by psycholinguistic theories, have reported descriptive-normative data on children's language, and that the descriptions will be of lasting value whenever they rely on observables and are adequately detailed. However, their primary focus and methodology make them

inadequate for identifying and assessing the role of social variables in language development.

The regularities in the child's deviations from adult's speech and the observations of the 'new but adequate' verbal forms (Brown and Bellugi, 1964) were considered as evidence that the child has his own 'system of rules' with which to produce and understand language. Given that both, deviations and new adequate verbal forms, were found not to depend upon parental, or adult's speech, as above described, the notion of 'latent structures' was stressed (Brown and Bellugi, 1964; McNeill, 1966, 1970).

Therefore, departing from a scientific activity which is essential as providing descriptive data on speech development, these studies have overlooked its preliminary character. Generalisations were put forward, stimulated primarily by the formal assumptions of psycholinguistic theory (Chomsky, 1957; 1965) rather than by the empirical evidence concerning the processes assumed to be at work. The non-important role attributed to parental stimulation is, as yet, questioned in the light of the methodology and analyses applied, though Brown (1973) and Cazden (1971) concede that experimental data are required for the evaluation of social variables affecting language development.

Most of the experimental data available up to now coincide with an increasing progression on the application of the experimental analysis of behaviour to the study of emission and development of some language systems.

Several investigations have demonstrated controlling effects of social stimulation over rate and form of vocal and verbal responses within an experimentally contrived setting (vocal responses with infants:- Haugan and McIntire, 1972; Rheingold, Gewirtz and Ross, 1959; Routh, 1969; Tood and Palmer, 1968; Weisberg, 1963: verbal responses with older children:- Loovas, 1964; Meyer, Swanson and Kauchack, 1964; Sherman, 1964; Stella, 1972). Although adding evidence to the reinforcement approach to verbal behaviour those studies were not primarily concerned with the acquisition of specific verbal responses.

The first investigations which reported the effects of training variables on the development of specific verbal repertoires were carried out in clinical or school settings, with children considered as 'autistic' or 'retarded', who had very limited speech repertoires. Basically they consisted of the application of the paradigm of imitation and differential reinforcement, within varied designs according to the verbal response class trained and/or purposes of investigation. The basic training

is usually accomplished in the following way: an object or picture is shown to the child who is asked "what is it?" (or "what do you see?") and is given a short period (3 to 5 sec) to reply; if the child does not reply, or replies incorrectly, the investigator, after a subsequent interval, gives the correct model for the response, followed by another verbal prompt ("what is it?" or "can you say it?"); if the child replies correctly, reinforcement is applied, usually in the combined form of material and social reinforcers (food or tokens and praise or approval). The achievement of the criterion performance by the child determines subsequent steps, or trials, in the training, which vary according to the design of investigation.

One of the first attempts to develop the verbal repertoire of children was reported by ^{VG}Loovas (1967) who worked with 'autistic' children. The programmed training situation was differentiated by a gradually increasing complexity characterised by fading out the physical referents of the verbal models till the presentation of verbal models alone. Loovas reported the acquisition of an extensive verbal repertoire by his subjects, beyond the specific verbal stimuli used in the training situations.

Other investigators have analysed the development of specific aspects of children's language. They have worked with some verbal response classes, characterised as the language systems considered as 'rule governed', which were not observed in the speech of the children used. Those verbal response classes referred to some simple kind of generative language systems related to morphological (plural of nouns, tenses and inflections of verbs) and syntactical aspects (complete and incomplete sentences). Most of the subjects were 'retarded' children; some were very young normal children who did not present the selected verbal response class in their speech. Varied designs were applied to examine the occurrence of the 'novel but adequate' verbal form, and the generalisation of the use of the response class analysed.

From these investigations, consistent evidence showed the establishment of speech repertoires related to plurality (Guess, 1969; Guess, Sailor, Rutherford and Baer, 1968); use of differential inflections of plurality (Sailor, 1969); use of grammatically correct sentences (Fygetakis and Gray, 1970; Wheeler and Sulzer, 1970); use of present and past tense verb inflections (Shumaker and Sherman, 1970). Equally consistent were the results showing the generalisation of the use of the response class studied, beyond the specific verbal stimuli presented in the training. Besides, the controlling procedures (reversion of conditions and multiple baseline) applied to evaluate the effects of the training conditions allowed the observation of

the 'overgeneralisation' of primitive or 'wrong' responses when the correctⁿ training conditions were modified.

If on the one hand, these studies were carried out precisely because the subjects had specific deficits in their verbal repertoire, on the other hand, the characterisation of such subjects as 'autistic' or 'retarded' could be recalled in questioning the generality of those data for the understanding of 'normal' development. However, other investigations, carried out in schools and homes have supported the evidence of the earlier data. They have shown that a structured stimulating context, adequately programmed, can contribute to the acquisition and improvement of the use of some verbal response classes by preschool and young children. However, it should be pointed out that, these studies, where social interaction was involved, (either teacher-child or parent-child), revealed some methodological difficulties in dealing with it.

Hart and Risley (1968) reported the increased use of adjective-noun combinations for preschool children who were using few of them in their verbalisations. Teachers were trained to apply the procedure of imitation and differential reinforcement, which consisted of guarantee of access to play material and of presentation of social reinforcers. It seems that the critical variable was the guarantee of access to play material, though the authors did not discuss the relative efficacy of the social reinforcement applied.

This aspect was analysed into more detail by Reynolds and Risley (1968). They studied the increase in the frequency of a child's verbalisations focusing on the aspects of social interaction with the teacher which could have been related to the child's verbal performance. The results were reported as indicative that social interaction, per se, is a weak reinforcer for young children, and that adults could be primarily important as deliverers of material reinforcers. Although the context of the child's verbalisations could be pointed out as limiting the authors' contention, it is interesting to note that the content analysis of the child's verbalisations revealed that the increase in frequency was mainly due to repetitions of the same kind of utterances.

On the other hand, the study by Whitehurst, Novak and Zorn (1972) points to important aspects of social interaction. They worked with a young child who presented delayed speech, and investigated its development as a function of levels of naturally occurring parental stimulation. Within a baseline reversal design, two categories of parental behaviour were analysed: 'imitative prompts' and 'conversation'. The results showed that a small change in the level of prompts

delivered and of conversation was related to the improvement of the child's verbal repertoire. Besides that the authors reported the occurrence of maternal 'non-differential attention' in relation to the child's verbalisations, and this was related to the inefficacy of attention contingent on the use of new words and phrases for changing the nature of the child's speech.

This consideration is supported by the results reported by Wahler (1969) in his analysis of 'an infant-mother interaction during the first year of life'. The target behaviours were the mother's differential attention and the child's vocalisations, specified as 'old' and 'new' response classes. After a baseline procedure, where both mother and child target behaviours were assessed, the mother was instructed to differentially attend to the child's response classes. The results showed differences in the child's emissions of one or another response class according to the mother's differential attention. However, the baseline data did not show the occurrence of maternal differential attention, even though the child was progressing in the development of his verbal repertoire. As the author suggested, it is possible that the mother was reacting with different kinds of behaviour, which could have different effects on the child's verbal performance. But, his data did not allow to examine this possibility.

A similar deficit is found in the procedure of Hursh and Sherman (1973), concerning the effects of parent-presented models and praise on verbal behaviour of their young children (15-24 months of age). Target responses were selected for analysis and the within-subject design with multiple baseline was applied in three phases: a) parental modelling and praise combined; b) modelling alone, praise alone, praise with repetition of the child's vocalisation, modelling plus praise with repetition; c) uninstructed parents were asked to increase their child's output of a target vocalisation in any way they chose. The results of a) and b) indicated that the condition 'modelling with praise plus repetition' was the most effective for increasing the frequency of the child's emissions of the selected responses. The results concerning the phase c) indicated that the 'procedure' chosen by the uninstructed parents was almost exclusively 'modelling' with very little use of praise. Nevertheless those children were progressing in their verbal development. If the condition 'modelling with repetition plus praise' was found to be the most effective and if uninstructed parents apply 'modelling' with very little use of praise, then: a) how critical is the controlling effect of praise? b) how do parents vary in their responses to the child's verbalisations? c) which are the parental responses that make modelling effective in everyday life?

All these studies have demonstrated that contingencies of reinforcement are important in the production and/or modification of verbal repertoires in both 'retarded' and 'normal' children. Also those studies dealing with 'novel or generative' language systems, in the paradigm of imitation and reinforcement, have stressed the contingency between the verbal response and reinforcement as being the critical independent variable.

However, evidence is still needed to show the effects of modelling and social reinforcement in the early elaboration of vocal and verbal responses in young children, and to determine the separate contribution of each of these procedures. Moreover, apart from the implications contained in these studies concerning the effects of parental behaviour on the elaboration of children's verbal repertoire, there has been no specific analysis of the stimuli presented by parents and of their effects on the children's verbal performance.

In fact, two basic aspects of the studies mentioned so far, may be considered as causing some difficulties for the task of identifying and specifying the kind and effects of the stimuli to which the child is exposed in his everyday life. On the one hand, there has been no special concern about the reinforcing stimuli used. Most of the studies have combined material (food or tokens) and social reinforcement, which has been referred to by the general forms of 'attention', 'praise' or 'approval'. Special concern should be given to the social reinforcers used because of the amount of contradiction and inconsistency noticed in the social-reinforcement literature (Bijou and Baer, 1963; Eisemberger, 1970; Parton and Ross, 1965). The stimuli applied as social reinforcers have been usually imposed over the subject within the experimental setting, and, from what has been reported in the literature, the efficacy of such reinforcers could have been determined by one or more of the following factors: a) the developmental history of the subject (see data by Erickson, 1962; Massari, 1971; Meddock, Parson and Hill, 1971, Steinman, 1968); b) the nature of the stimulus (see data by Rosenham and Greenwald, 1965; Stevenson, 1961; Zigler and Kanzer, 1962); c) the discriminability and immediacy of application (Cairns, 1967; Paris and Cairns, 1972; Ramey and Ourth, 1971; Warren and Cairns, 1972; Weisberg, 1963); d) relativity of its efficacy, as compared with material reinforcers (Hart and Risley, 1968; Haugan and McIntire, 1972; Reynolds and Risley, 1968). Any well-programmed and -applied procedure would guarantee the item c), although one can scarcely find data reporting, for example, the actual immediacy used (Hursh and Sherman, 1973; Stella, 1972). Concerning the other items, one has to assume that the stimuli used, whatever they were, happened to be well chosen. However, it is not clear whether the stimuli applied actually correspond

to the stimuli in the child's everyday life and whether they are the most effective ones.

On the other hand, although the effect of training accomplished through imitation (and differential reinforcement), has been emphasised in producing verbal response classes, the actual stimuli controlling a particular response and its ordering in relation to others, have not yet been ascertained. It is not clear whether the steps prescribed in this training, which define the operations of stimuli, are as critical in determining the child's performance as the specific forms of verbal stimuli used. Therefore, one cannot tell whether the training procedures as described, are operative and effective in the child's everyday life.

Taking these two points together, it seems worth saying that in the social and verbal interaction established between the investigator and the child within the controlled settings, the interactional patterns implicated as critical in promoting the child's verbal responding have not yet been precisely described.

As the child's development processes through his interaction with the environment, in which the parents are the prevalent sources of stimuli during the early years, it seems that the identification of the stimuli involved in the social interaction which parents establish and develop with the child should be a starting point for investigation.

For such, field-descriptive and experimental analysis of the specified attributes of parent-child social and verbal interaction are required, and they should be designed in order to be sensitive to the small changes that a naive observer can notice in the life of a child as he gradually succeeds in the elaboration of more complex forms of verbal behaviour.

1.2 Proposition of the Present Investigation

The results from the naturalistic studies, identified with developmental psycholinguistics, have indicated that during the language development the child shows various structural forms that are gradually changing into other verbal forms more closely approximated to the adult's speech. Concerning the processes involved in such a development, those studies, by minimising the role of environment, appeal to theory construction of special 'causal systems'. However, as yet, those studies have been methodologically inadequate for the task of assessing the environmental stimulation to which the child is exposed and responding.

The results from previous experimental analysis of children's verbal behaviour have shown the control of some verbal responses through reinforcement and the production and development of some verbal response classes through training

procedures involving imitation and differential reinforcement.

Although it must be conceded that these results are far from providing accounts for every aspect of language acquisition, my contention is that the progress of research is better served by an approach that keeps objective operational descriptions and procedures, and values the accumulation of empirical evidence rather than theoretical issues. Therefore, on the one hand, I claim the inadequacy of the naturalistic studies, which have relied on formal-hypothetical devices, to provide further methodological and explanatory contexts for the study of children's language development. On the other hand, I intend to argue that the learning-theoretical accounts are not sufficiently developed to deal with some details of environmental stimulation and its relationships with the child's verbal repertoire. My contention implies that the understanding of children's verbal behaviour and development does not require special construction of 'causal systems' but does require special methodological improvements.

The basic implication suggested by experimental data is that parents exert strong influence on the degree to which their children use immature forms of utterances, after a newly acquired more mature form. In this respect, the lack of differential responding to the child's utterances could possibly retard the development of his speech. The results concerning the generative use of some verbal responses suggest that parents who attend to the child only when he uses more grammatically mature utterances would strengthen the use of all the grammatically similar utterances as a response class, or a linguistic system. However, apart from the importance of reinforcement variables, what about the specific parental stimuli controlling the emission of a new verbal form? One could ask whether the model of training applied in controlled situations is actually operative in the child's everyday life, and whether it is essential to the child's progression on this verbal repertoire. As said before, this training has been consistently reported as effective in producing the child's responding in controlled settings. However, as suggested by Whitehurst (1971, 1972), besides the training conditions, the stimuli controlling the boundaries of the response classes established in the child's verbal repertoire should also be assured. Therefore, in this respect, no specific suggestions have yet been made concerning the role of parental behaviour.

Generally speaking, the development of language can be considered as consisting of gradual transitions from some simple verbal responses, related to some simple stimuli, to more elaborated verbal emissions related to complex arrays of stimuli. This elaboration basically occurs through the verbal social interaction of the child

with his environment, which in our society is practically restricted to parents, in the early years. It seems reasonable to consider that, as the child's development proceeds, the parents are also changing their ways of interacting with the child, so that the patterns of social and verbal interaction established between them will differ at different times of the child's developmental history. The differentiation of these patterns will be characterised by the social and verbal behaviours shown by the parents and by the child and will define the ways in which they are responding (and/or stimulating) to each other. Some of the child's utterances may become less effective in eliciting a parental response and some categories of parental social and verbal behaviour may become more, or less, effective in eliciting a child's utterance.

The knowledge of the patterns of interaction between parents and their children, and therefore, of the stimulation implicated in parental behaviour as important to the child's speech, stresses the need for more exhaustive programmes of research. The starting point of such programmes should be represented by field-descriptive studies in order to assess the variables and/or parameters identified and defined from a given situation rather than arbitrarily imposed to it. This would enable to bring to the laboratory 'copies' of what is the parental stimulation to which the child is exposed and could contribute to the understanding of specific characteristics of the child's verbal repertoire in different points of his developmental history, as represented by the different classes of verbal responses gradually superseded as development occurs.

The present investigation was planned around such considerations. It represents a preliminary attempt of a field-descriptive study focusing on detailed attributes of verbal interaction between the mother and the child, extended to an experimental analysis of two different aspects of reinforcement of the child's speech within a controlled situation. Its purposes were: a) to describe the patterns of verbal interaction between the mother and her child in order to investigate the maternal behaviour which might be related to the child's usage of speech and b) to analyse the child's usage of speech in a situation where some attributes previously described for maternal behaviour could be manipulated according to programmed contingencies of reinforcement, and compared with the effects of 'material' reinforcement.

CHAPTER 2

Field-Descriptive Study : Method

2.1 Specific Purpose

The purpose of this study was to describe patterns of verbal interaction between mother (M) and child (C) in order to identify maternal behaviours which might be related to the child's speech. Categories of verbal and non-verbal behaviour were defined for both M and C. The child's verbal categories were chosen to enable a rough evaluation of his level of development. Criteria were established to define the unit of utterance and to record the frequency of occurrence.

2.2 Subjects

The subjects (S, Ss) were five young children, four boys (S1-4) and one girl (S5) aged about 21 months at the beginning of the study. All the children were firstborns with no substantial health or developmental problems and were from middle class families. They were selected through the help of medical authorities and health visitors from central areas of London (Borough of Camden).

2.3 Setting and Equipment

One part of this study was carried out at the S's home where the living room served as the setting for the observational periods. The living room usually was the play area for C where most of his toys were available to him, and, at the same time, presented the facilities for setting up the recording equipment. Two observers, the mother and, occasionally, the father were present during the sessions.

The other part of this study was carried out in a playroom at the Department of Growth and Development of the Institute of Child Health (University of London). A variety of toys was available to the child in the playroom. It was adjacent to an observation room where the recording equipment was mounted. The observations on C-M were made through an one-way screen between the two rooms. Only mother and child were present in the playroom and when, occasionally, the father came he was invited to stay in the observation room with the observers.

An UHER 5000 Universal portable tape recorder, set at $3\frac{3}{4}$ ips taping speed was used to record the verbal behaviour. A specially prepared tape, recorded with audible signals at ten second intervals, was played in a SANYO portable tape

recorder for timing the recording of non-verbal behaviour. A SONY portable Videocorder was used to take some periods of video-tape in the playroom sessions.

2.4 Observational Sessions and Recording

Four observation sessions were carried out with each S, two at home and two in the playroom, with a week's interval between sessions. The situation for all the sessions was called a free-play situation, in which the mother was asked to interact as usual with her child. The mothers were told that the purpose of the study was to describe the children's play behaviour.

The home sessions were 20 min long during which the Ss' verbal behaviour was taped and non-verbal behaviour was recorded according to the selected behavioural categories, within 10 sec intervals. The start of both verbal and non-verbal recordings was synchronised.

The playroom sessions were 30 min long, with a 10 min break in which coffee was offered to the Ss. The same recordings were made through the one-way screen, and a 5 min period of video-tape was also taken for each 10 min of observation.

The recordings used in the analyses concern the first 10 min for each home session and the first and the second 10 min for each playroom session. Therefore, for each S six 10 min periods were used, except S4 and S5 for whom five and four periods were recorded due to problems with the recording equipment during the first home session and the last playroom session, respectively.

The audio-tapes taken during all the sessions were transcribed and submitted to a recording technique, devised from preliminary analyses of M-C verbal interactions with 14 children aged 21 months. This technique aimed to record the temporal intervals in which the utterances occurred (either M-C and C-M or M-M and C-C) and the kind of utterances. It consisted of ascribing M's and C's utterances to the defined verbal categories and of applying criteria to record the unit and frequency of utterances.

The categories for M's utterances and their definitions were the following:

- a) attention (AT) : a non-word utterance presented by M, for example : "mm?"; "anham"; "unhum".
- b) command (CD) : M's utterance which specifies and/or requests a non-verbal performance to be enacted by C, for example : "you draw a car"; "empty it on mummy's lap"; "look, put it on this one"; " hold the pencil in that hand".

- c) comment (CT) : M's emission of an elaborated utterance not necessarily related to the content of the C's last utterance, which may or may not present one or more of the verbal forms included in C's utterance. For example, :
 "C: big lorry - M: maybe you'll see a big lorry before we go home"; "C: car - M: that's all you ever do, isn't it? play with cars"; C: lorry, lorries car - M: I wonder if that one will go on, it is much the same"; 'C: for the baby - M: I think the baby is a bit too small to play with them, she doesn't know what to do with them".
- d) expansion (EX) : M's utterance which fills C's previous utterance by adding one or more words (adjective, article, verb, etc.). For example : "C: car - M: it is a big car"; "C: daddy car - M: it is like daddy's car"; "C: nice man - M: it is a nice man"; "C: door train - M: there is a door in the train".
- e) model (MO) : M's utterance which provides the label or the description of any characteristic of the environment, which is focussed by C or presented to him by M. For example : "M: this is a car"; "M: the ball is red"; "M: it is a pink drink". M's utterance is also considered as a model when it implies correction of C's previous utterance. For example : "C: red - M: it isn't red; yellow"; "C: tea - M: it is not tea, it is coffee".
- f) praise (PR) : any kind of M's utterance which implies approval for C's previous utterance. For example : "yes!"; "very good"; "that is right"; "very clever"; "you have said it!"; "great!".
- g) prompt (PV) : M's utterance which is presented in the form of WH questions, such as : "what is it?"; "what is that?"; "what do you want?".
- h) question (QT) : M's utterance which implies an interrogative form but not of the WH type, for example : "would you like to draw?"; "do you want a drink?"; "is the car broken?".
- i) repetition (RE) : M's utterance is the same as C's previous utterance. Usually is followed by any kind of approval. For example : "C: tractor - M: tractor, yes!"; 'C: fire engine crashed - M: fire engine crashed"; "C: this is a cow - M: this is a cow, very good!"

The categories for C's utterances and their definitions were:

- a) onomatopoeics (on): free verbal forms copying sounds of some specific environmental characteristics, for example : sounds emitted by animals or sounds produced by engines (of trains, cars) and actions (like : bang!; splash!; plonk!)
- b) exclamations (ex) : free verbal forms such as :oh!; ah!; ups!.

c) unintelligibles (un) : sound patterns unrecognisable as words or as the above mentioned.

d) intelligibles (in) : recognisable words with most of the accepted adult phonemes. On a few occasions a sound will score as intelligible only because of its context. This could bias some analysis for example in favour of children whose mothers do more prompts, but this bias is likely to be very small, particularly as in the analyses where (on), (ex), and (un) are combined, (on) and (ex) greatly outnumber (un).

Singing was excluded as a category. When it did occur (which was extremely rare) the seconds spent singing were timed and deleted from the total observation period used for analysis (10 min). These deleted seconds were then added at the end of the period to ensure an entire 10 min session that could be analysed.

The unit of utterance for any of the described categories could be a word, phrase or sentence or else the verbal forms implying onomatopoeics and exclamations. Repeated utterances, either by C or by M, were considered as one more occurrence each time they were separated by an interval of 2 sec or more; repetitions of the same utterance within 2 sec were considered as one occurrence, disregarding the number of times they were emitted. Other temporal criteria and categorisations of M's and C's utterances, developed throughout the analyses, will be described in the results' section.

To record the various kinds of utterances emitted by M-C as well as the temporal intervals in which they occurred the following technique was used : 1) a complete one minute tape was played during which a flow diagram was drawn to describe the sequence of M's and C's utterances; 2) the same one minute interval was played back several more times in order to ascribe M's and C's utterances according to the previously defined categories; 3) then, each interval between utterances (either M-C, C-M or M-M, C-C) was timed and recorded. These particular intervals were defined to last from the end of sound production in one utterance to the beginning of a subsequent utterance. While the duration of an utterance was not taken into account, the period between utterances was measured to within a 1/5th of a second; 4) when the flow diagram of the particular one minute was completed in terms of speaker, number and category of utterances and length of temporal intervals, the timing accuracy was checked by listening to the section several times with stop-watch running. These steps were repeated for each subsequent minute of the audio-tape to make up the whole flow diagram, of the total length of each observational period.

A second observer recorded independently M's and C's utterances for seven sessions. Reliability was computed by scoring the agreements and disagreements in ascribing M's and C's utterances to their respective categories. Reliability percentage was obtained by dividing the number of agreements by the number of agreements plus disagreements. The mean reliability obtained for M's categories was 82% (range: 80% to 86%) and for C's categories was 83% (range: 76% to 94%).

was directed to the sequences in which M-C and C-M interchanges were emitted in the temporal continuum, looking for relations of number and kind of C-M and M-C interchanges.

3.1. Delays between M and M-C or C-M

Temporal intervals were recorded for the whole flow of utterances, that is, the intervals between utterances of speaker and listener (M-C or C-M) as well as those between two or more subsequent utterances emitted by the same speaker (M-M or C-C) were recorded.

The intervals that occurred between M-C or C-M verbal interchanges will be referred to as delays in verbal exchanges.

A sequence of M-C or C-M utterances could be constituted by a 1:1 ratio (for example: M-C-M-C...) or by a X:1 ratio (for example: M-M-M-C-M-M-C...) or else by a X:X ratio (for example: M-M-C-C-C-M-M-C...). In the 1:1 instances delays were computed for each interchange. Had X utterances been emitted, either by M or by C, only the last uttered was taken in relation to the first one emitted either by C or by M. This can be exemplified with the following reading of the flow diagram represented in Figure 1:

- C's utterances (a_1), (a_2), (a_3), (a_4) and (a_5) were used to record M's delays in (b_1), (b_2), (b_3), (b_4) and (b_5), respectively;

- M's utterances (a_1), (a_2), (a_3) and (a_4) were used to record C's delays in (c_1), (c_2), (c_3) and (c_4), respectively.

The occurrence of different lengths of delays in verbal interchanges between M-C and C-M are presented in Table 1.

The delays were grouped into 1 sec intervals up to delays as large as 12 sec, since delays larger than 12 sec were rare they were grouped in the interval > 12 sec. One observation from Table 1 is the similarity between children and between mothers in the distribution of delays throughout the intervals. The scores of SE and his respective mother, though smaller because only four observational periods were recorded, show the same tendencies in distribution. As one can see, the

CHAPTER 3

Field-Descriptive Study : Results

The flow diagrams drawn for each observational period recorded for each S were analysed and the individual results were put together for each S. Attention was directed to the sequences in which M-C and C-M utterances were emitted in the temporal continuum, looking for relations of number and kind of C-M and M-C interchange utterances.

3.1 Delays Between C-M and M-C Verbal Interchanges

Temporal intervals were recorded for the whole flow of utterances, that is: the intervals between utterances of speaker and listener (M-C or C-M) as well as those between two or more subsequent utterances emitted by the same speaker (M-M or C-C) were recorded.

The intervals that occurred between M-C or C-M verbal interchanges will be referred to as delays in verbal reactions.

A sequence of M-C or C-M utterances could be constituted by a 1:1 ratio (for example: M-C-M-C...) or by a X:1 ratio (for example: M-M-M-C-M-M-C...) or else by a X:X ratio (for example: M-M-C-C-C-M-M-C...). In the 1:1 instances delays were computed for each interchange. Had X utterances been emitted, either by M or by C, only the last uttered was taken in relation to the first one emitted either by C or by M. This can be exemplified with the following reading of the flow diagram represented in Figure 1:

- C's utterances (a_1), (d_4), (d_5), (i_7) and (k_9) were used to record M's delays in (b_1), (e_2), (g_5), (j_6) and (k_7), respectively;
- M's utterances (b_1), (f_4), (g_5) and (j_6) were used to record C's delays in (c_2), (d_5), ($h_{6.1}$) and (j_8), respectively.

The occurrence of different lengths of delays in verbal interchange between M-C and C-M are presented in Table I.

The delays were grouped into 1 sec intervals up to delays as large as 12 sec; since delays larger than 12 sec were rare they were grouped in the interval > 12 sec. One observation from Table I is the similarity between children and between mothers in the distribution of delays throughout the intervals. The scores of S5 and his respective mother, though smaller because only four observational periods were recorded, show the same tendencies in distribution. As one can see, the

Table 1. Number of Different Lengths of Delays Between M-C and C-M Interactions

Time	Children (M-C)	Children (C-M)
1	81	83
2	22	25
3	13	15
4	15	12
5	12	10
6	10	8
7	10	10
8	9	10
9	10	10
10	10	10
11	10	10
12	10	10
13	10	10
14	10	10
15	10	10
16	10	10
17	10	10
18	10	10
19	10	10
20	10	10
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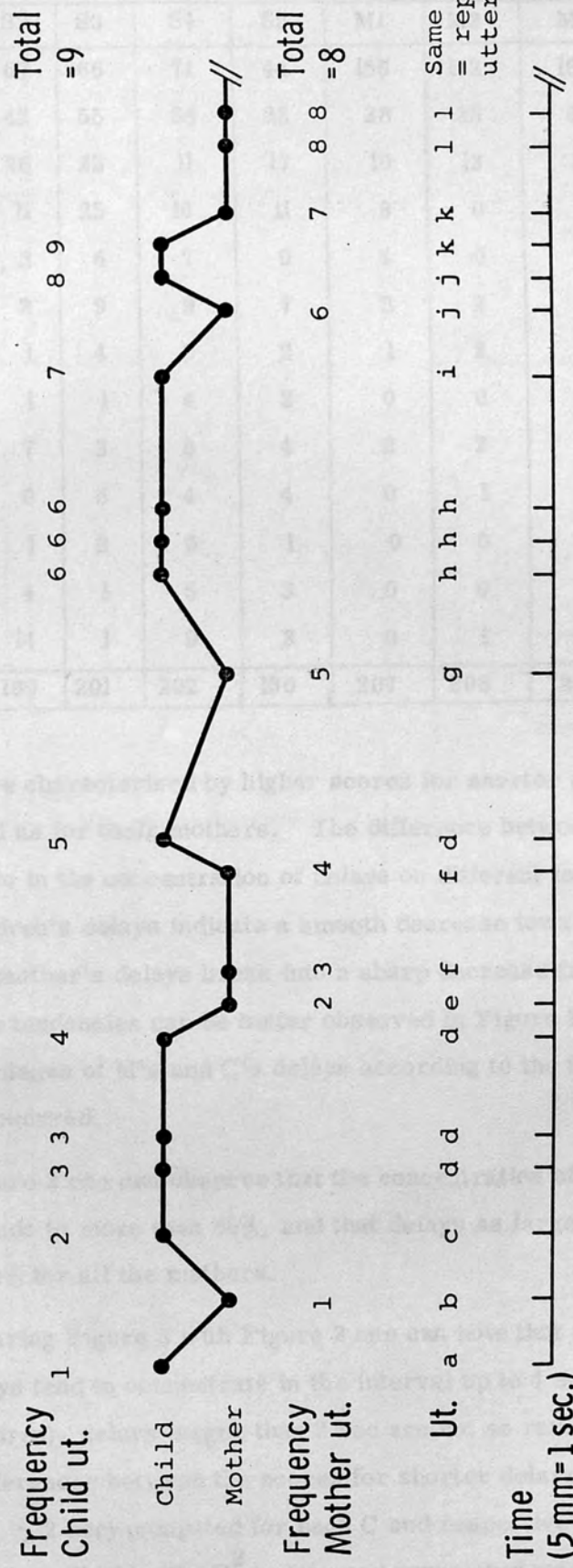


Figure 1 SCHEMATIC REPRESENTATION OF SEQUENCES OF UTTERANCES IN MOTHER-CHILD VERBAL INTERACTION

Table I. Number of Different Lengths of Delays (in sec) Between M-C and C-M Utterances

Time in Sec	Children (M-C)					Mothers (C-M)				
	S1	S2	S3	S4	S5	M1	M2	M3	M4	M5
0-1	62	67	66	71	44	156	152	160	156	97
1-2	42	42	55	56	23	28	35	45	42	25
2-3	25	26	23	11	17	10	13	13	1	9
3-4	19	11	25	16	11	3	0	8	0	4
4-5	12	3	6	7	9	4	0	6	0	2
5-6	9	3	9	9	7	3	2	2	1	0
6-7	6	1	4	5	2	1	2	1	1	1
7-8	5	1	1	4	2	0	0	1	1	1
8-9	2	7	3	5	4	2	2	1	3	1
9-10	4	0	5	4	4	0	1	0	1	0
10-11	1	1	2	0	1	0	0	0	1	0
11-12	5	4	1	5	3	0	0	0	2	1
> 12	10	14	1	9	3	0	1	0	2	1
Total	202	180	201	202	130	207	208	237	211	142

distributions are characterised by higher scores for shorter delays for all the children as well as for their mothers. The difference between children and mothers appears in the concentration of delays on different lengths. While the scores for children's delays indicate a smooth decrease towards longer lengths, the scores for mother's delays break into a sharp decrease from < 2 sec to > 2 sec delays. These tendencies can be better observed in Figure 2 and Figure 3, which show the percentages of M's and C's delays according to the temporal interval in which they occurred.

In Figure 2 one can observe that the concentration of M's delays up to 2 sec corresponds to more than 85%, and that delays as large as 4 sec corresponded to more than 94% for all the mothers.

Comparing Figure 3 with Figure 2 one can note that although the children's delays tend to concentrate in the interval up to 4 sec (more than 73% for all the children), delays larger than 2 sec are not so rare as for mothers. Indeed, the differences between the scores for shorter delays (< 2 sec) and larger delays (> 2 sec) computed for each C and respective M are highly significant, as described by the X^2 values and associated probabilities in Table II.

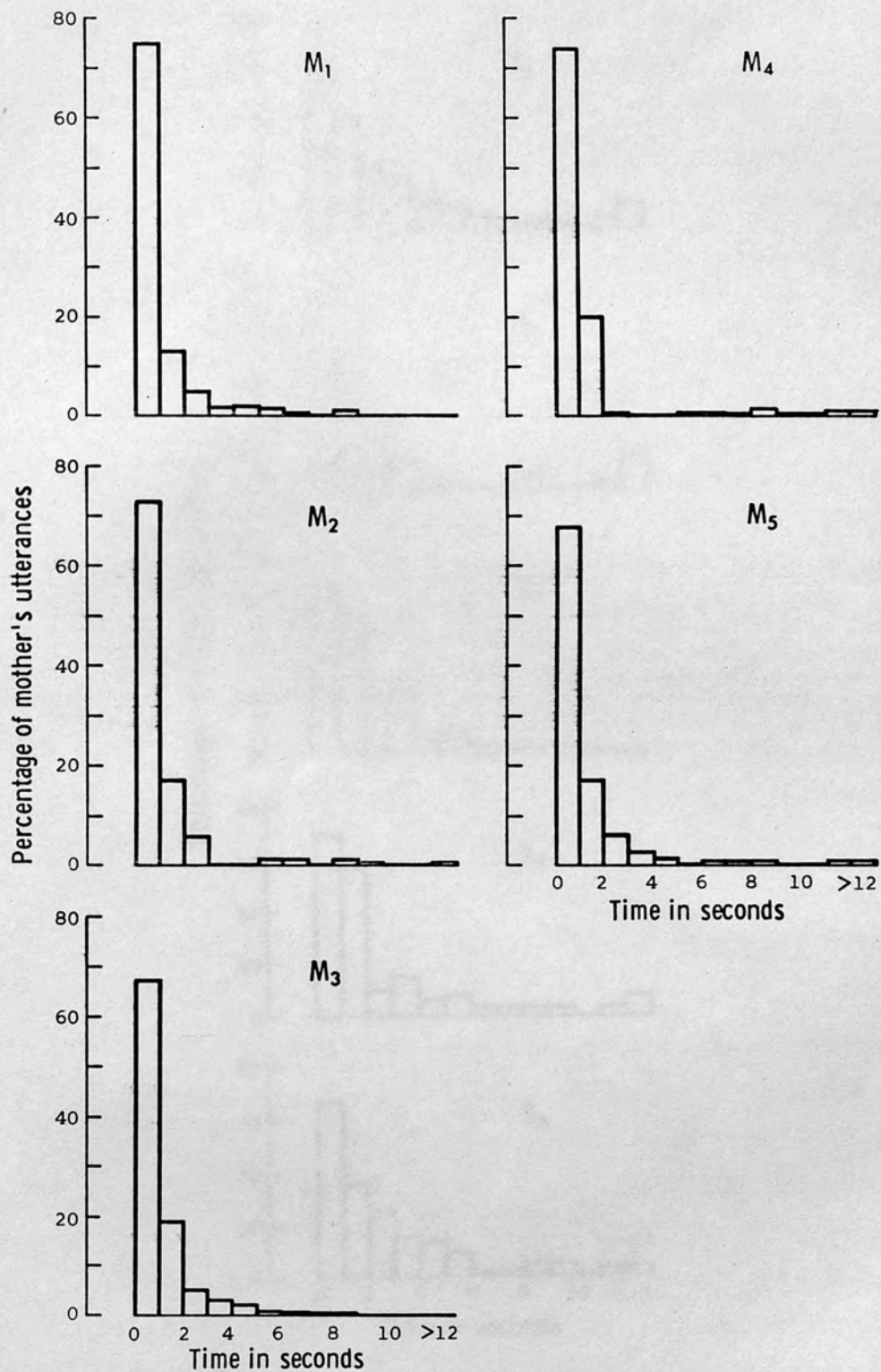


Figure 2 PERCENTAGE OF MOTHER'S UTTERANCES OCCURRING WITH DIFFERENT DELAYS AFTER CHILD'S LAST UTTERANCE

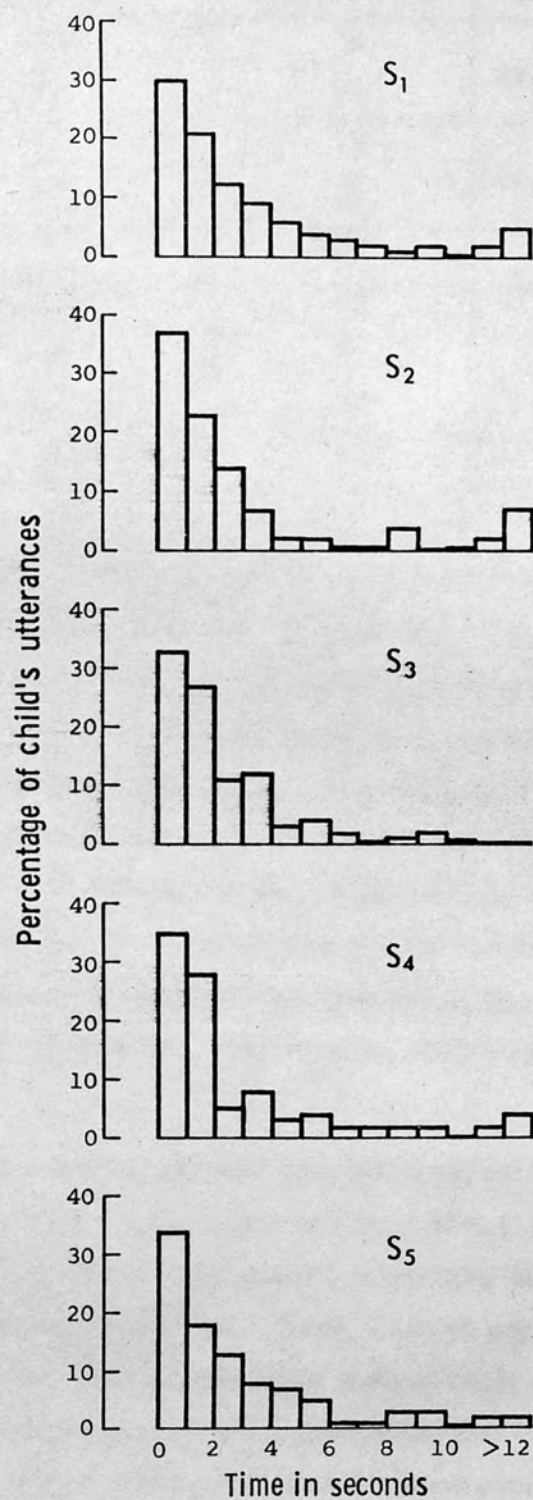


Figure 3
 PERCENTAGE OF CHILD'S UTTERANCES OCCURRING WITH
 DIFFERENT DELAYS AFTER MOTHER'S LAST UTTERANCE

Table II. Differences Between Mother's and Child's Delays

Subjects	Delays < 2 sec	Delays > 2 sec	X ²	p
S1	104	76	47.33	<.001
M1	184	99		
S2	109	71	44.34	<.001
M2	187	21		
S3	121	80	38.17	<.001
M3	205	32		
S4	127	75	57.19	<.001
M4	198	13		
S5	67	63	36.22	<.001
M5	122	20		

It should be remembered that such delays, as defined, refer to the instances in which a verbal interchange (M-C or C-M) occurred. They do not include the intervals between two or more utterances emitted by the same speaker (M-M or C-C). Therefore, the number of such delays does not equal the total number of utterances emitted either by M or by C. Had the ratio of M-C utterances always been 1:1 then it would have been expected that the number of C's delays and utterances were equal and that the number of M's delays was one less than that of M's utterances. Bearing this in mind, the present results indicate that when mothers reacted verbally to their children they did in fact do it very quickly, that is, within 2 sec most of the time. The children had generally a longer time of reaction, 0-4 sec.

This description seems to show an interesting aspect of patterns of verbal interactions between M-C: a quick reaction from M to C and a "delayed" reaction from C to M. I have found no other reports concerning M-C-M reaction time in naturally occurring verbal interaction. Thus, I cannot say whether M's delays are a general adult characteristic or they might instead imply a kind of adaptation to C's pace of verbal interaction. Also, it is possible that C's delays might relate to his developmental stage; however, I have not found comparable descriptions and/or suggestions in the literature for children's verbal reactions at this and/or other points of development.

Before continuing the description of the analyses I would like to point out that the occurrence of delays of different lengths is not related to the duration of an observation. Short delays are as frequent at the end of an observation as at the beginning (c.f. Table III). There is no indication of the change one might expect if C or M was getting tired (or annoyed) towards the end of each observational

period. This possibility was excluded from the present recordings, because, I believe, no specific task was imposed or asked of M or C and the recordings referred to naturally occurring interactions. To illustrate this, Table III shows the means for the delays occurred in the beginning (first minute), middle (fifth minute) and end (tenth minute) of some observational periods randomly chosen for the M-C pairs.

Table III. Mean Length of Delays (in sec) Presented by Child's and Mother's Utterances During the First, Fifth and Tenth Minutes of One Observational Period (O. P.)

S (O. P.)	First Minute		Fifth Minute		Tenth Minute	
	Child	Mother	Child	Mother	Child	Mother
S1 (II)	2.5	0.4	1.85	0.74	1.44	0.63
S2 (III)	1.6	1.0	3.55	0.8	2.5	1.0
S3 (VI)	1.2	0.6	1.7	0.8	1.4	1.4
S4 (I)	9.3	0.7	6.0	0.5	3.3	0.68
S5 (IV)	1.0	1.6	3.0	1.3	4.9	1.2

3.2 Intervals Between Repeated Utterances and the Criterion for "Utterance"

As the whole matrix of verbal interactive sequences was considered and the number of utterances emitted by C and M was to be computed, a criterion for the unit of utterance should exist.

It was said before that an utterance could be a word, phrase or sentence, or the verbal forms consisting of onomatopoeics or exclamations. But it was frequently observed that in sequences of the type C-C-C-M-C-C-M-C..., C usually presented repetitions of the same utterance. In the present analysis a 2 sec temporal criterion was used to record repetitions of the same utterance. Figure 1 illustrates the application of this criterion.

Repetitions of the same utterance, by the same speaker, within 2 sec were counted as one occurrence disregarding how many times they were repeated (c.f. Figure 1, C's: d_3, d_3, h_6, h_6, h_6 ; M's: l_8, l_8). Repetitions were considered as one more occurrence each time the interval between them was > 2 sec (c.f. Figure 1, C's: d_4, d_5 ; M's f_3, f_4). This criterion was not applied when an interchange occurred, that is when M repeated C's utterance (c.f. Figure 1, M's k_7) or when C repeated M's utterance (c.f. Figure 1, C's j_8). Therefore, the same

criterion was used to record both C's and M's repetitions. However, it seemed that when mothers repeated their previous utterance, either they then "waited" more than 2 sec or they "changed" the verbal form. This was one of the reasons for saying before that mothers possibly "adapt" themselves to the C's pace of verbal interaction. It seems that the mothers have learned that C takes some time to respond and they "wait" for that time, before changing the "subject" or insisting over C's response.

3.3 "Attended" Utterances and Utterances per Minute (UT/MIN)

C's utterances followed by a M's utterance within 4 sec were considered as "attended". The total number of utterances emitted by C and by M during all the observational periods are presented in Table IV. The number of C's utterances which were "attended" by M are indicated as well as the proportions of M's verbal output corresponding to those instances.

Table IV. Number of C's and M's Utterances (and UT/MIN) with Indication of Child's Attended Utterances (AT, UT.) and the Percentage of the Corresponding Mother's Utterances

Subject	Child			Mother		
	Total	UT/MIN	AT, UT	Total	UT/MIN	%+
S1-M1	339	5.65	197	353	5.88	60.24
S2-M2	306	5.37	200	359	6.30	60.06
S3-M3	260	4.33	226	639	10.65	36.6
S4-M4	262	5.24	199	384	7.68	57.68
S5-M5	174	4.35	135	271	6.78	55.10

+ percentage of M's utterances, from her total verbal output, which followed C's previous utterance within 4 sec.

Table IV shows that there is not an exact correspondence between C's total of utterances and that of his respective M. For all the pairs, M's frequency is larger than C's, though in different degrees. Looking for relations between them I found that the total number of C's utterances is not correlated with the total of M's verbal output, but it is related to the proportion of M's verbal output that consisted of verbal reactions to the C's previous utterance within 4 sec. As the time of recorded observational periods was not the same for all the Ss, one can better notice the correlation looking at the number of C's utterances expressed in utterances per minute ($r_s : 1.00$).

It is important to remember that those totals refer to the utterances recorded in the whole flow of interactive sequences between M-C. As the totals for M and

for C in each pair are different, and larger for M, they indicate that for each utterance emitted by C there was more than one utterance emitted by M. Considering the 0-4 sec criterion for "attended" utterances emitted by C, it seems that C's participation in the verbal interactive sequences with M depends upon M's quick reaction to C rather than on the total of M's verbal output. This seems to be an important outcome of the present analysis. Contrary to the common sense view that talking very much to C would facilitate his verbal development, the present results seem to indicate, at least at this age of C, the speed of reaction of M is more important than the quantity of speech. This brief comment will be expanded further on.

As this result is related to the 4 sec criterion I would like to recall the data presented (c.f. Figure 2 and Figure 3) as a support for its objectivity. Nevertheless to examine the possibility of the results being purely an effect due to the 4 sec criterion I worked with all the recorded periods of S1 and S3 analysing M's verbal reactions to C's utterances and vice versa, with a 3 sec criterion. The results showed the following differences from the results of the 4 sec criterion analysis: 2% for the mother's reactions (M1 and M3); 7% and 13% for the children's reactions (S1 and S3, respectively).

According to Table IV the S who presented the smallest total of utterances (and UT/MIN), S3, is the one whose M presented the largest amount of verbal output. It could be possible that by talking most of the time she was not allowing "enough time" for C to speak. In order to find out if C's frequency of utterances could be limited by such a factor, I computed M's utterances (in sequences M-M) separated by more than 4 sec which were not followed by C's utterances and M's utterances (in sequences M-C) which were followed by a subsequent C's utterance after 4 sec. The results are shown in Table V.

Table V. Number of Mother's Utterances (and UT/MIN) Separated by > 4 sec from the Mother or Child's Subsequent Utterance

Subject	Total	UT/MIN
M1	99	1.65
M2	98	1.75
M3	148	2.46
M4	115	2.3
M5	83	2.07

M's utterances separated by more than 4 sec, in terms of UT/MIN are negatively correlated with C's frequency of utterances ($r_s : -.90$). S3 who presented the smallest total of verbal output had the largest number of intervals longer than 4 sec after M's utterances and he did not use them, that is he did not speak in those instances. The same can be said concerning the analysis with the 3 sec criterion, where the differences in results were about 3% for S1 and 11% for S3. In such case it would seem that the different numbers of utterances recorded for the children in the interactive sequences with their mothers might be related to C's actual use of speech, or in other words, to the level of its development. To examine this possibility I worked on the description of C's recorded speech.

3.4 Characterisations of C's Verbal Performance

One usual index to measure children's verbal performance at different points of development has been the Mean Length of Utterance (MLU). I computed it for each C's recorded utterance. For such a computation I used the transcriptions made from all the audio tapes of each C. I did not consider the utterances constituted by unrecognisable verbal forms.

Another index was worked out from the categories I used to record C's utterances. C's utterances ascribed to the categories "onomatopoeics", "exclamations" and "unintelligibles" were labelled "incorrect" utterances (IUT); the utterances ascribed to the category "intelligibles" were labelled "correct" utterances (CUT). In neither case (CUT or IUT) is any grammatical connotation implied. An index to describe the proportion of "correct" utterances was computed by dividing the number of "correct" utterances by the total of "correct" plus "incorrect" utterances.

Table VI shows the values of MLU and the proportion of "correct" utterances (CUT/CUT + IUT) for each C as well as of UT/MIN.

Table VI. Mean Length of Utterance (MLU) and the Index "Correct Utterance/Correct + Incorrect Utterances" (CUT/(CUT + IUT)) with the Indication of UT/MIN for Each Child

Subject	MLU	$\frac{CUT}{CUT + IUT}$	UT/MIN
S1	2.44	0.90	5.65
S2	1.95	0.82	5.37
S3	1.35	0.56	4.33
S4	1.44	0.73	5.24
S5	1.42	0.79	4.35

It is noticeable in that Table that the values of MLU are positively correlated with UT/MIN ($r_s : 1.00$) and with the proportion of "correct" utterances emitted by each C ($r_s : .90$).

If one can consider these measures as indicative of differences in the children's speech, it is interesting to remember the first description of section 3.3 : frequency of C's utterances correlates with the proportion of M's speech which consisted in replies to C's utterance within 4 sec.

3.5 Relations Between M's Verbal Reaction and C's Verbal Performance

Figure 2, by describing M's delays, suggested a very distinctive maternal behaviour in the verbal interactive sequences with C : either to reply to C's utterance very quickly or not to reply at all.

One could ask if the differences between the children in the described aspects of their speech could be somehow related to M's verbal reactions to C's utterances. To answer this I examined M's replies in order to find out if they were, in some way, "correcting" C's utterances. By "correction" is meant M's verbal response to C's utterance which implied the verbal forms "no" or "that is wrong" (very rarely recorded, if any), followed by emission of the adequate form. Table VII shows that such instances of M's replies were very rare for all Ss.

Table VII. Mother's Corrections of Child's Utterances

Subject	Corrections	
	Number	Kind
S1	10	noun (3); adjective (5); verb (1); plural (1)
S2	8	noun (8)
S3	13	noun (12); plural (1)
S4	7	noun (5); plural (1); preposition (1)
S5	6	noun (6)

Such a kind of maternal behaviour could not possibly relate to the children's use of one or another type of utterances (CUT or IUT) nor to the children's use of more complete phrases or sentences (MLU). In any case I believe it is unrealistic to expect mothers to correct or provide C with a specific verbal reply for every immature verbal form. The present data reported an average of 5 UT/MIN for all the children and 7.5 UT/MIN for all the mothers. Where 12 utterances are emitted per minute, it seems difficult, if not impossible, to think of the mother as consistently "correcting" or insisting on the child's progression from one to another form of utterances.

It seems quite reasonable to think of parents saving this phenomenal effort in making the child use progressively more mature verbal forms, by consistently ignoring some utterances while reacting to others, a possibility steadfastly overlooked by opponents of an operant approach to language development.

The results presented so far are compatible with this possibility. A way to examine it further could be to analyse M's verbal reactions (R) and non-reactions (NR) to C's utterances. Since the data shown in Table IV indicated that not all C's utterances were attended by M, I proceeded to see whether those mothers had somehow established "when" to reply to C's utterances.

As defined by the categories used to record C's utterances, M could react or not to: onomatopoeics, exclamations, unintelligible and intelligible utterances emitted by C. M's reactions and non-reactions were computed for each of these categories. For the purpose of verifying the differences in the proportions of such maternal behaviour according to C's previous utterance, I organised a 2 x 2 contingency table. As before, the categories "onomatopoeics", "exclamations" and "unintelligibles" were grouped under the label "incorrect" utterances (IUT) and the "intelligibles" under the label "correct" utterances (CUT). Such contingency table with the X^2 values is presented in Table VIII.

Table VIII. Mother's Reactions (R) and Non-Reactions (NR) to Child's Correct Utterances (CUT) and Incorrect Utterances (IUT) with the Respective Values of X^2 and "C"

Subject	M's R NR	CUT	IUT	X^2	p.	"C"
S1	R NR	184 120	13 22	6.12	<.02	0.14
S2	R NR	176 76	24 30	11.57	<.001	0.20
S3	R NR	125 20	101 14	0.04	<.90	0
S4	R NR	150 42	49 21	1.44	<.30	0.07
S5	R NR	105 33	30 6	0.50	<.50	0.05

As can be seen from Table VIII the proportion of C's utterances that was followed by M's reactions differed significantly for "correct" and "incorrect" utterances in the case of S1 and S2. Recalling from Table VII, these were the Ss who presented the larger values of MLU, CUT/(CUT + IUT) and UT/MIN.

The Contingency Coefficient C (Siegel, 1956) computed for the total of C's utterances is also shown in Table VIII. One can observe that the number of the two groups of C's utterances and the proportion of M's reactions and

and non-reactions are significantly associated for S1 and S2 at $p < .02$ and $p < .001$, respectively. The value of this co-efficient decreases with the decrease in the proportion of C's "correct" utterances and equals zero for S3 who presented the smallest proportion of such utterances (c.f. Table VI).

This measure ("C"), since it is associated with the difference in proportions of M's reactions and non-reactions to C's "correct" and "incorrect" utterances, will be emphasised here as an index of M's selectiveness in attending to C's speech.

Taken together these results indicate an important aspect of the patterns of verbal interaction between M-C. They show that M and C interchanges of verbal behaviour were not independent of each other. As far as M is concerned, she was selective in replying to C's utterances. The converse was also true: C's verbal performance differentially related to M's replies. In the following analyses and in Discussion I will take up the suggestion from these results that certain aspects of maternal behaviour during verbal interactive sequences with the child might indeed influence the development of the child's speech, but that the overall verbal output of the mother may give little or no advantage to the child at this age.

3.6 Categories of M's Verbal Behaviour as Related to C's Subsequent Utterances

I proceeded to examine whether the kind of utterance presented by M would affect a subsequent verbal emission by C. Figure 2 suggested a very distinctive behaviour for M, either to react very quickly to C's utterances or not to react at all. Figure 3, on the other hand, suggested an "oscillation" in the latency of C's reactions to M's utterance, though there was a concentration between 0 and 4 sec. To analyse such an "oscillation" I studied the types of utterances emitted by M which were followed by C's utterances with delays shorter or longer than 4 sec.

As shown in Figure 4, the results of such an analysis indicate that some of the M's categories were consistently followed by C's subsequent utterances with longer delays.

These results suggested to me that different kinds of M's utterances, as categorised, could have different effects on C's verbal performance (though looking at the Figure is not as impressive as listening to the tape with stop-watch in hand).

The search for such effects led me to the definition and detailed analysis of verbal chains observed in the interactive sequences of M-C utterances.

A verbal chain was defined as the interactive sequence of M-C utterances where no interval longer than 4 sec occurred between any two subsequent utterances

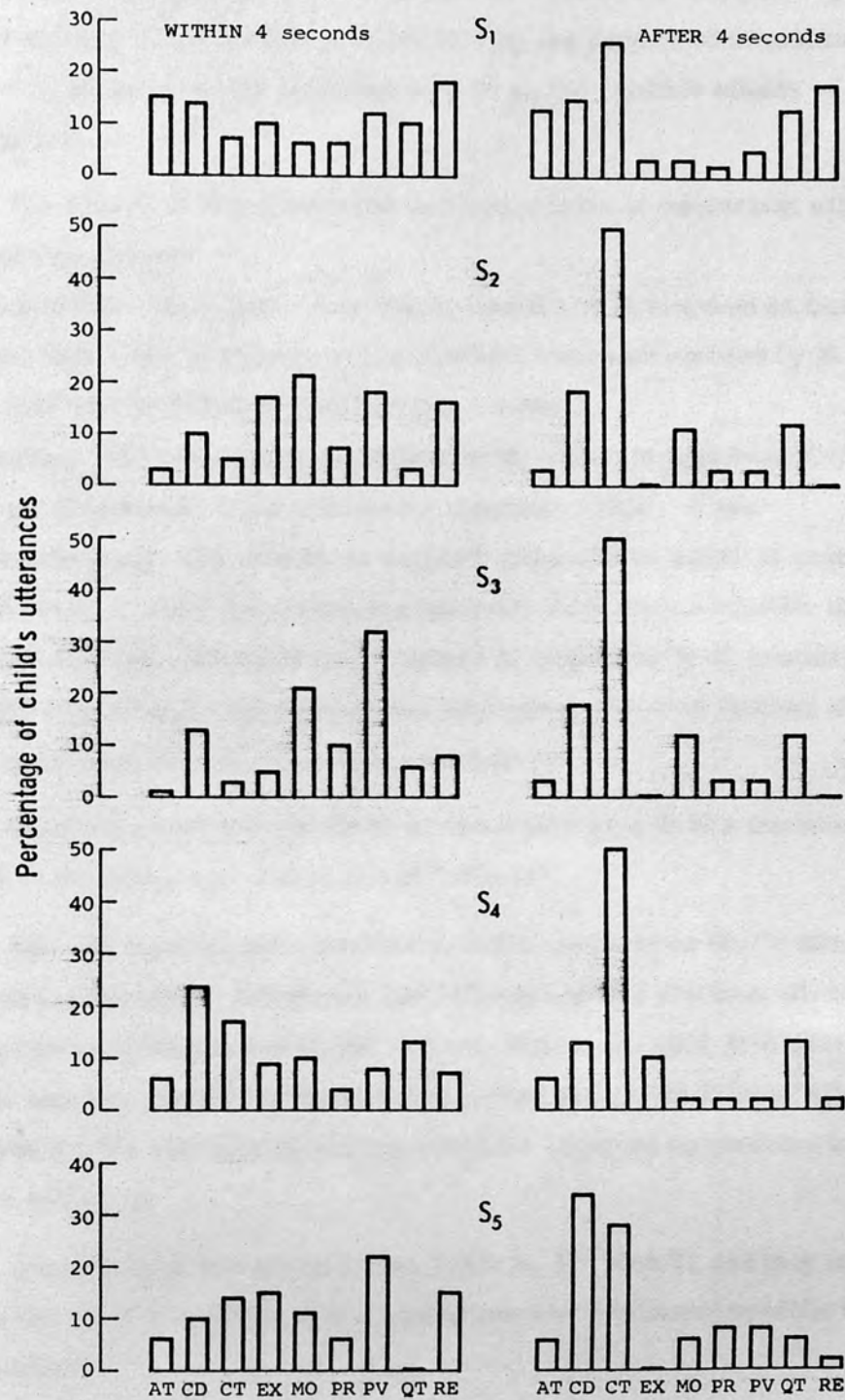


Figure 4 CATEGORIES OF MOTHER'S VERBAL EMISSIONS FOLLOWED BY THE CHILD'S UTTERANCE WITHIN 4 SECONDS AND AFTER 4 SECONDS
(c.f. definitions of M's verbal categories pp. 18-19).

(M-C, C-M, M-M or C-C). The length of a chain was computed by the number of interchanges that occurred rather than by the number of utterances emitted. Figure 5 illustrates this definition as well as the possible effects of M's verbal categories.

The effects of M's utterances in verbal chains of interaction with her child were defined as follows:

- a) initiating: the utterance currently emitted by M followed an interval (or delay) longer than 4 sec in relation to the previous utterance emitted by M (or by C) and was followed by a C's utterance within 4 sec
- b) ending: the last utterance emitted by M, either in sequences C-M or M-M, was not followed by a C's subsequent utterance within 4 sec
- c) maintaining: M's utterances emitted within chains either in sequences C-M or M-M between which the delays and intervals were always smaller than 4 sec
- d) non-reacted: M's utterances emitted in sequences M-M separated by intervals longer than 4 sec. Therefore these utterances occurred between chains and should not be confounded with "M's ending utterances".

Table IX shows the instances in which each kind of M's utterance occurred in each of the above four categories of "effects".

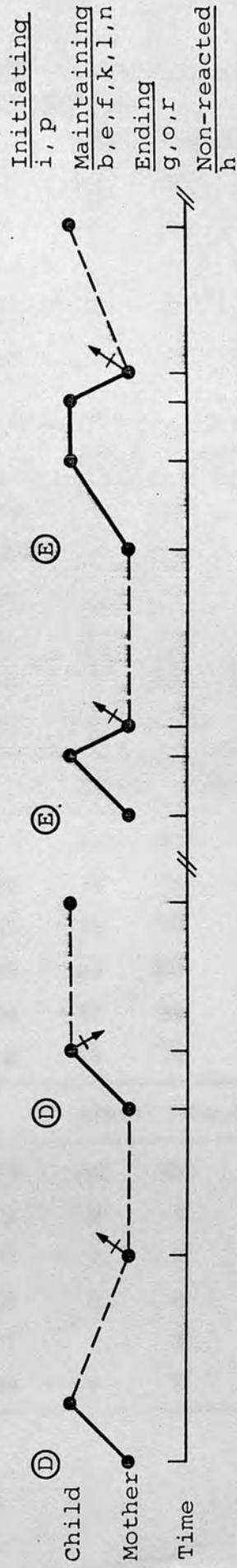
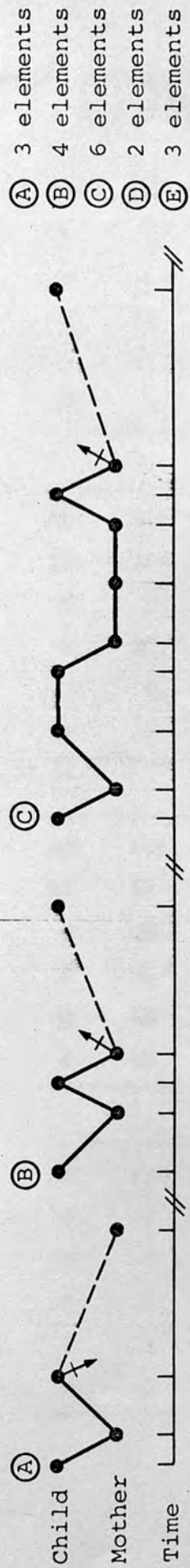
One can observe some tendencies in the proportions of C's utterances as related to the verbal categories and "effects" of M's previous utterances. To describe such effects among the children better, for each M-C pair, a contingency table was organised with the M's nine verbal categories X four "effects", and "z" scores for the standard deviations about the expected frequencies for each table were computed.

These scores are presented in Table X, for each S, and they indicate the differences in proportion of C's utterances which followed specific types of M's utterances.

Such differences, measured by the Cochran Q Test (Siegel, 1956) showed a Q value of 105.97, significant at $p < .0001$.

These data show the primary effect of "prompts" (PV) as initiating; of comment (CT) as ending; of "repetition" (RE), "modelling" (MO) and "expansion" (EX) as maintaining M-C verbal interactions. In addition to the effect of "comment" as ending verbal chains of interaction, the results also show that "comment" was rarely reacted to whenever it occurred.

LENGTH OF CHAINS



'EFFECTS' OF MOTHER'S UTTERANCES

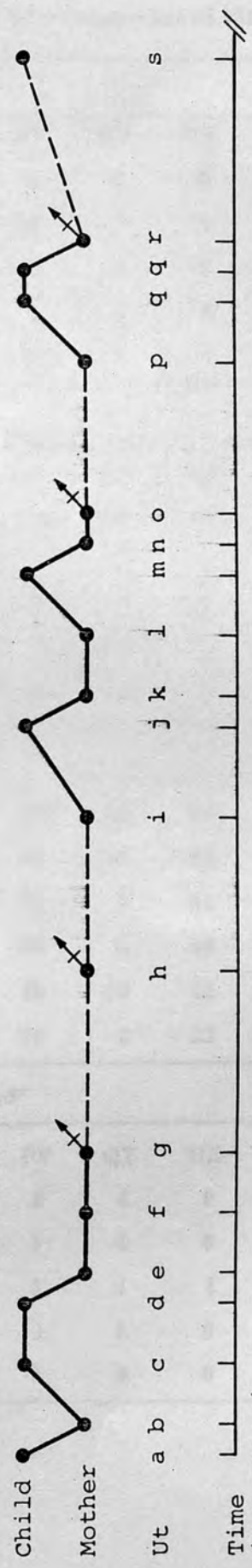


Figure 5 SCHEMATIC REPRESENTATION OF LENGTH OF CHAINS IN MOTHER-CHILD VERBAL INTERACTION AND OF THE 'EFFECTS' OF MOTHER'S UTTERANCES

Table IX. Distribution of M's Utterances Amongst M's Categories of Utterances for the Different Effects

Effect: "Initiating"										
	AT	CD	CT	EX	MO	PR	PV	QT	RE	TOTAL
S1	0	6	4	0	1	1	8	6	0	26
S2	0	4	1	0	5	3	10	0	0	23
S3	0	20	8	0	15	7	27	3	0	80
S4	0	13	9	0	5	3	7	2	0	39
S5	0	5	3	0	4	2	12	0	0	26

Effect: "Ending"										
	AT	CD	CT	EX	MO	PR	PV	QT	RE	TOTAL
S1	11	11	22	5	2	1	2	9	10	73
S2	2	8	30	7	11	2	0	1	6	67
S3	3	17	35	5	12	5	8	4	10	99
S4	7	6	45	7	1	2	2	4	2	76
S5	3	14	21	6	1	1	5	1	2	54

Effect: "Maintaining"										
	AT	CD	CT	EX	MO	PR	PV	QT	RE	TOTAL
S1	23	37	24	18	19	17	14	23	53	238
S2	8	16	12	33	76	10	31	7	45	243
S3	2	61	65	26	100	38	62	11	46	415
S4	11	59	34	27	30	11	10	23	25	250
S5	6	40	11	20	19	12	29	3	22	162

Effect: "Non-Reacted"										
	AT	CD	CT	EX	MO	PR	PV	QT	RE	TOTAL
S1	0	6	13	0	1	0	2	4	0	26
S2	2	4	17	0	2	1	1	4	0	31
S3	0	15	16	0	6	3	4	4	1	49
S4	0	8	27	0	1	0	1	2	0	39
S5	0	9	10	0	2	1	7	0	0	29

Table X. "Z" Scores for the Values in Table IX

Effect: "Initiating"									
	AT	CD	CT	EX	MO	PR	PV	QT	RE
S1	-1.58	0.76	-0.28	-1.27	-0.48	-0.34	4.42	1.73	-2.15
S2	-0.88	1.36	-1.45	-1.60	-0.42	1.95	4.46	-0.88	-1.81
S3	-0.80	1.56	-1.91	-1.97	-0.40	0.14	4.03	0.15	-2.67
S4	-1.36	1.45	-0.78	-1.85	0.64	1.07	3.50	-0.65	-1.65
S5	-0.92	-0.60	-0.63	-1.58	0.96	0.37	3.08	-0.61	-1.51
Effect: "Ending"									
	AT	CD	CT	EX	MO	PR	PV	QT	RE
S1	1.51	-0.40	2.49	0.14	-1.24	-1.47	-1.43	0.14	-0.83
S2	-0.16	0.83	5.61	-0.17	-1.56	-0.57	-2.80	-0.83	-1.14
S3	2.53	-0.12	3.61	0.09	-1.90	-1.12	-1.93	-0.32	0.39
S4	1.82	-2.67	4.66	0.10	-2.33	-0.66	-0.98	-0.86	-1.45
S5	0.90	0.12	4.02	0.36	-1.83	-1.22	-1.71	0.22	-1.27
Effect: "Maintaining"									
	AT	CD	CT	EX	MO	PR	PV	QT	RE
S1	0.21	0.27	-2.61	0.75	1.34	1.27	0.79	-0.86	1.88
S2	0.01	-1.13	-4.39	1.26	1.73	-0.19	0.60	-0.34	1.93
S3	-0.68	-1.37	-1.65	1.36	1.56	0.67	-0.37	-0.84	1.54
S4	0.07	1.04	-4.20	1.47	1.66	0.46	-0.57	1.03	2.20
S5	0.27	0.10	-3.06	1.13	0.88	0.79	-0.48	0.39	2.44
Effect: "Non-Reacted"									
	AT	CD	CT	EX	MO	PR	PV	QT	RE
S1	-1.58	0.76	3.93	-1.27	-0.48	-1.19	0.07	0.58	-2.15
S2	0.94	0.75	5.18	-1.85	-2.15	-0.32	-1.38	2.90	-2.10
S3	-0.61	2.15	2.11	-1.55	-1.32	-0.53	-1.35	1.78	-1.61
S4	-1.36	-0.25	4.48	-1.85	-1.42	-1.27	-0.73	-0.65	-1.65
S5	-0.98	0.64	2.35	-1.66	-0.47	-0.54	0.56	-0.65	-1.61

Therefore, if on one hand the previous data about the proportions of M's reactions indicated M's selectiveness in reacting to C's utterances, these data, on the other hand, indicate C's differentiated reacting to M depending on the type of M's utterance. The selected categories suggest that an M's utterance which closely related to C's previous utterance (e.g. RE, MO, EX) or which clearly cued a C's subsequent utterance (e.g. PV, MO) were more likely to be followed by a C's verbal reaction; the utterances which did not closely relate to C's previous utterance either in form or in content (e.g. CT, QT) were more likely not to be followed by a C's subsequent utterance.

Such effects are, in general, consistent for all the children and the deviations they presented are illustrated by the histograms plotted in Figure 6 for each effect across the children and M's categories, with the described "z" scores.

In reading the histograms it is important to recall the definitions of the effects. That is, "M's initiations" mean C's utterances which followed M's previous utterance within 4 sec; "M's endings", C's utterances which did not follow M's previous utterance within 4 sec; "M's maintaining", C's utterances which followed M's utterances within 4 sec; "M's non-reacted", M's utterances which did not establish verbal chains with the child.

These results stress the previously described interdependence between M-C interactive sequences of utterances. They show that C's verbal performance, in such sequences, was differentially affected by the specific kind of M's utterances presented.

Therefore, taken together, the present results strongly suggest that the attributes of paternal verbal behaviour involved in natural interactions with the child may indeed relate to the child's use of speech. These attributes, as described in the present study are:

- 1) presence or absence of a very rapid verbal reaction to C's utterance;
- 2) selectivity and consistency in reacting;
- 3) the kind of verbal reaction presented;
- 4) the total verbal output of maternal verbal behaviour to which C is exposed.

These attributes, as described for the mothers, seemed to be consistently related to the differences observed in C's speech.

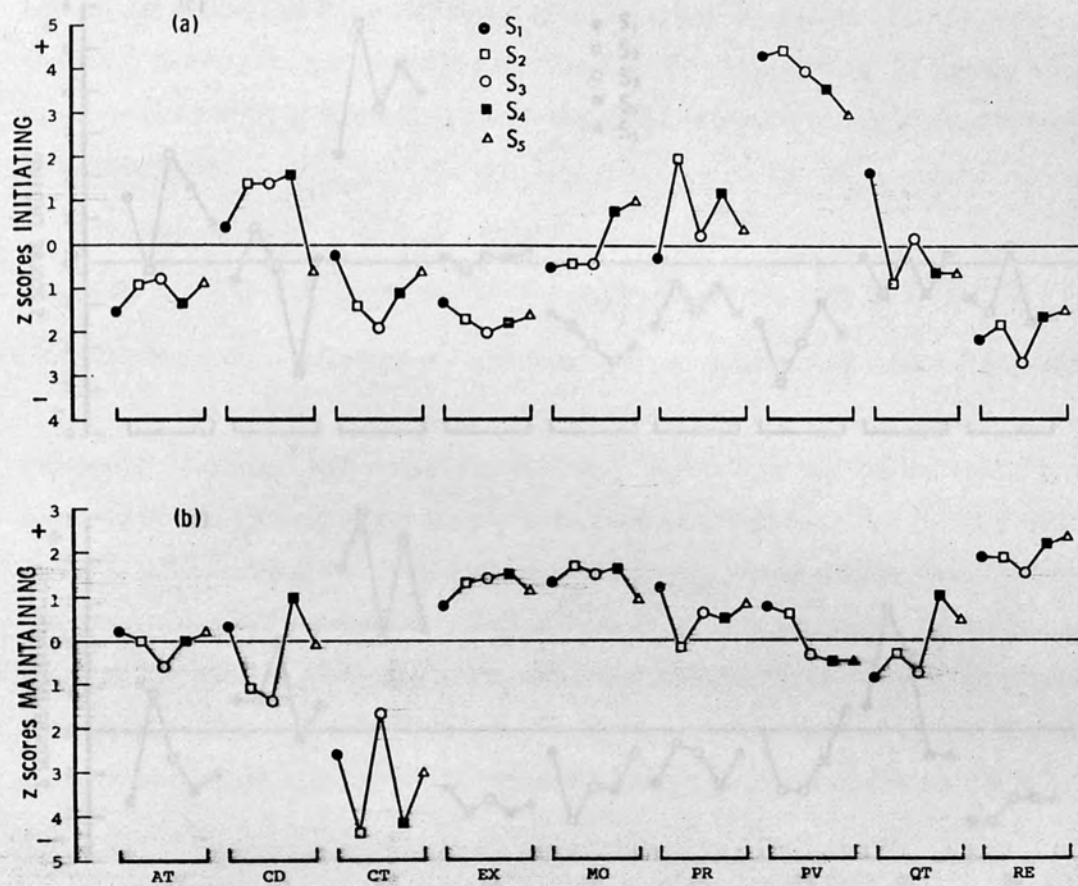


Figure 6 THE 'EFFECTS' OF MOTHER'S CATEGORIES OF VERBAL EMISSIONS

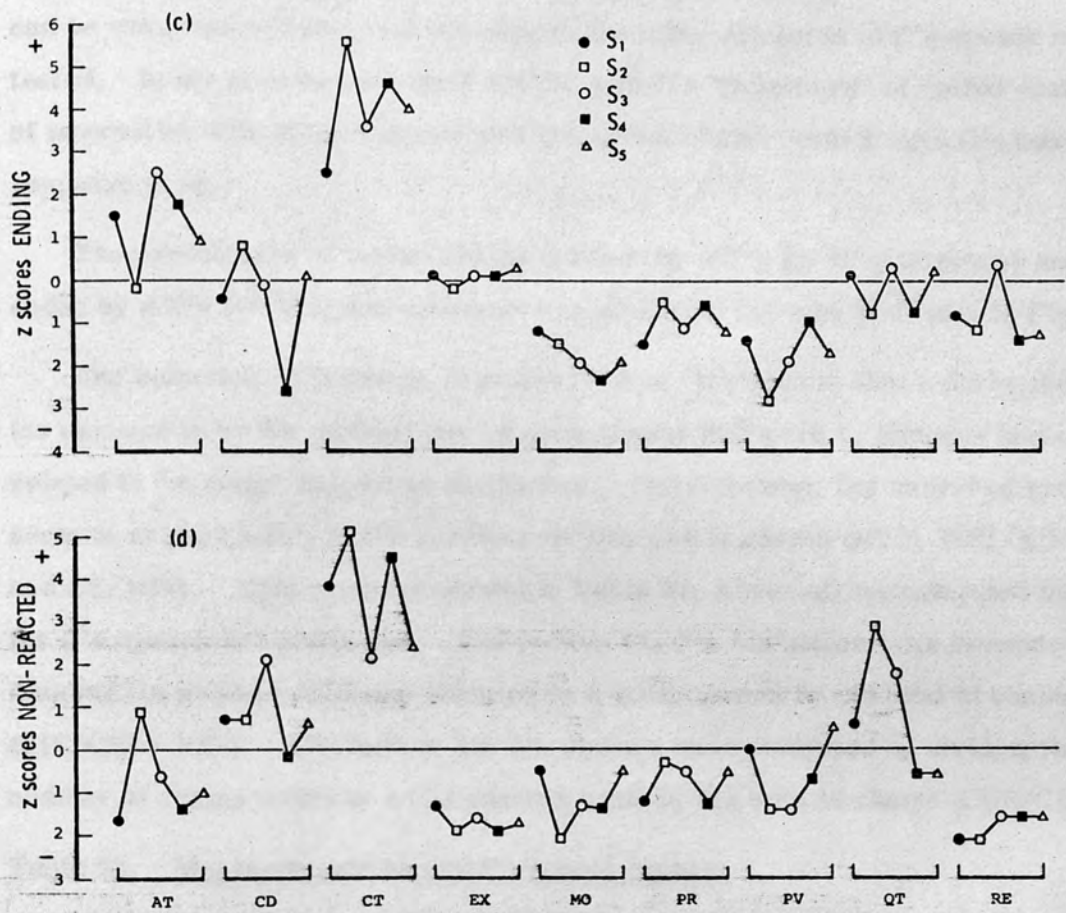


Figure 6 THE 'EFFECTS' OF MOTHER'S CATEGORIES OF VERBAL EMISSIONS

3.7 Two Further Measures of C's Verbal Performance

The categorisations of "effects" (initiating, ending, maintaining and non-reacted) can be just as well applied to the child's utterances. When it is done their occurrence can be examined and their relationship to the other measures of C's speech can be tested. In the present analysis I worked with C's "initiations" of verbal chains of interaction with M to compare with the verbal chains "ended" by a C's non-response to M.

The percentages of verbal chains initiated by a C's (or M's) utterance and ended by a C's (or M's) non-response are presented for each M-C pair in Figure 7.

The individual differences in proportions of "initiations" that were by the child (as opposed to by the mother) can be seen clearly in Figure 7, although those related to "endings" are not so distinctive. Nevertheless, the individual proportions seem to relate closely to the previous indices of C's speech (MLU, CUT/(CUT + IUT) and UT/MIN). This can be observed in Table XI, where all the computed indices for C's speech are presented. The indices for C's initiations were computed by dividing the number of chains initiated by C's utterances by the total of chains (CIN/CIN + MIN). The indices for C's endings were computed by dividing the number of chains ended by a C's non-response by the total of chains (CEN/CEN + MEN).

Table XI. Measurements of Child's Speech (Ranks)

Subject	UT/MIN	MLU	$\frac{CUT}{CUT + IUT}$	$\frac{C'S IN}{C'S IN + M'S IN}$	$\frac{C'S EN}{C'S EN + M'S EN}$
S1	5.65 (1)	2.44 (1)	0.90 (1)	0.766 (2)	0.658 (1)
S2	5.37 (2)	1.95 (2)	0.82 (2)	0.768 (1)	0.677 (2)
S3	4.33 (5)	1.35 (5)	0.56 (5)	0.355 (5)	0.798 (5)
S4	5.24 (3)	1.44 (3)	0.73 (4)	0.606 (4)	0.768 (3)
S5	4.35 (4)	1.42 (4)	0.79 (3)	0.618 (3)	0.794 (4)

I expected high indices for C's "initiations" (bigger proportion of initiations are by C) and "endings" (bigger proportion of the endings are due to C's non-response than due to M's) to be associated with "more advanced" or "less advanced" development, respectively.

Since all the measures presented in Table XI were described as indicative of differences in C's speech, therefore I computed the Coefficient of Concordance W (Siegel, 1956) to verify the association between the rankings of the children according to these measures. Their agreement was a W: .96 value, significant at the 1% level. Thus, C's "initiations" and "endings" of verbal chains do seem to relate to the

3.8 Summary of Results

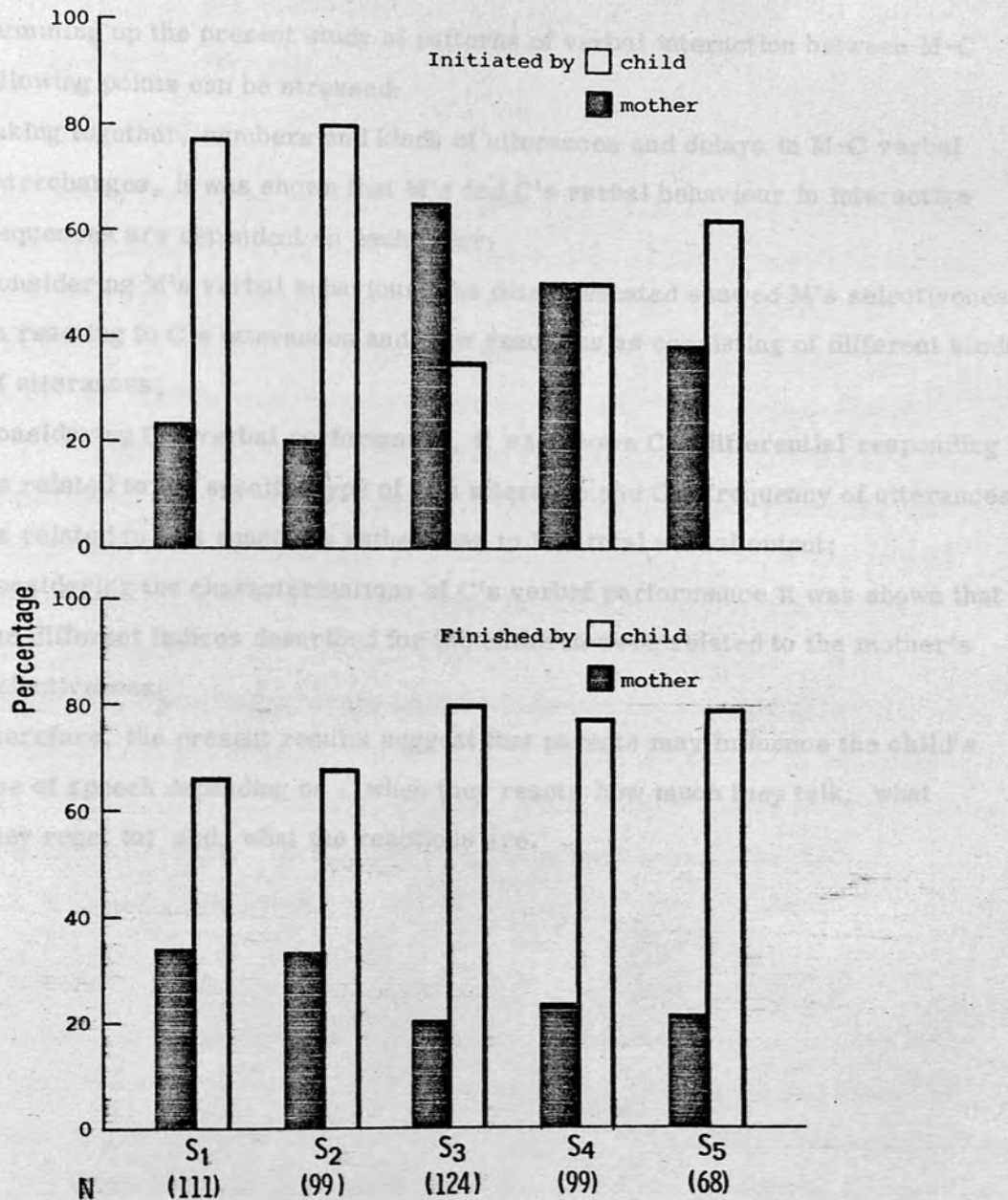


Figure 7 PERCENTAGE OF VERBAL CHAINS INITIATED AND FINISHED BY THE CHILD AND BY THE MOTHER

other measures of his verbal performance in the expected direction.

3.8 Summary of Results

Summing up the present study of patterns of verbal interaction between M-C the following points can be stressed:

- a) taking together, numbers and kinds of utterances and delays in M-C verbal interchanges, it was shown that M's and C's verbal behaviour in interactive sequences are dependent on each other;
- b) considering M's verbal behaviour, the data presented showed M's selectiveness in reacting to C's utterances and, her reactions as consisting of different kinds of utterances;
- c) considering C's verbal performance, it was shown C's differential responding as related to the specific type of M's utterance and C's frequency of utterances as related to M's reactions rather than to M's total verbal output;
- d) considering the characterisations of C's verbal performance it was shown that the different indices described for the children were related to the mother's selectiveness;
- e) therefore, the present results suggest that parents may influence the child's use of speech depending on : when they react; how much they talk; what they react to; and, what the reactions are.

CHAPTER 4

Experimental Study : Method

4.1 Specific Purpose

The second part of the present investigation sought to analyse the C's usage of speech in a situation where some attributes described previously for maternal behaviour could be manipulated according to programmed contingencies of reinforcement. A class of C's utterances was selected and defined as "correct utterances" as distinct from "incorrect utterances". The maternal verbal category "repetition" was chosen as a kind of verbal social reinforcement to be tested against a kind of material reinforcement. The following reasoning was applied: given a C's emission of a "correct utterance" his performance will be enhanced in conditions where the consequent stimulus relates to that utterance in nature (or similarity) and temporal contiguity (i. e. immediacy). In order to avoid possible effects related to the social interaction between the experimenter (E) and the subject (S), when the reinforcers should be delivered, an equipment (adapted from Baer, 1962) was used so that E would remain absent from the setting. Some decisions about the experimental procedure were based upon the data analyses previously presented.

4.2 Subjects

S1 and S2 served as subjects in this study. They were both 24 months old by the time the sessions started. S3 was not able to participate and S4 and S5 were discarded as subjects after the third session. S4 presented some difficulties in engaging in spontaneous play within the experimental room; with S5 it was impossible to have the mother not interacting with the child, in spite of asking her to avoid doing so.

4.3 Setting and Equipment

The experimental space consisted of a test-room in the Department of Psychology of Bedford College (University of London), converted into a playroom connected with a control room through an one-way screen and an intercomm system. Figure 8 shows schematic representation of the experimental and control rooms.

A clown to present verbal social stimuli and a feeder to liberate small trinkets were mounted in a wooden box ($31\frac{1}{2}$ ins wide x $24\frac{1}{2}$ ins high x 12 ins deep) fixed on the window, 3 feet above the floor. The clown was made of soft-wood

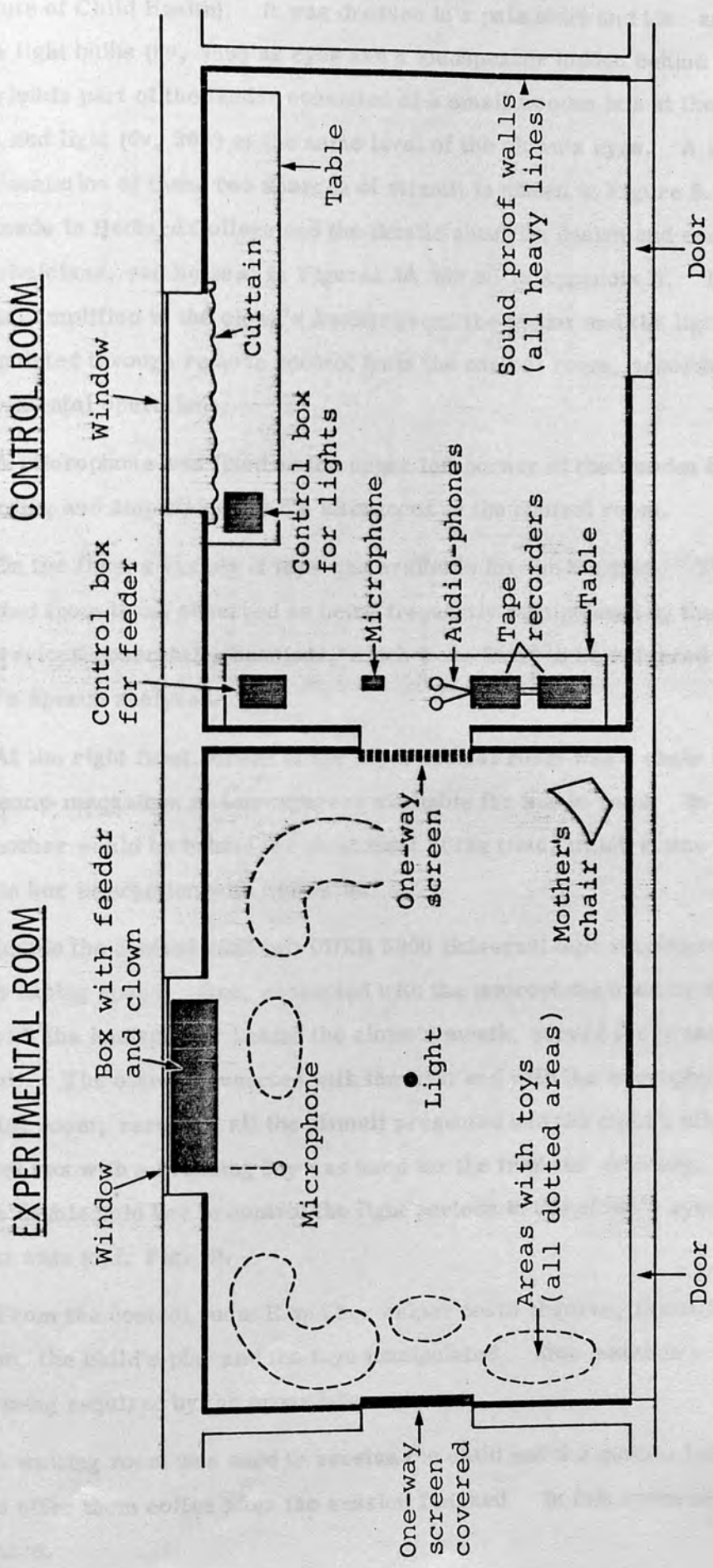


Figure 8 SCHEMATIC REPRESENTATION OF THE EXPERIMENTAL AND CONTROL ROOMS

by Miss Mabel R. Rattenbury (Department of Growth and Development of the Institute of Child Health). It was dressed in a pale shirt and tie and had two green light bulbs (6v, 36w) as eyes and a loudspeaker hidden behind its mouth. The visible part of the feeder consisted of a small wooden box at the delivery hole and a red light (6v, 36w) at the same level of the clown's eyes. A schematic representation of these two sources of stimuli is shown in Figure 9. The feeder was made in Bedford College and the details about its design and controls, drawn by technicians, can be seen in Figures 9A and 9B in Appendix B. The verbal stimuli amplified in the clown's loudspeaker, the feeder and the lights were manipulated through remote control from the control room, according to the experimental operations.

A microphone was fixed on the upper left corner of the wooden box for recording and amplifying the S's utterances in the control room.

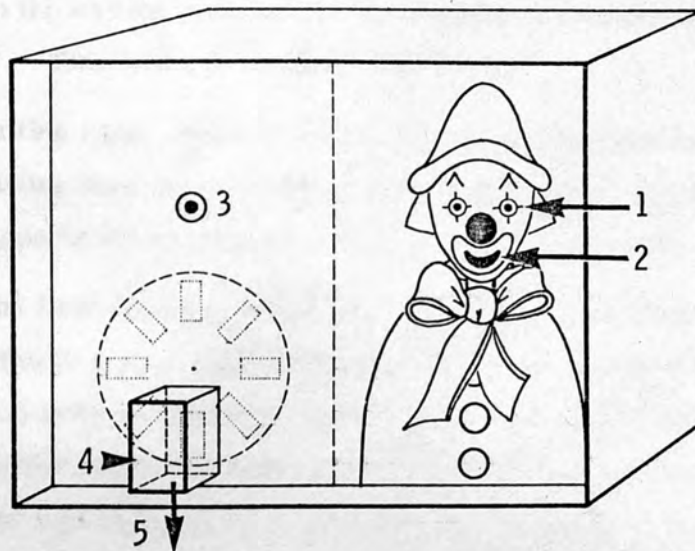
On the floor a variety of toys was available for the S's play. They were selected from those observed as being frequently manipulated by the child during the previous observation sessions, which were found to be referred to in the child's speech analysed.

At the right front corner of the experimental room was a chair for the mother, with some magazines and newspapers available for her to read. In this position, the mother would be behind the child most of the time, which it was thought would reduce her interaction with her child.

Inside the control room two UHER 5000 Universal tape recorders were used at $3\frac{3}{4}$ ips taping speed. One, connected with the microphone used by E's helper and with the loudspeaker behind the clown's mouth, served for presenting the verbal stimuli. The other, connected with the first and with the microphone in the experimental room, recorded all the stimuli presented and the child's utterances. A control box with a pressing key was used for the trinkets' delivery. Close to it was a double pole key to control the light periods in the clown's eyes or in the feeder side (c.f. Fig. 8).

From the control room E and her helper could observe, through the one-way screen, the child's play and the toys manipulated. Stop-watches were used to do the timing required by the procedure.

A waiting room was used to receive the child and the mother before the session and to offer them coffee after the session finished. In this room no toys were available.



FEEDER Material stimuli
(behind the first wall)

3. Red lamp
4. Wood box covering the dispenser hole
5. Hole out of which matchboxes fall

CLOWN Social verbal stimuli

1. Green lamps in the eyes
2. Loudspeaker behind the mouth

Dimensions of the box

- 31½ inches wide
- 24½ inches high
- 12 inches deep
- first wall (clown and feeder) 4 inches deep

Figure 9
SCHEMATIC REPRESENTATION OF THE SOURCES OF STIMULI

4.4 Procedure and Recordings

For all the sessions E waited for M and C in the main entrance of the College. On the way to the waiting room E tried to maintain a friendly interaction with both M and C. This took, in general, 3 or 4 min.

In the waiting room, while M took coats off, E continued to interact with C. The usual settling time here was about 2 min, in which E also informed M about the general aspects of the session and her expected behaviour.

Before the first session, M was told that the interest of the study was to describe the things a child says during his play when two sorts of events could happen and was informed in detail about the equipment and its functioning. M was asked to introduce and to demonstrate it to her child, as well as to call his attention to the toys on the floor. This was done in order to facilitate C's adaptation to the setting. Restrictions on time would not allow E to wait for the possibly longer period of adaptation by C at his own pace.

The demonstration of the equipment consisted of showing C with the lights, the box at the delivery hole of the feeder and the clown, and telling C about what could happen: lights could go on and off; small toys could fall down and the clown could speak. At each step the equipment was properly operated: the lights were switched on and off several times, alternately; some trinkets were delivered; the clown introduced itself through a short dialogue ("hello! how are you? My name is Bobby, what is yours? - C's response prompted by M - Hello, - S's name"). After that M was instructed to leave C playing on his own and to assume her role, that is, do not interact with C and if C initiated any interaction she should react as she pleased, but avoid encouraging C to continue the interaction. In order to facilitate such a performance she was suggested to keep reading during the session.

From the second session on, the demonstration period was suppressed and M was reminded about her behaviour.

The procedure basically consisted of presentation of verbal prompts and, depending on C's response, reinforcement applied with material or verbal social stimuli within alternating periods 4 min long, on average. These operations of stimuli required the previous selection and definition of the C's utterances which would be ascribed to two categories: "correct responses" and "incorrect responses".

The two categories were defined based upon the previous analysis from the observational sessions and they were not intended to imply any specific grammatical restriction or connotation. The category "correct responses" consisted of any

kind of utterance emitted by C which described: a) any aspect (or property) of the currently manipulated toy ("this is a car"); b) the C's own ongoing observable behaviour ("I am sitting down"); c) a product of his play behaviour ("the car is on the truck now"); d) his own body or clothes ("this is my head"; my sweater is white"); e) any observable aspect of the experimental setting ("the clown's got eyes on"; "it (trinket) fall down"). The category "incorrect responses" consisted of: a) onomatopoeics; b) exclamations; c) utterances not understood by E and her helper, including any doubtful instances; d) utterances clearly understood but not related to the description of any currently observable event; this type of utterance seemed to be rare in the S's speech. In any of the described instances the utterance could be a word, phrase or sentence. As in the previous study, singing was not taken into account.

The procedure was applied as follows:

- a) verbal prompts ("what is it?"; "what is that?") were presented according to a variable schedule of 50 sec on average (VI 50"). However the programmed intervals were not always strictly followed since S could not be asked "what is it?" or "what is that?" if he had nothing in his hands at that precise moment, or was not engaged in play. This happened usually during change of toys or of position by S in the experimental room.
 - b) if S did not answer to the prompt, another one was presented in the next interval.
 - c) if S did answer, his utterance was immediately judged, by E and her helper, according to the previous definitions and observation of his play behaviour.
- "Incorrect responses" had no programmed consequences and a new prompt would be presented in the subsequent interval. "Correct responses" were followed either by verbal social or material reinforcement depending on the current experimental period. All the "correct responses" to prompts were reinforced; the spontaneous, or non-prompted, utterances considered "correct" were reinforced in a variable schedule of two responses on average (VR2). This was a rough approximation to what could be considered as the "schedule" observed in mother's reactions in the previous study (c.f. Table IV).

The kind of verbal social reinforcement used was decided on the basis of the observations of M's reactions to some of the C's utterances, and consisted of the category "repetition" plus praise. The E's helper repeated the C's utterance adding one of the following forms: clever boy, that's right; yes!; very good!; and the name of the S at random.

The kind of material reinforcement was selected upon the previous observations

of the C's play and evaluation of his vocabulary. The trinkets delivered consisted of small toys of wood or plastic material of varied colours, forms and shapes. They were small enough to be fixed within match boxes.

During the periods of verbal social reinforcement the green light bulbs in the clown's eyes were on. The red light at the feeder side was on during the periods of material reinforcement. Shifts from green to red lights marked the alternation of the periods. The number of alternative periods in each session varied, depending on the S's performance: three, four or five periods were applied. In general the sessions were 16 min to 20 min long.

With this procedure, seven sessions were run for S1 and four for S2, after which S2 left the study.

After an observed stable performance of S1 during the alternated verbal social and material periods, delayed reinforcement was introduced for both kinds of reinforcers. Given C's emission of a "correct" utterance, the reinforcing stimulus was presented with an average delay of 5 sec (range 4 sec to 6 sec). All the operations but this delay were applied as described before.

One and a half sessions were run with delayed reinforcement and a new stable level was observed in S's performance.

Reversion to the previous phase was then applied, that is immediate reinforcement was reintroduced, in order to observe if S's performance would return to the level presented before delayed reinforcement. This consisted the last experimental session with S1.

All the sessions were run at about 11 a. m. and 3. p. m. ; the same time was maintained for each S, depending on M's convenience.

The audio-tapes of the experimental sessions were submitted to the same technique used in the previous study for recording M's and C's utterances and temporal intervals between utterances. Thus, for each particular minute of each experimental session, the number and category of C's utterances as well as the temporal interval between the reinforcing stimulus and C's subsequent utterance were recorded.

A second observer recorded independently the C's utterances for two sessions, categorising them in terms of "correct" and "incorrect" utterances. Reliability was computed by scoring the agreements and disagreements in categorising each utterance in one or other of the categories. Reliability percentage was obtained by dividing the number of agreements by the total of agreements and disagreements. The mean reliability obtained was 77.5% (range 76% to 79%).

CHAPTER 5

Experimental Study : Results

The utterances emitted by S1 and S2, recorded from the audio-tapes taken during the experimental sessions, were analysed in terms of frequency, according to the defined categories and reinforcement operations. The delays, as defined in the previous analysis, were also measured.

5.1 Rate of "Correct" Utterances

The data of primary interest in this study are the number of "correct" utterances emitted by the child within the alternated periods where the consequences provided were either verbal social (the repetition of C's previous "correct" utterance plus any kind of praise) or material (the delivery of a small toy). In these periods, 4 min long on average, the contingencies of reinforcement were the same, the only difference being the nature of the reinforcing stimulus. I would like to point out that, at the time of the experiment, C had not been instructed about his expected performance (which, even if tried, would indeed be very difficult at this age), and M had not been told about the specific purpose of this study. The "correct" utterances emitted by the Ss in the successive periods of reinforcement will be presented in terms of rate (UT/MIN) of utterances.

Figure 10 shows the rate of "correct" utterances emitted by S1 during each verbal social ($R \rightarrow S^{R+}$ verbal) and material ($R \rightarrow S^{R+}$ material) period of reinforcement, throughout all the sessions.

It can be observed in this figure that "repetition with praise" of "correct" utterances increased the rate of emission of such utterances whereas, in comparison, the act of simply giving C a small toy without any associated verbal stimulus did not have this incrementing effect, and the S's rate of emission of "correct" utterances remained at a low level. So, the S's performance shows a consistent decrease in the rate of "correct" utterances in every material period following a verbal social period. This can be seen throughout the sessions I-VI and first half of session VII.

Figure 10 shows that during sessions II-IV the rate of "correct" utterances also decreased in the second period of verbal social reinforcement, thus decreasing the frequency of utterances towards the end of each session. Though differences between verbal social and material periods were still present, I wanted to observe

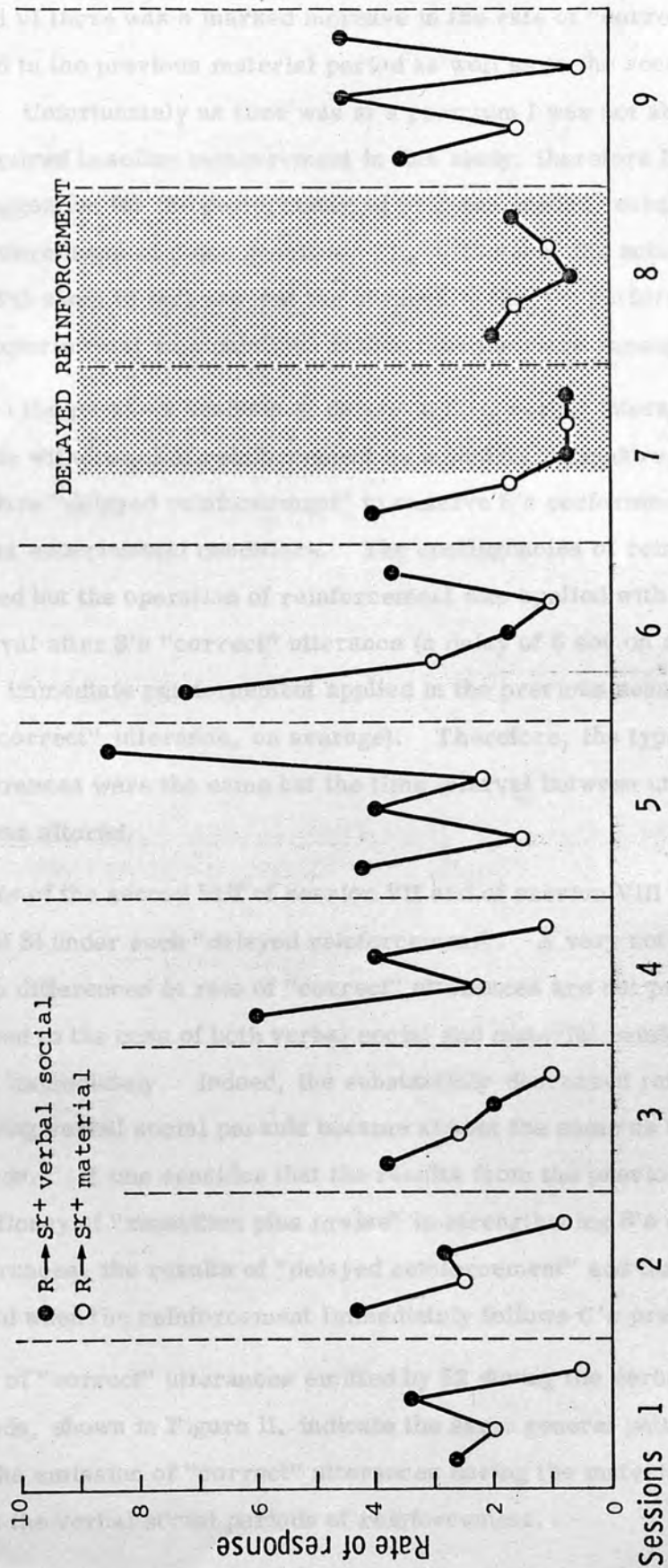


Figure 10 RATE OF RESPONSE OF S₁ DURING THE PERIODS OF VERBAL SOCIAL AND MATERIAL REINFORCEMENT, THROUGHOUT THE EXPERIMENTAL SESSIONS

the result of an additional period, which following the order of alternation, was of verbal social reinforcement. This was done from session V to IX. During sessions V and VI there was a marked increase in the rate of "correct" utterances when compared to the previous material period as well as to the second verbal social period. Unfortunately as time was at a premium I was not able to make a classically required baseline measurement in this study, therefore I cannot present any suggestion for the performance of S1 in the second verbal social periods of reinforcement of these sessions. Nevertheless, the subsequent results (sessions VII-IX) seem to indicate that the changes in the S's performance were a result of the experimental manipulations rather than the mere passage of time.

Based upon the previous analysis of delays in M-C verbal interaction, instead of opting for the withdrawal of reinforcement as a control procedure, I decided to use the procedure "delayed reinforcement" to observe S's performance under changed current experimental conditions. The contingencies of reinforcement were maintained but the operation of reinforcement was applied with a large temporal interval after S's "correct" utterance (a delay of 5 sec on average), as opposed to the immediate reinforcement applied in the previous sessions (1.17 sec after the S's "correct" utterance, on average). Therefore, the types of consequence and target utterances were the same but the time interval between utterance and consequence was altered.

The results of the second half of session VII and of session VIII show the performance of S1 under such "delayed reinforcement". A very noticeable change occurred: the differences in rate of "correct" utterances are not present any more, which is opposed to the case of both verbal social and material reinforcement following S's utterances immediately. Indeed, the substantially decreased rate of "correct" utterances during verbal social periods became almost the same as the rate in the material periods. If one consider that the results from the previous sessions indicate the efficacy of "repetition plus praise" in strengthening S's emission of "correct" utterances, the results of "delayed reinforcement" add that such efficacy is only obtained when the reinforcement immediately follows C's previous utterance.

The rates of "correct" utterances emitted by S2 during the verbal social and material periods, shown in Figure 11, indicate the same general pattern: constant decreases in the emission of "correct" utterances during the material periods as compared with the verbal social periods of reinforcement.

Although only four sessions were made with S2, the changes in his performance resulted in an increased rate of "correct" utterances when they were followed by

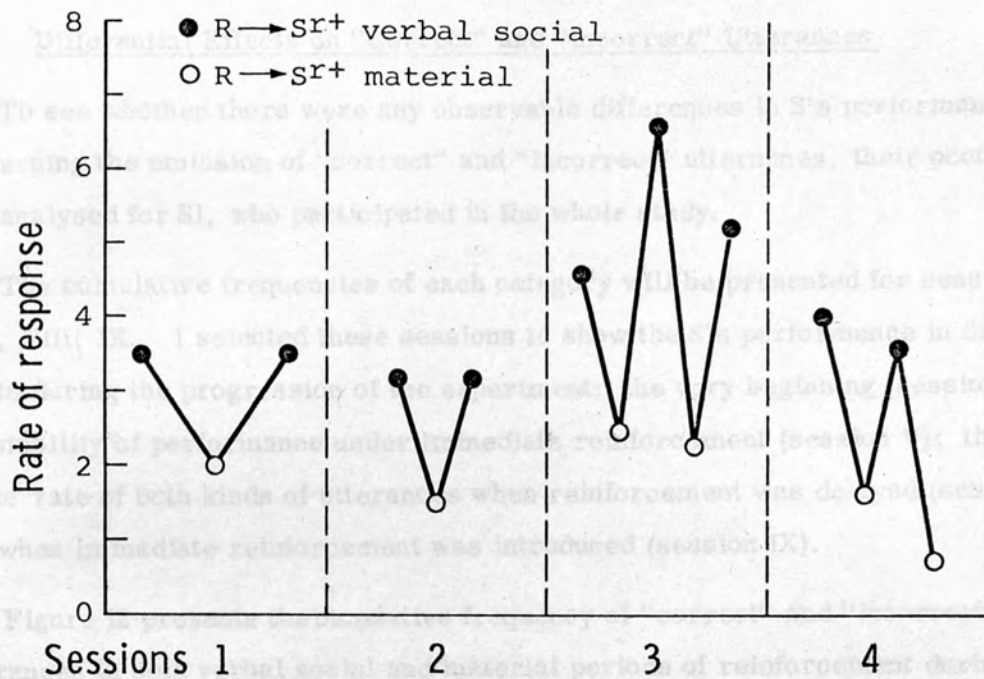


Figure 11

RATE OF RESPONSE OF S_2 DURING THE PERIODS OF VERBAL SOCIAL AND MATERIAL REINFORCEMENT IN FOUR EXPERIMENTAL SESSIONS

As the sessions progressed, the frequency of "incorrect" utterances started to present different rates in the successive periods of verbal social and material reinforcement, and the slight difference in the frequency of "correct" utterances, observed in session I, was accentuated. This is illustrated by the performance of S_1 during the session V, shown in Figure 13.

This differentiated performance of S_1 can be observed in Figure 13 in the acceleration of the slopes of the curves referring to the cumulative frequency of "correct" and "incorrect" utterances, in each period of reinforcement. While the curve for "correct" utterances tends to be positively accelerated during the verbal social periods and negatively accelerated during the material periods, the curve for "incorrect" utterances indicated opposite directions of acceleration in those periods.

The effects of "delayed reinforcement" over such performance can be seen from Figure 14, referring to Session VIII.

One can observe the disruption in the emission of "correct" utterances, when

"repetition plus praise", contrasting with a relatively lower rate when they were followed by "a small toy" with no additional verbal consequences. Unfortunately, with this S it was not possible to test the effects of "delayed reinforcement".

5.2 Differential Effects on "Correct" and "Incorrect" Utterances

To see whether there were any observable differences in S's performance concerning the emission of "correct" and "incorrect" utterances, their occurrence was analysed for S1, who participated in the whole study.

The cumulative frequencies of each category will be presented for sessions I, V, VIII, IX. I selected these sessions to show the S's performance in distinctive points during the progression of the experiment: the very beginning (session I); the stability of performance under immediate reinforcement (session V); the change in the rate of both kinds of utterances when reinforcement was delayed (session VIII) and when immediate reinforcement was introduced (session IX).

Figure 12 presents the cumulative frequency of "correct" and "incorrect" utterances in both verbal social and material periods of reinforcement during the first session with S1. One can observe that while the frequency of "correct" utterances slightly decreased under material reinforcement, the frequency of "incorrect" utterances proceeded at a steady rate throughout the successive verbal social and material periods of reinforcement.

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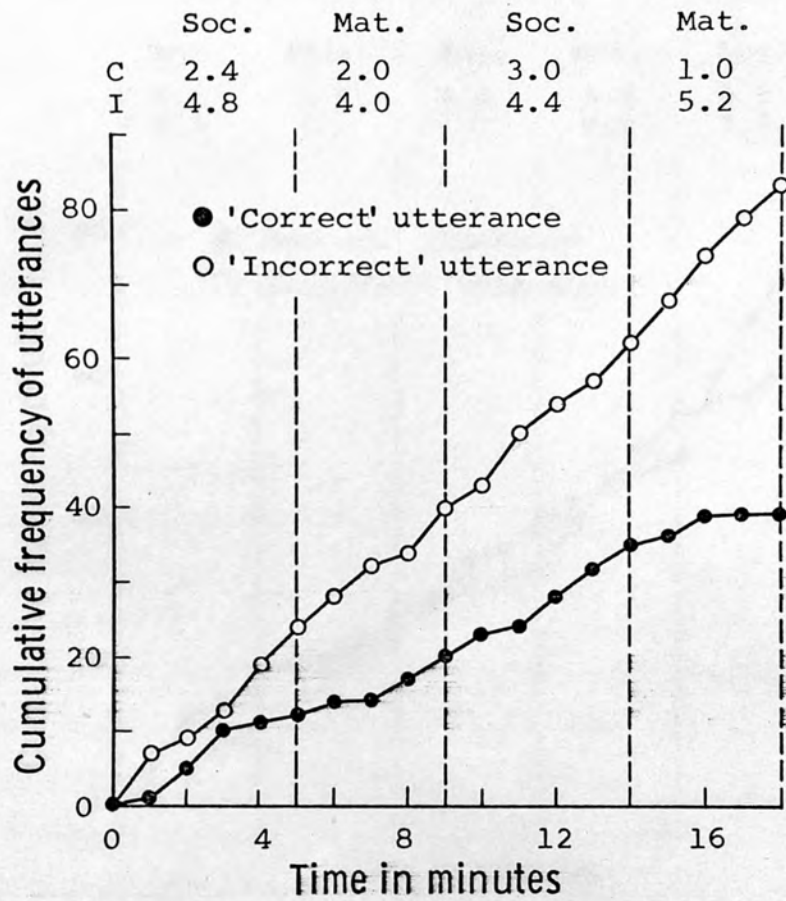


Figure 12
 CUMULATIVE FREQUENCY OF 'CORRECT' AND
 'INCORRECT' UTTERANCES EMITTED BY S_1 IN
 THE FIRST EXPERIMENTAL SESSION
 (verbal social and material immediate reinforcement)

verbal social and material reinforcement were presented. After S's utterance, by the negative acceleration of the cumulative frequency of utterances throughout all the periods. On the other hand, the frequency of "incorrect" utterances constantly increased throughout those same periods.

	Soc.	Mat.	Soc.	Mat.	Soc.
C	4.2	1.5	4.0	2.2	8.5
I	2.5	4.0	1.7	5.2	2.7

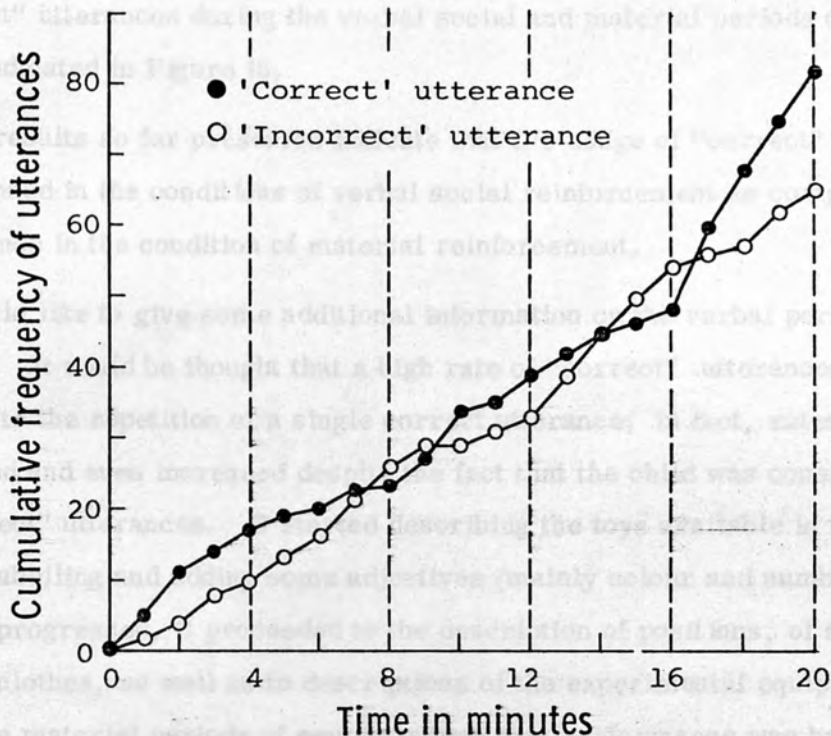


Figure 13
 CUMULATIVE FREQUENCY OF 'CORRECT' AND
 'INCORRECT' UTTERANCES EMITTED BY S₁ IN
 THE FIFTH EXPERIMENTAL SESSION
 (verbal social and material immediate reinforcement)

The disruption in S's performance when material reinforcement replaced verbal social reinforcement did not mean that S stopped talking, but that his talking did not improve to what has been considered to be "adequate" in the experimental situation. This same performance was present when verbal social reinforcement was "delayed".

Therefore, neither material reinforcement nor the "delayed" verbal social reinforcement were effective in changing S's verbal performance in the predicted direction.

5.3.4 Delay of C's Utterances Subsequent to Reinforcement

The delay in successive utterances incurred by the Ss after reinforcement were also computed and they were recorded in the same way as described in the

both verbal social and material reinforcement were presented on average 5 sec after S's utterance, by the negative acceleration of the cumulative curve for such utterances throughout all the periods. On the other hand, the frequency of "incorrect" utterances constantly increased throughout those same periods.

When the immediate reinforcement was reintroduced, in session IX, S's performance shifted to the differentiated pattern of emission of "correct" and "incorrect" utterances during the verbal social and material periods of reinforcement. This is indicated in Figure 15.

The results so far presented indicate that C's usage of "correct" utterances was enhanced in the conditions of verbal social reinforcement as compared to his performance in the condition of material reinforcement.

I would like to give some additional information on the verbal performance of the child. It could be thought that a high rate of "correct" utterances might have been due to the repetition of a single correct utterance; in fact, rates were maintained and even increased despite the fact that the child was constantly varying his "correct" utterances. C started describing the toys available in the experimental setting, labelling and adding some adjectives (mainly colour and number). As the sessions progressed, C proceeded to the description of positions, of actions, of his body and clothes, as well as to descriptions of the experimental equipment. During the material periods of reinforcement this performance was basically replaced by emission of onomatopoeics and exclamations, which were considered as "incorrect" utterances. "Correct" emissions during this period were scarce, and most of the time prompted, even when such emissions resulted in the delivery of a trinket.

The disruption in S's performance when material reinforcement replaced verbal social reinforcement did not mean that S stopped talking, but that his talking did not improve to what had been considered to be "adequate" in the experimental situation. This same performance was present when verbal social reinforcement was "delayed".

Therefore, neither material reinforcement nor the "delayed" verbal social reinforcement were effective in changing S's verbal performance in the predicted direction.

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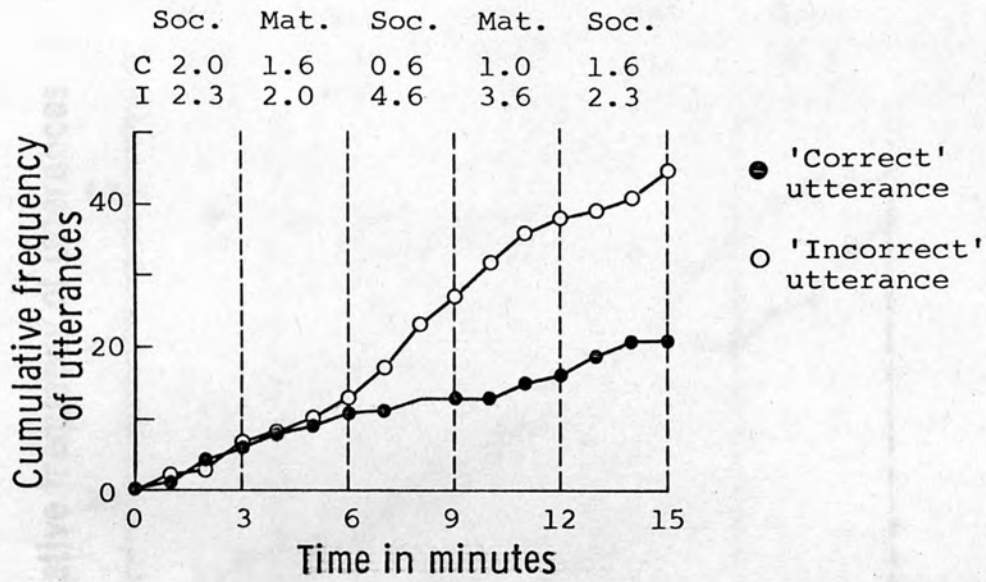


Figure 14
 CUMULATIVE FREQUENCY OF 'CORRECT' AND 'INCORRECT' UTTERANCES EMITTED BY S₁ IN THE EIGHT EXPERIMENTAL SESSION (verbal social and material delayed reinforcement)

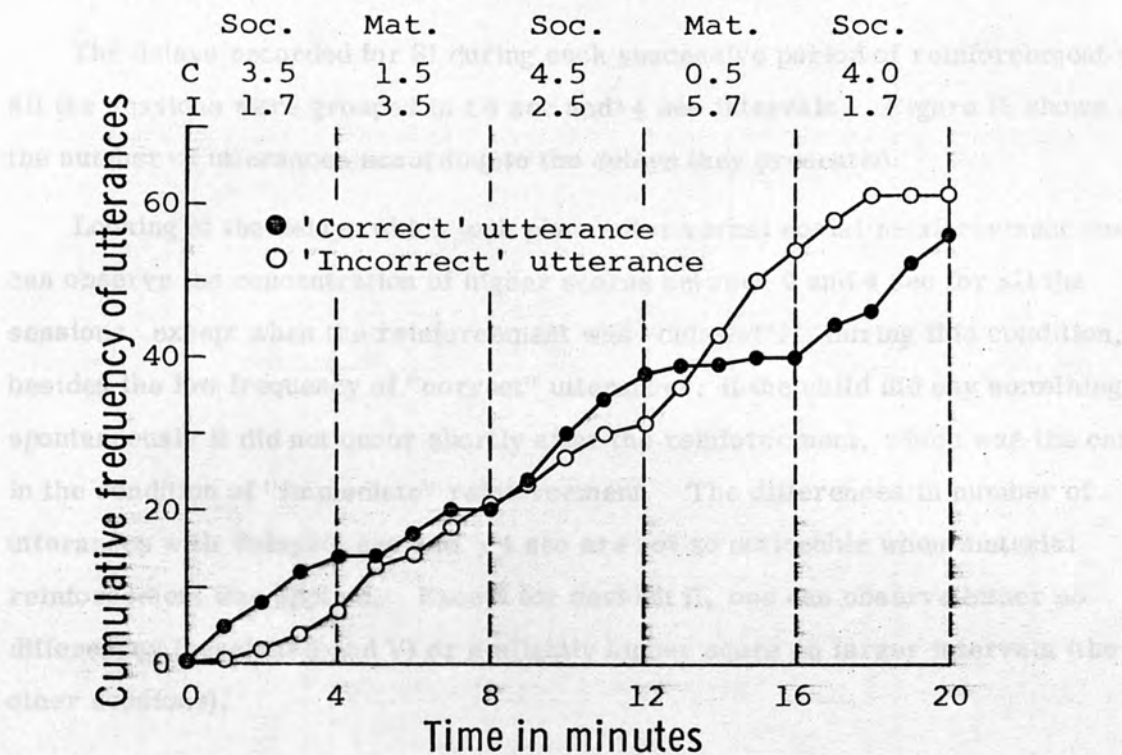


Figure 15

CUMULATIVE FREQUENCY OF 'CORRECT' AND
'INCORRECT' UTTERANCES EMITTED BY S_1 IN
THE LAST EXPERIMENTAL SESSION

(verbal social and material immediate reinforcement)

field-descriptive study. In the present analysis delays consisted of the temporal interval between the end of presentation of the reinforcing stimulus (either "repetition plus praise" or the "delivery of a small toy") and the beginning of a child's subsequent spontaneous utterance of any kind.

The delays recorded for S1 during each successive period of reinforcement of all the sessions were grouped in < 4 sec and > 4 sec intervals. Figure 16 shows the number of utterances according to the delays they presented.

Looking at the delays which took place after verbal social reinforcement one can observe the concentration of higher scores between 0 and 4 sec for all the sessions, except when the reinforcement was "delayed". During this condition, besides the low frequency of "correct" utterances, if the child did say something spontaneously it did not occur shortly after the reinforcement, which was the case in the condition of "immediate" reinforcement. The differences in number of utterances with delays < 4 sec and > 4 sec are not so noticeable when material reinforcement was applied. Except for session II, one can observe either no differences (sessions I and V) or a slightly higher score on larger intervals (the other sessions).

These results therefore indicate that when the consequence of C's utterance was "repetition plus praise", C proceeded quickly to the next emission; when "repetition plus praise" was presented 5 sec, on average, after C's utterance, his performance was disrupted both in terms of verbal output and in the temporal pattern involved. It is interesting to observe that the pattern of disruption of the performance of S1 in the verbal social periods during the "delayed" mode is similar to the pattern of disruption of performance in the material periods during the "immediate" mode of, for example, session IX.

The delays recorded for S2 utterances subsequent to verbal social and material reinforcement, during the four sessions, presented similar characteristics, as can be observed from Figure 17. The utterances subsequent to verbal social reinforcement mostly occurred after short delays (0-4 sec) in the four sessions; those subsequent to material reinforcement mostly occurred after long delays (> 4 sec), as in sessions I-III, or in the case of session IV, occurred in equal numbers before and after 4 sec.

In order to describe in more detail the differences in length of delays in successive utterances occurring after each kind of reinforcement I plotted histograms of the number of utterances as a function of the lengths of the delays. Delays

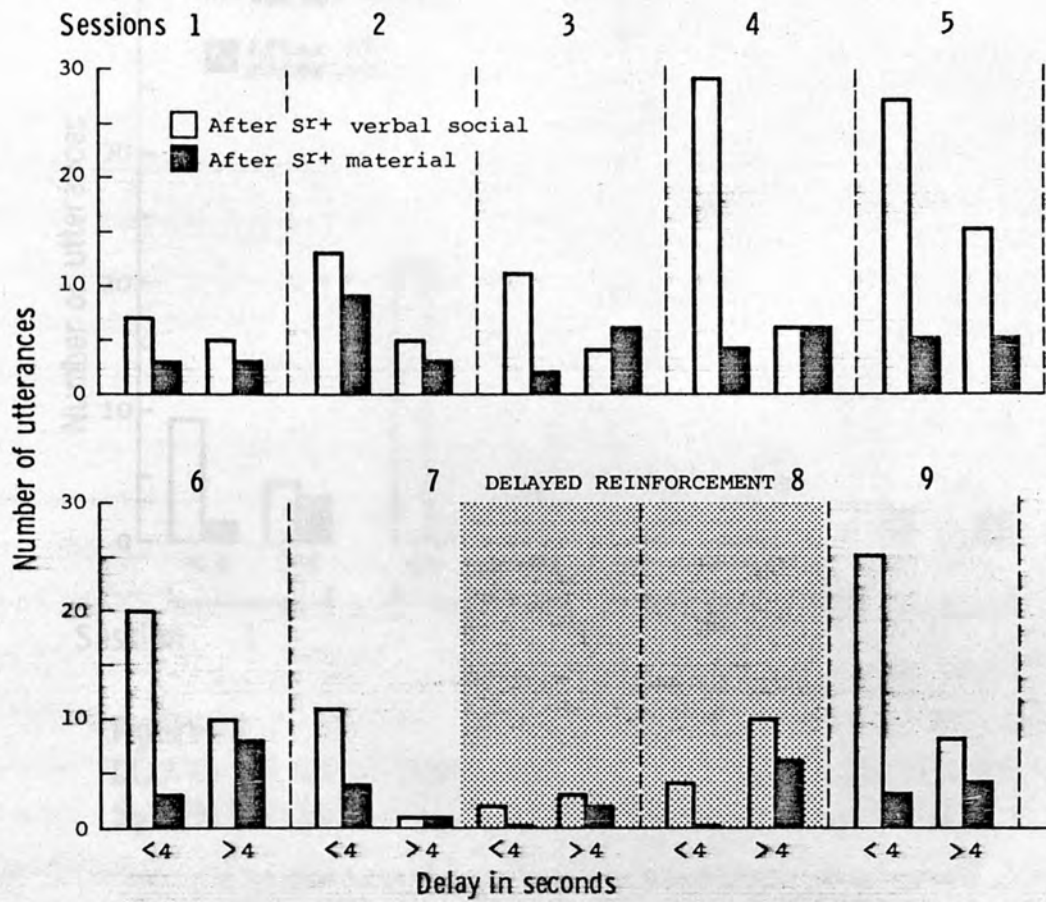


Figure 16
 DELAYS OF <4 SECONDS AND >4 SECONDS PRESENTED BY
 S_r AFTER VERBAL SOCIAL AND MATERIAL REINFORCEMENT

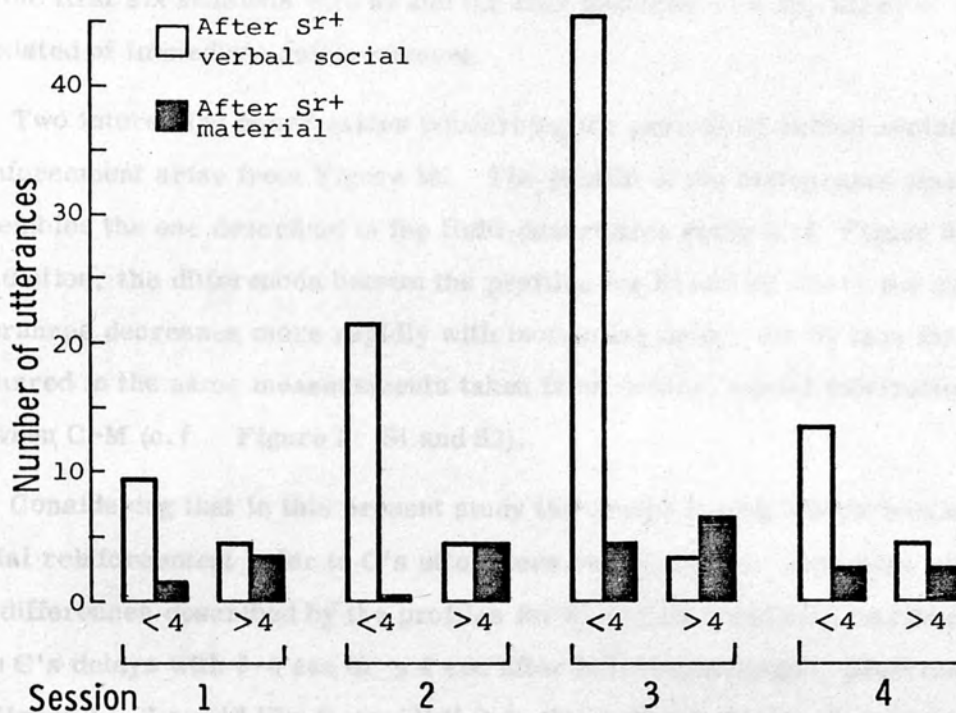


Figure 17
 DELAYS OF <4 SECONDS AND >4 SECONDS PRESENTED BY
 S₂ AFTER VERBAL SOCIAL AND MATERIAL REINFORCEMENT

were grouped into 1 sec intervals up to delays as large as 12 sec; delays larger than that are referred in the interval > 12 sec. Figure 18 presents the histograms for the first six sessions with S1 and the four sessions with S2, all of which consisted of immediate reinforcement.

Two interesting observations concerning the periods of verbal social reinforcement arise from Figure 18. The profile of the histograms closely resembles the one described in the field-descriptive study (c.f. Figure 3: S1 and S2). In addition, the differences between the profiles for S1 and S2 where the number of utterances decreases more rapidly with increasing delays for S2 than for S1, also occurred in the same measurements taken from natural verbal interaction between C-M (c.f. Figure 3: S1 and S2).

Considering that in this present study the delays during the periods of verbal social reinforcement refer to C's utterances subsequent to "repetition plus praise" the differences described by the profiles for S1 and S2 could also be compared with C's delays with 0-4 sec or > 4 sec after M's "repetitions", presented previously in Figure 4. I would like to recall that in those distributions, the proportions of utterances with delays 0-4 sec and > 4 sec were almost the same for S1, and very distinctive for S2, for whom no utterance with a delay larger than 4 sec was recorded after M's repetitions. Therefore, comparing such performances with the distributions presented in Figure 18, it seems that the Ss were presenting a very similar pattern of speech in the experimental situation to that recorded in the natural situation, maintaining their individual characteristics.

Though without a constant pattern, the distributions of delays of utterances after material reinforcement seem to indicate a tendency of higher scores towards larger intervals for both Ss, but more clearly for S2.

For S1 it was also possible to describe the intervals between each kind of reinforcement and C's subsequent utterances during the condition of "delayed" reinforcement. The number of such utterances emitted during the last three sessions was grouped, according to the delays they presented, into 2 sec intervals because the small scores obtained from the material periods. These data are presented in Figure 19.

It is interesting to observe that when verbal social reinforcement was "immediate" C's subsequent utterances mostly occurred after short delays, while when the verbal social reinforcement was not immediate delays of subsequent utterances were longer.

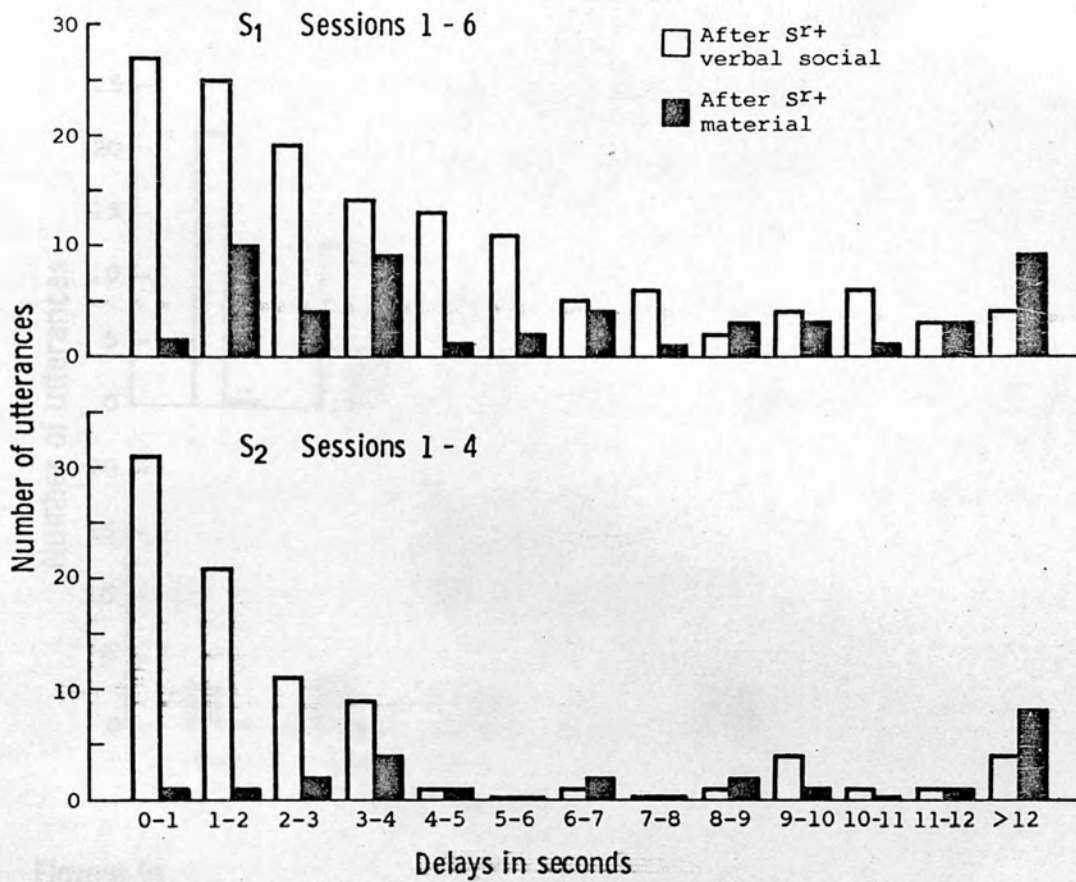


Figure 18 DELAYS OF S₁ AND S₂ UTTERANCES AFTER VERBAL SOCIAL AND MATERIAL REINFORCEMENT

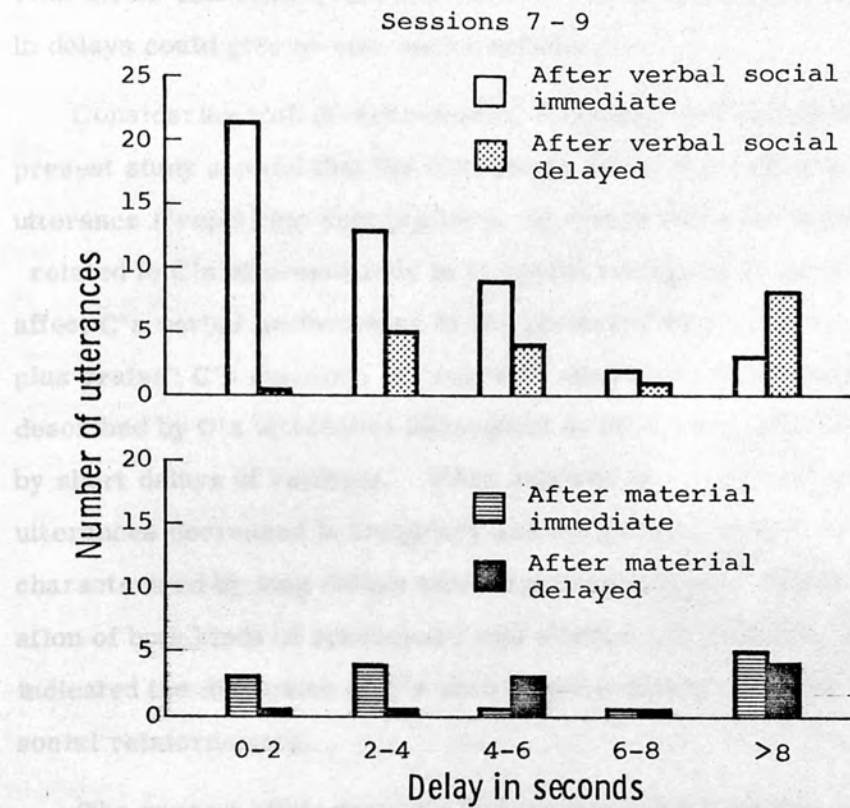


Figure 19
 DELAYS OF S_1 UTTERANCES AFTER VERBAL SOCIAL AND
 MATERIAL IMMEDIATE AND DELAYED REINFORCEMENT

As during the periods of material reinforcement C's "correct" utterances were very rare the corresponding reinforcements were consequently also rare. This meant that subsequent utterances were so few that an analysis of differences in delays could give no conclusive results.

Considering both measurements, frequency and delays of C's utterances, the present study showed that the consequent event which closely related to C's utterance ("repetition plus praise"), as compared to the consequent event which related to C's utterance only in temporal contiguity (a small toy), was found to affect C's verbal performance in the predicted way. When exposed to "repetition plus praise" C's emission of "correct" utterances was enhanced and the pattern described by C's utterances subsequent to such a consequence was characterised by short delays of reaction. When exposed to "small toy" the emission of "correct" utterances decreased in frequency and the general pattern of C's speech was characterised by long delays after that consequence. When immediacy of presentation of both kinds of consequenc was altered and "delayed" the data basically indicated the disruption of C's performance observed during "immediate" verbal social reinforcement.

The present study suggests that a consequent stimulus to C's utterances may have different effects on his speech depending on both "what the consequent stimulus consists of" and "when the consequent stimulus occurs".

The implications of these findings for language development are straightforward: subsequent verbal behaviour affects the child's subsequent verbal performance and this appears to influence the child's development of speech. This is in agreement with the basic assumption made in learning-theoretical approaches to language development (Wolman, 1957; Hayes, 1963).

Returning to the point raised in the introduction, the studies both ground these assumptions, through systematically varying the type of environmental stimulation in language development, do not appear to cover the majority of the child's life. There has been no detailed account concerning the stimulation provided by parents and the effects it has on the child's speech. On the other hand, the naturalistic studies planned around developmental psychologists, which consistently minimised or denied the importance of active social stimulation in language development, have not been methodologically adequate by the measurement of verbal stimulation.

The point of interest regarding the child's speech development is that it might be defined as verbal social interaction with parents especially with the

CHAPTER 6

DISCUSSION

This research combined field-descriptive and experimental analysis of young children's speech aiming for the identification and description of environmental and/or training variables related to the child's usage of speech. Despite a considerable number of investigations on this subject, the discrepancy between the results and analyses presented by the naturalistic and experimental studies makes the assessment of the role of environmental stimulation in the child's everyday life a major issue, when language development is considered. The present study yields information on some attributes of environmental stimulation, focused specifically on the mother's verbal interaction with her child, and this information might suggest the need for further integrated studies.

The analysis of the patterns of verbal interaction between mother and child suggested, as a major finding, the interdependence between their interactive sequences of utterances. Interdependence was reported for the mother's selectiveness in reacting to the child's utterances and for the child's differences in verbal performance as related to the mother's previous utterances. In addition, the descriptive indices of the child's verbal performance (UT/MIN; MLU; CUT/CUT+IUT; CIN/CIN+MIN; CEN/CEN+MEN) were related to the degree of selectiveness that the mother showed.

The implications of these findings for language development are straightforward: maternal verbal behaviour affects the child's subsequent verbal performance and this seems to influence the child's development of speech. This is in agreement with the basic assumptions made by learning-theoretical approaches to language development (Skinner, 1957; Staats, 1968).

Returning to the point raised in the introduction, the studies built around these assumptions, though consistently arguing for the role of environmental stimulation in language development, do not specify its role in the everyday life of the child. There has been no detailed account concerning the stimulation provided by parents and the effects it has on the child's speech. On the other hand, the naturalistic studies, planned around developmental psycholinguistics, though consistently minimising or denying the importance of environmental stimulation in language development, have not been methodologically adequate for the assessment of parental stimulation.

The present research analysed the child's speech under circumstances which might be defined as verbal social interaction with parents (specifically with the

mother) in natural settings. The description of the interactive patterns indicated some interesting characteristics and relationships in M-C-M-C interactive sequences of utterances. As far as language development is concerned, the study primarily raises several questions rather than answers them. These questions concern both the methodology of investigation and the conceptualisations of environmental variables as related to the child's language development.

The methodological aspect which I intend to point out stems from the measurements of the temporal intervals at which the mother's and child's utterances occurred. These showed a striking consistency in the delays of mothers' and children's verbal reactions. The delays shown by mothers to their children were very short; longer delays were shown by children to their mothers and these were of different lengths depending on the kind of the mother's utterance and of the immediacy with which it occurred, in relation to the child's previous utterance.

On the one hand, the non-existence of comparable measurements in the literature about children's language makes it difficult to evaluate the significance of various lengths of delays, but, on the other hand, the regularities exhibited by these delays suggest the possible importance of timing measurements for the accurate specification and/or assessment of parental stimulation where language development is concerned. In this respect, the present study suggests that even when the social environment of the child is restricted to maternal behaviour in interaction with him, a very fine-grained analysis and objective description is required, for which the timing measurement seems to be fundamental.

The basic point is that in verbal social interaction between mother and child several utterances can occur between successive interchanges of speakers.

Besides the need for behaviour categories for analysing such sequences, the observer has to be able to identify the number of instances of occurrence for each of these categories for each individual, that is, in sequences such as M-M-M or C-C-C, as well as for instances of interchanges, such as M-C or C-M. In order to do this an objective definition of the unit of utterance is required. In addition, if the dynamics of the interchanges are to be assessed, another problem arises: does an interchange necessarily mean that an individual is actually responding to the other? One knows that in everyday life, where an interchange of verbal emissions between speakers occurs, one tends to consider each speaker's utterance as a 'response', or reaction to the other. However, when an observer has to analyse a M-C-M-C sequence of utterances it is difficult to decide whether a change of speaker actually indicates a response from C to M or from M to C, respectively. This

difficulty increases because the young child's own speech does not allow the observer to follow the flow sequence of verbal interchanges in a similar way as that in which he could do for a simple colloquial interchange between two mature speakers. The observer's own verbal repertoire does not help him to make such a decision, and could even bias it. He should have a device, independent from his own behaviour and also independent from the content of the particular verbal interaction, to evaluate the instances of interchange as 'responses', or simply as changes of speaker.

Assuming that the elaboration of the child's verbal repertoire occurs basically through the interactive sequences of verbalisations with the parents, the two points mentioned above seem to be fundamental to any empirical descriptive analysis. They would enable the observation of the consequences applied to the child's utterances in his everyday environment as well as the amount and kind of verbal stimulation parents present. On the other hand, they would also enable the observation of the child's responses to parental stimulation and/or the child's elaboration over a number of successive utterances (C-C-C...). In other words, these two points, that is, the definition and criterion for an utterance, and for a 'response', would represent an essential preliminary step in an analysis aimed at identifying and describing the verbal social circumstances in which the child's speech occurs.

Considering the individual differences which might possibly imply an enormous variety of patterns of interaction, one could well imagine the task of working out such criteria for analysis of M-C sequences of utterances as an endless one. However, it is precisely in this respect that the results of the timing measurements in the present study should be emphasised. Despite the differences in the patterns of verbal interaction between mother and child, for the five pairs of subjects, the profiles of delays between verbal interchanges were very similar for all the mothers and for all the children, but different between mothers and children (c. f. Figures 2 and 3). The regularities they showed led to the adoption of temporal criteria for determining the occurrence of 'responses' and of boundaries between utterances.

This application of temporal criteria, which I consider fundamental to the analysis of young children's language, has not yet been reported by previous studies. From the results of this research I would suggest that it could be considered in further investigations, whatever their framework might be.

Besides, at the present stage of knowledge in the area of young children's language, it seems that one needs more accurate descriptions of a child's actual verbal performance and the circumstances in which it occurred, rather than theoretical

constructions around the processes assumed to be at work, which might be premature. The relationships described from the patterns of verbal interaction among categories of maternal behaviour and the child's verbal performance, strongly suggest this need.

The analysis of frequency of utterances showed that each mother was talking more than her child, although to different extents (c.f. Table IV). The children, all equal in age, presented individual differences in their amounts of talking. The frequency of the child's utterances was found to correlate with the proportion of the mother's verbal output that was a direct response to the child's utterance, within 4 sec. The total amount of maternal verbal output, in itself, did not seem to be an important factor. It did not relate to the child's responses to the mother's utterances and characterised only the length of sequences of mother's utterances.

This is one of the interesting outcomes of this study. It seems to suggest that there are some critical levels in the mother's verbal behaviour concerning the amount and kind of verbal stimulation and/or verbal responses to which the child is exposed.

The indices of the mother's selectiveness describe another characteristic of the patterns of verbal interaction for the five pairs of subjects and they are related to the child's actual usage of speech.

Table VIII showed the number of the mother's verbal reactions and non-reactions to the child's 'correct' and 'incorrect' utterances. Where the differences in the respective proportions for each mother were found to be significant (M1 and M2), the mother's responses were dependent on the kind of the child's utterance. The 'C' coefficients of contingency for these differences were suggested as indices of the mother's selectiveness. The pattern described, therefore, is: the larger the index, the larger the number of child's utterances emitted before one was responded to by the mother. Thus, where the index equals zero, the mother was responding to almost every utterance emitted by the child. It seems that mothers M1 and M2 were differentially responding to the child's utterances, taking into account the ones which could be considered as more mature verbal forms as opposed to unintelligibles, onomatopoeics and exclamations.

The measurements of the child's verbal performance correlated with the mother's selectiveness, suggesting that the mothers who were consistent in responding differentially to the child's utterances had the child with a 'more advanced' verbal repertoire.

The measurements of the child's verbal performance were made through

different indices (UT/MIN; MLU; CUT/IUT; CIN/CIN+MIN; CEN/CEN+MEN) and the concordance between these indices was significant at the 1% level (c. f. Table XI). All these measurements correlated with the mother's index of selectiveness. As the mother's selectiveness was computed in terms of responses or non-responses to the child's utterances, it seems that the relationship between the type of the child's utterance and the presence or absence of his mother's response is an important one for the elaboration of the child's verbal repertoire. In addition, the mothers were not responding to all the 'correct' utterances emitted by the child, but nevertheless where the 'incorrect' utterances were more consistently ignored, the children had the higher descriptive indices for their verbal performance. So it seems that the number of intelligible utterances was growing larger in children S1 and S2, even though the mothers responded directly to only some rather than all of these utterances. This result could bring some light to those who question the role of the environment in the child's development of language, but who a) have overlooked, systematically, the possible effects of maternal differential reactions, as described here, and b) have overlooked, systematically, the possibility that a verbal response class may develop, and become strong, even if the environment is acting directly on only some rather than all the utterances in that class. As far as the mother is concerned, it seems unrealistic to expect that she would respond properly to every utterance emitted by her child, bearing in mind that for these young children the total rate of mother's and child's verbal emissions was of the order of 12 utterances per minute. These descriptions show that it is not unrealistic to think of mothers applying what seems to be an effective way of interacting with their children, whilst sparing themselves a terrible effort, and yet, promoting the development of the children.

Nevertheless, I believe that the nature of these data and analyses does not allow the conceptualisation of this relationship even if it suggests it. Though the verbal behaviour was recorded with meticulous detail, the analysis of the concomitant, or substitutive, social non-verbal behaviour was not concluded, and therefore could not be matched with the verbal analysis. I cannot state whether the above mentioned relationship will still be found to be true when the non-verbal behaviour is matched to the verbal behaviour. From the observations made, however, I believe that no basic difference will appear. Still, disregarding this point, one should bear in mind that this part of the present investigation, being a field-descriptive one, is an essential but preliminary step in the identification and analysis of environmental variables as related to the child's language. The relationships it indicates might suggest some conceptualisations where a ready context exists and for which the observed phenomena seem to stand. However, the accurate assessment of the

implied conceptualisations will rely on the experimental manipulation of the variables and/or parameters which seem to be involved.

One could say that, according to the reinforcement theory, these results might describe a shaping process at work in the child's elaboration of the verbal repertoire. Considering the mother's indices of selectiveness, it could be that in their reactions or non-reactions to the child's utterances the mothers were promoting a shift of contingencies towards more elaborate forms of utterances (from exclamations, onomatopoeics and unintelligibles to intelligibles). Where such maternal behaviour was present and consistent, as for M1 and M2, the child's reported indices of verbal performance were the highest, (S1 and S2). Where such maternal behaviour was not observed at all, as for M3, and the mother was responding to almost every utterance emitted by the child, his reported indices of verbal performance were the lowest (S3).

Field-experimental studies which analysed the effects of mothers' differential attention (Wahler, 1969; Whitehurst, et al, 1972) have reported relationships between lack of such maternal behaviour and the child's immature or delayed speech. 'Attention' in these studies, however, did not correspond to the verbal maternal category 'attention' (AT) defined in the present study. It was instead defined by the mother's reaction to the child's specific utterance causing a change in her behaviour from what it would have been otherwise. In neither of the mentioned studies is there a specification of the maternal behaviours, verbal or non-verbal, which constituted in 'attention', though the concept implied is that of social reinforcement.

The naturalistic study by Brown and Hanlon (1970) which analysed the same phenomenon in order to understand the child's progressions from immature to mature forms of utterances, conveyed negative evidence, since the authors did not find differences in mothers' 'responses' to the child's utterances for the ones selected to be analysed. The present data, though not allowing an actual comparison, do suggest some restrictions on the authors' conclusions derived from their descriptions. Returning to the point raised in the introduction concerning the methodological inadequacy of this kind of study for the purpose of assessing the child's speech as a function of parental stimulation, on the basis of the present results, I would specify such an inadequacy as being related to the behavioural categories selected for both the child and the mother, and also, to the type of analysis made. If a very fine-grained description and analysis of the patterns of verbal interaction is not carried out, I would strongly suggest that the investigation will not be sensitive to the gradual changes that are occurring in a specific moment of

the child's developmental history and which must necessarily differ from one moment to another, or from one 'stage' to another.

In the present study, differences in MLU as well as in the other indices descriptive of the children's verbal performance were related to different patterns of verbal interaction between the child and the mother. The characteristics of the patterns which allow me to restrict Brown and Hanlon's (1970) conclusions refer to the simple presence or absence of a maternal response to different kinds of the child's utterance. Besides that, according to the maternal categories of verbal behaviour, the mother could reply in varied forms, as indeed occurred; and, the analysis of the sequences of mother's and child's utterances indicated that some specific kinds of maternal responses were more likely to be followed by a child's subsequent utterance. This, which seems to be one of the most surprising results of the present investigation, has not been investigated, or even considered, by the naturalistic studies built around developmental psycholinguistics, and, as the case in point, by Brown and collaborators.

Yet, it has not been investigated by field-experimental studies either. However, Wahler's (1969) suggestion concerning the baseline results from his study seems to come to this point quite well. Considering the mother's 'non-differential attention' during the baseline and the child's development of new verbal response classes up to the beginning of the study, Wahler suggested that possibly certain maternal behaviours were more reinforcing to the child. But his study did not focus on possible differences in maternal behaviours in the interactions with the child.

Returning to the considerations in the proposition for the present investigation, the present data do indicate that mothers respond to the child's utterances with slightly different performances and that the child does respond to the mother depending on such differences, which were either in terms of delays of verbal reactions or in terms of the kind of the maternal utterance. Even if I cannot evaluate the significance of such attributes of interaction, as yet, I would like to point out the need for careful observations when the role of social reinforcement is to be assessed in natural settings.

There has been a constant tendency to analyse, or consider, the instances of occurrence of those words that are usually identified as 'approval', or 'disapproval' or 'praise' ('that is right'; 'that is wrong'; 'very good'), which also happen to be the kinds of verbal social reinforcers usually manipulated in experimental settings. However, the information about the actual stimuli presented by maternal behaviour and the variety of forms they may assume is missing. Surprisingly, also missing

is the consideration that different histories of development, or in other words, differences in the patterns of interaction of a child with his environment, determine what will and what will not be a social reinforcer for a particular child. The studies related to social reinforcement have taken for granted the generality of some specific reinforcers, for which the evidence seems to be at least inconsistent, if not contradictory. The usual procedure, that is, the random selection of some verbal reinforcers and the empirical assessment of their efficacy, seems to bring little light, if any, into the area. Primarily with regard to the child's development, the studies seem to be failing to move towards more fruitful questions. Differences of efficacy of some verbal reinforcers have been reported in several studies as related to the age of the child (Lewis, Wall and Aronfreed, 1963; McCullers and Stevenson, 1960; Stevenson, 1961), but the possibility of a developmentally changing verbal reinforcers hierarchy has not yet been approached. I consider that some of the descriptions from the present investigation properly suggest this need.

In the present study the child's utterances were analysed in relation to the mother's 'approval' or 'disapproval' to see whether this kind of maternal behaviour could in fact be contingent on different kinds of utterances presented by the child, for instance mature or immature verbal forms or, as defined, 'correct' or 'incorrect' utterances. 'Disapproval', in the precise verbal form 'that is wrong', was not recorded at all; the corrections made by the mothers to the child's utterances consisted, basically, of the verbal form 'no' followed by the model required in the specific situation. Besides, I have reported them as being very rare indeed (from eight to 12 instances for all the Ss). This particular description is in agreement with naturalistic studies (studies summarised by Brown, 1973; Brown and Hanlon, 1970). The occurrence of 'approval' in the forms usually referred to ('that is right'; 'very good'; 'yes'; and others similar) was also very scarce when compared with the occurrence of the other categories of verbal behaviour presented by the mothers (c.f. Table IX, 'PR').

It is interesting to recall, at this point, the discussion by Paris and Cairns (1972) concerning the discriminative use of 'right' and 'wrong' as determinant of their efficacy as social reinforcers. They have shown that 'right' is relatively less effective than 'wrong' because it is more frequently used and indiscriminately applied. Although the authors' contention is a theoretical corollary of the concept and their results have shown that the indiscriminate use of such type of praise does happen in school settings, the descriptions of the present study do not suggest that the same occurs for naturally occurring interactions between mother and child. The mothers were not using praise so frequently, in spite of not using the form 'wrong',

and when they did praise the child it did not seem to be in an indiscriminate manner (bear in mind that the indices of mother's selectiveness discussed before were computed for all kinds of utterances emitted by the mother). Even so, praise was not followed by a child's subsequent utterance as frequently as were some of the other maternal categories. So, the suggestion about looking for the different effects of various forms of maternal verbal behaviour and the possibility of differential effectiveness of different kinds of verbal reinforcers whilst development occurs, seems to be a very adequate one from this point of view.

Different categories of maternal behaviour, as described by the analysis of M-C verbal chains, were reported to have significantly ($p < 0.001$) different effects on the child's subsequent verbal emissions. The main effects were: verbal prompt to initiate, comment and command to end, and repetition, model and expansion to maintain verbal chains. Praise in itself, when compared with repetition, model and expansion was reported to have the weakest effect in maintaining the child's subsequent emissions (c.f. Figure 6).

Bearing in mind that the definition of 'maintenance' of a verbal chain was not restricted by the kind of utterance emitted by the child, it is interesting to note that these descriptions are in agreement with the experimental data concerning the relative efficacy of praise alone as compared with repetition plus praise in toddlers (Hursh and Sherman, 1973), and with praise plus instructions in school children (Bandura and Harris, 1966). Besides, Hursh and Sherman (1973) reported that 60% of the child's target verbal responses occurred within 4 sec of the mother's model. In the present study, most of the child's utterances after a mother's model also occurred within 4 sec (c.f. Figure 4).

The description of the occurrence of expansions agrees with descriptions reported by previous naturalistic studies (Brown and Bellugi, 1964, Brown, et al, 1968). However, a comparison concerning the effect of expansion, as analysed in the present study, with that tested by Cazden in 1965, is not possible. In the present study, the effect of expansion as 'maintaining' a verbal chain is simply that this kind of maternal behaviour was frequently followed by a child's utterance. The specific form of the utterance was not analysed, so the grammatical contention about its effect, as suggested by Brown and Bellugi (1964) and tested by Cazden in 1965, cannot be evaluated.

One interesting effect arises from the occurrence of model in maintaining verbal chains. Recalling the definition of 'effects', if 'model' is maintaining, then this means that this maternal category was also presented as a response, or consequence, to the child's utterance. In fact, from the recordings, it appeared that in these

instances the mother was 'correcting' or 'emphasising' the child's approximations to a more mature verbal form. Therefore, those of the child's utterances which were subsequent to a previous 'model', were not followed exclusively by either praise, 'approval', or non-response, but also by a repetition of the 'model' as if the mother was being insistent over the child's verbal performance. In these instances, this 'model' could be followed by a subsequent utterance emitted by the child or by the mother, and in this case the mother's next utterance would more likely be a 'verbal prompt'. I would like to stress this point, as it seems to describe a very noticeable characteristic of the patterns of verbal interaction between the mother and her child.

Of all the effects described, that of the category 'comment' was the most striking one because of the regularity with which it ended a verbal chain, and the regularity with which it did not 'initiate' a new chain, whenever it was presented. The category 'command' was also frequently not followed by a child's subsequent utterance, but, as defined, this category would be more likely to cue non-verbal rather than verbal response in the child. As the analysis of non-verbal behaviour was not included in the present report, I shall not discuss this particular category and effect, but I would point to it as an important maternal category to be considered in further studies.

Despite the regularities observed, and the significance of the differential effects of maternal verbal behaviour on the child's verbal performance, as previously stated, this study does not allow an evaluation of the empirical concepts which could underly these effects, as suggested by the comparisons with experimental data. I could assume that the maternal categories which were consistently followed by a child's subsequent utterance, having the effect of 'maintaining verbal chains', were functioning as social reinforcers, and in this case the categories were, respectively, 'repetition', 'model', 'expansion', and 'praise'. But, if this is the case, it seems more important to consider the differential effects even among these categories, and therefore, the relative efficacy of such verbal social reinforcers. If one is ready to consider that a two-way classification of a verbal social stimulus as a reinforcer or as a non-reinforcer seems not to be an adequate one, especially in the case of developing children, then the following considerations could suggest some of the ways in which that classification system could be expanded. On the other hand, these considerations could also be helpful for those investigators who, by considering a simple two-way classification of verbal social reinforcers, did not find and/or did not accept the possible existence of their role in the child's elaboration of speech and as a consequence, stress the need for theory construction on formal

grounds in order to account for language development.

The definition of the categories of maternal verbal behaviour allow one to point out that the mother's responses 'repetition', 'model' and 'expansion' were very similar to the child's immediately preceding and/or subsequent utterances in terms of the verbal forms involved (bearing in mind that in the cases of 'model' as a consequence, or response, the mother was 'emphasising' or 'correcting' the child's approximations to a model previously presented). The category 'comment' was one of the kinds of the maternal utterance which did not resemble the child's previously presented utterance or did not have the same verbal elements, if any, as the child's utterance. Then, according to the effects described for the different categories, one could say that the verbal emissions by the child and by the mother constituted a verbal chain of interchanges while the mother's and child's utterances were very similar to each other. Recalling that a chain was defined by successive utterances emitted by the mother and by the child without any interval between utterances longer than 4 sec, it seems that in the instances of maternal 'repetition', 'model', and 'expansion', the child was able to continue the interaction, by emitting a subsequent utterance 'quickly'. One could say that in such instances the child was exposed to a situation in which he could 'match' the common verbal forms in successive utterances. If the mother's utterances are still similar to his own, the child continues talking. When the maternal response happened to be a 'comment', the verbal chain was ended by a child's non-response. The regularity in which this occurred could mean that the maternal 'comment' had a disruptive effect on the child's verbal performance.

In this respect some interesting descriptions from other studies could also be recalled.

Whitehurst, et al (1972) discussing the relationships among categories of parental behaviour and the improved speech of a child subject, suggested that 'there is some critical level for the amount of conversation that must be present for speech to be acquired'. Considering also that the child was being exposed to a high level of television stimulation and yet his speech development was retarded, the authors suggested that verbal interaction is more crucial than simple verbal stimulation. A small increase in the amount of conversation was one of the events related to the child's progress and the authors' comment here is interesting: 'as the mother increased her rate of conversation above baseline she may have simplified the grammatical complexity of that conversation.'

Brown and Bellugi (1964) commented that a mother's speech differs from the speech of adults in general when she is talking with her child. 'Her sentences are short and simple' and they put 'differential stress' on words of a sentence, heavier

on contentives rather than on functors. Describing the interchanges, the authors say that the child imitates the mother's utterances, but his imitations are reductions from the mother's utterances ('telegraphic speech'), and that the heavier stress falls, for the most part, on the words the child 'retains'. Then, they go on 'we are fairly sure that differential stress is one of the determinants of the child's telegraphic speech'.

Bearing these two studies in mind, it is worth recalling the basic points resulting from the present investigation:

a) verbal interaction with the mother was more important than maternal stimulation, in itself,

b) verbal interaction was considered when the mother responded to the child's utterance and the child responded to the mother's utterance; the descriptive indices of the child's verbal performance were related to the mother's quick verbal reactions and not to the total amount of verbal output in itself.

c) the child, however, responded to the mother depending on the kind of utterance the mother presented: in general, 'verbal prompt', 'repetition', 'model', and 'expansion' were the maternal categories more likely to be followed by a child's subsequent utterance. Those were the mother's utterances which could be considered as short and simple sentences.

d) the mother, however, did present long and complex utterances, 'comment' and 'question'; and such utterances did not establish nor maintain verbal interaction with the child in the same way, nor with the same frequency as the short and simple sentences did.

e) the mother did not respond to all the utterances presented by the child, and the degree in which she did respond characterised the patterns of verbal interaction between the mother and the child for the five pairs of subjects. The indices of measurement of the child's verbal performance correlated with that pattern, that is, with the described index of mother's selectiveness.

The description of the patterns of verbal interaction in which such events happened seems to agree with Brown and Bellugi's about the mother's speech consisting of short and simple sentences. However this was not all that was observed. Besides the occurrence of long and complex utterances, a more striking observation from these patterns of interaction is that there seems to be an almost formal training going on. The mother was continuously prompting the child's utterances, primarily related to some environmental characteristics. The mother's responses to the

child's subsequent utterances did not seem to be focusing mainly on the subject of talking, but on the kind of those utterances: she repeated ('emphasised'), she corrected (giving a new model), expanded or praised the child's utterance, and in these instances the child continued talking. The mother could also simply ignore the child's utterance and after some two, three or four of such consecutive instances, either the mother or the child could start a new chain of verbal interactions, which might very well coincide with some different verbal forms ~~not~~ being emitted by the child. When it happened that the mother was not primarily attending to the utterance then a general comment, question or command was presented, which from the mother's point of view is probably a safer behaviour (since there is no risk of giving the child an inadequate model, or correction or expansion) but which seems less likely to continue the verbal interchange.

In this respect it seems that the contentions by Whitehurst et al, Brown and Bellugi, and by myself, although expressed differently, might well be similar ones, if not the same. Whitehurst and his collaborators talked about the possible simplification of grammatical complexity, Brown and Bellugi about short and simple sentences and differential stress on some verbal forms, and I suggested that the more similar the mother's utterances are to the actual verbal emissions of the child the more likely they are to be followed by a child's subsequent response.

Besides, Whitehurst, et al, suggested that verbal interaction seems to be more crucial than simple verbal stimulation, and the present data suggested that the verbal chains of interaction of the child with the mother depended upon the quick verbal reactions of the mother and on the kind of utterance emitted; yet, concerning their suggestion about a 'critical level for the amount of conversation', the present study allows one to say that, out of the five pairs, where the level was highest (M3, M4 and M5), the indices of the child's verbal performance were the poorest. But, in this respect, the present data led to two confounding events: by talking more, those mothers were both responding more, and presenting more indiscriminate verbal stimulation to their children (this last point only serves to illustrate the difficulties with exclusively field-descriptive analysis).

As previously stated, the basic implications of the present study can be related to some of the assumptions of learning-theoretical approaches to language development, (Skinner, 1957; Staats, 1968). Yet, for some of the descriptions offered in the present analyses, no ready context was found in which they could possibly reside.

In spite of the role of social reinforcement (in combination with imitation) in controlling the child's verbal responses in experimental settings having been stressed, the present study suggests the importance of looking at specific attributes of the

patterns of verbal interaction between the mother and the child.

As stated, the mother can express her approval in a number of different ways, so as to avoid repeating consecutively the same kind of utterance; she can either simply not react to a child's utterance; or she can emphasise the expected utterance by either modelling gradual approximations, or by repeating what the child said, or by expanding it, or sometimes by only praising the child's utterance. Such a variety of stimulations, which may quite possibly be usual at this point in the child's developmental history, have differential effects on the child's subsequent verbal emissions, and have not been manipulated within controlled situations, although this would lead to fruitful investigations.

Besides this, the training procedures usually applied in experimental analysis of a child's verbal acquisitions (imitation and reinforcement), seem vaguely to resemble everyday situations in the child's life. Mothers do present prompts, models and expressions of approval, just as described. But, the order of such stimuli is not followed so strictly, and yet, the child proceeds on the elaboration of his verbal repertoire. I do not believe that this gap justifies the move in developmental psycholinguistics towards constructing grammars for the child's language, and as I have said, I consider the methodology, as yet, inadequate even to describe the child's verbal performance.

However, I would ask whether the order of presentation of those stimuli, or the steps prescribed in the training procedures, are as fundamental as the kind of specific verbal stimuli to which the child is exposed. If, on the one hand, the variables including reinforcement are important, then on the other hand it seems that analyses of the attributes of the stimuli which control the differential responses from the child are required. In this respect I would like to stress the need for further integrated field-descriptive and experimental analysis of children's language, since what is primarily missing in this area is the accurate evaluation of the attributes of the patterns of verbal interaction to which the child is exposed in everyday life.

The small experimental study included in the present dissertation cannot be considered as truly integrated with the field-descriptive study, but it showed that this integration can be achieved even with very young children as the present subjects.

The question it asked was basically derived from one of the fundamental issues in the literature concerning the relative efficacy of social (verbal) and non-social (non-verbal) reinforcers for young children. This question has been exhaustively discussed in relation to non-verbal responses, but scarcely in relation to verbal responses (Cairns, 1967; Spence, 1973; Stevenson, 1965). It appeared to me

that, besides the usual considerations about frequency and discriminability of the reinforcement operation, the nature of the response should also be taken into account, otherwise it would be difficult to consider the role of social reinforcement on speech development, from some of the conclusions. Therefore, I thought that it could be interesting to look at consequences, social verbal and non-verbal, usually applied to the child's speech in everyday life, and to analyse, within a controlled setting, the relative efficacy of some arbitrarily selected verbal and non-verbal reinforcers. If the expected results should appear, then the history of the child's interactions with his environment would have been helpful in assessing the experimental results, and this could throw some light on possible assumptions from the concept above.

However, the field-descriptive study indicated that a very fine-grained analysis is required even when only verbal social reinforcement is considered.

As I have said before, time was at a premium, so that I could not carry out the experimental analysis also testing the differential efficacy of some of the maternal verbal categories suggested. So, I decided to use one of the more 'effective' maternal verbal categories, which was 'repetition' to analyse its effect on the child's speech as compared with a non-verbal reinforcer, such as a small toy.

Nevertheless, this does not decrease the significance of some interesting aspects of the experimental study.

The basic finding was clear: for the two children involved in this study (S1 and S2), the verbal social reinforcer 'repetition of the child's correct utterance, plus praise' was found to be relatively more effective than the material reinforcer, in controlling the child's emissions of 'correct' utterances.

If from the previous analysis the effect of the mother's 'repetition' (which was usually followed by any expression of approval) as maintaining verbal interactions with the child could not be conceptualised, from the present analysis the relation was found to be 'causal', and then it does seem proper to say that this kind of maternal behaviour did relate to the child's verbal performance as a social reinforcer. Besides, in spite of the difficulty of evaluating the significance of child's delays in verbal reactions, it is interesting to point out again the similarity of the profiles of the child's delays after verbal social reinforcement with the delays after the maternal responses to the child (c. f. Figure 3 and Figure 18). The slight differences between the profiles of S1 and S2, in the natural setting, were maintained in the controlled setting. Unfortunately the data in this respect are not enough to allow further considerations and the non-existence of comparable measurements makes it even more difficult.

The other outcome of this study which can be addressed to the previous analysis is the disruption of the S1's performance when verbal social reinforcement was delayed. Recalling that the delay in reinforcement was 5 sec on average (range from 4 sec to 6 sec), it seems proper to say that the 4 sec criterion used to classify mother's utterances as 'reponses' to the child, and vice-versa, was indeed an adequate one. However, this does not invalidate the possibility that the same questions and descriptions from the present investigation could be examined with a 3 sec, or even a 2 sec, criterion. Indeed it would be interesting to know which relations would remain, and then, perhaps the evaluation of delays in verbal responses would be possible.

Why was the material reinforcer relatively less effective? I cannot relate this effectiveness to the child's interactions in his natural setting, because, after all, the non-verbal consequences to the child's utterances were not examined. Whether its efficacy will relate to the verbal social reinforcement, which was available in the controlled setting, or whether it will depend on some kind of relationship between the nature of the (verbal) response analysed and the (material) reinforcer presented remains to be answered. Unfortunately, in experimental analysis of verbal responses when both kinds of reinforcers, verbal social (usually praise) and non-verbal (usually food or tokens) were applied (e.g. Shumaker and Sherman, 1970; Whitehurst, 1971), their use was combined, and the possible relative efficacy of each one was not considered. In analysis of vocal responses in infants, Weisberg (1963) reported the inefficacy of non-social and of social non-contingent reinforcement, and Haugan and McIntire (1972) extended further these results with more specification of the reinforcing stimuli (vocal imitation, tactile stimulation and food) and reporting the 'vocal social reinforcer' as the more effective in increasing the rate of the infant's vocalisations. In spite of the similarity of 'vocal imitation' with the verbal social reinforcer applied in the present study, 'repetition' (plus praise), its relative efficacy, as compared with food and tactile stimulation, was analysed in different groups of subjects and not on the same subject, as in the present study. It seems that for this kind of evaluation both individual and group designs are required.

However, considering the changes in the child's verbal performance during the successively alternated periods of verbal social and material reinforcement, I believe that there might be some kind of relationship between the nature of the response and the reinforcing stimulus in the determination of its relative efficacy. This view can be stressed by the previous considerations concerning the effects of the maternal categories recalling that those of the mother's utterances more likely to be followed by a child's subsequent utterance happened to be those closely related to the child's

previous utterances.

As showed by the cumulative curves of 'correct' and 'incorrect' utterances, the disruptive effect of material reinforcement, as compared with verbal social reinforcement, did not mean that the child stopped talking. But, instead of emitting the 'correct' utterances, which seemed to occur discriminatively, the child continued the emission of 'incorrect' responses. So, the material reinforcement applied to a few 'correct' utterances, most of which were prompted, was followed by a maintained level of 'incorrect' utterances. It is worthwhile to note that, during the material reinforcement periods, the 'correct' utterances referred to the toys delivered (either about labelling alone, or also with some colour and size adjectives added) and the 'incorrect' utterances were, mostly, onomatopoeics and exclamations related to the child's play behaviour. Therefore, it seems that the material reinforcers, in spite of not maintaining the rate of 'correct' utterances, served to cue some other utterances which were considered to be in the class of 'incorrect' ones. That was not the case when verbal social reinforcement was at work. The child not only increased the level of 'correct' verbal emissions but also expanded it to a wide range of different types of descriptions.

Considering S1's rate of 'correct' and 'incorrect' utterances during the successive periods of verbal social and material reinforcement, it is interesting to point out that, together, they did not overcome by much the rate presented by the same S in natural interactions with his mother (5.65 UT/MIN). So this S was not really speaking much more than he did in his everyday life, when 58% of his utterances were followed by the mother's response and, specifically, 30% by mother's repetition. Instead, he was rather emitting 'correct' or 'incorrect' utterances according to the contingencies of reinforcement applied.

It is important to recall that the children (S1 and S2) used in the controlled setting, were not being taught to speak. Simply, their usage of speech was analysed in relation to two contingencies of reinforcement which differed in the nature of the reinforcing stimulus. In this situation, the children were 'using' the words and phrases, from their vocabulary, according to the contingencies applied. One of the contingencies was: during the social periods (that is, when the green lights in the clown's eyes were on), the emission of a 'correct' response, which could be a word, phrase or even a sentence, was followed by the 'repetition' of the child's own utterance, added to any kind of approvative verbal form, and, sometimes, including the name of the subject. This was effective in maintaining verbal interaction between the Ss and the 'clown' which was presenting the verbal consequences. In these interactions the child's verbal responses were not repetitive, but the child

was putting different words together, or was 'creatively' associating different verbal forms in the correct way, or in other words, in the way in which the clown was 'telling' him to associate them.

It really seems quite difficult to me to conceive that the elaboration of verbal repertoires can happen freely from environmental stimuli. Which these stimuli are, and how precisely they contribute towards such an elaboration seems to be a question for further systematically programmed and accurate analysis rather than a question for formal theoretical constructions.

Although it was said previously that the present investigation was raising questions rather than answering them, its basic contribution should be stressed. It indicated a clear interdependence between mother and child interactive sequences of utterances. The mothers showed different degrees of selectiveness when responding to the child's utterances. The children's verbal performance differed depending on the mother's selectiveness and on the kind of the mother's utterances. The implications of these results should be assessed by other studies using an integrated field-descriptive and experimental approach, in which a fine-grained analysis should be applied to the description and evaluation of the various attributes of the mother and child ongoing social interaction. Only this kind of approach could lead to further methodological developments in order to provide an empirical account for language acquisition and development.

A progress on these lines could be fruitful for the understanding of 'normal' and 'abnormal' language development and could be helpful in dealing with children with language problems.

REFERENCES

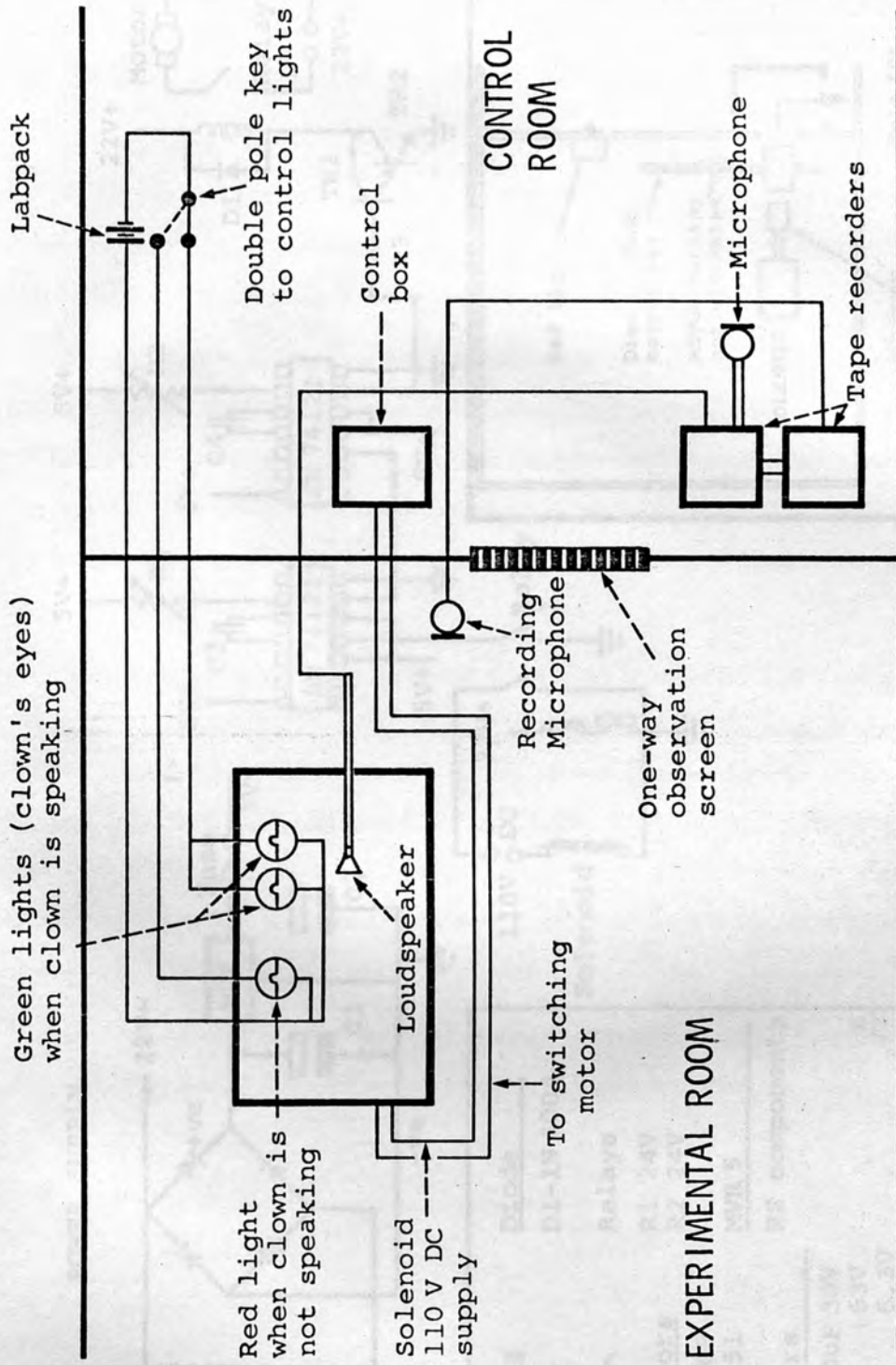
- Baer, D.M. A technique of social reinforcement for the study of child behaviour: behaviour avoiding reinforcement withdraw. Child Development, 1962, 33, 847-858.
- Bandura, A. and Harris, M.B. Modification of syntactic styles. Journal of Experimental Child Psychology, 1966, 4, 341-352.
- Bellugi, U. The development of interrogative structures in children's speech. In: K. Riegel (Ed), The development of language functions. University of Michigan Language Development Program, Rept. No. 8, 1965, 103-138.
- Bijou, S.W. and Baer, D.M. Some methodological contributions from a functional analysis of child development. In. L.P. Lippsitt and C.C. Spiker (Eds), Advances in child development and behavior, vol 1, New York: Academic Press, 1963, pp 197-231.
- Blurton Jones, N.G. and Leach, G.M. Behaviour of children and their mothers at separation and greeting. In. N. Blurton Jones (Ed) Ethological studies of behaviour. Cambridge: University Press, 1972, pp 127-247.
- Braine, M.D.S. The ontogeny of English phrase structure: the first phrase. Language, 1963, 39, 1-14.
- Braine, M.D.S. The acquisition of language in infant and child. In C.E. Reed (Ed), The learning of language. New York: Appleton-Century-Crofts, 1971, pp. 7-95.
- Brown, R. The development of WH questions in child speech. Journal of Verbal Learning and Verbal Behavior, 1968, 7, 277-290.
- Brown, R. A first language: the early stages. London: Allen and Unwin, 1973.
- Brown, R. and Bellugi, U. Three processes in the child's acquisition of syntax. Harvard Educational Review, 1964, 34, 133-151.
- Brown, R., Cazden, C. and Bellugi, U. The child's grammar from I to III. In: J.P. Hill (Ed), The 1967 Minnesota symposium on child psychology. Minneapolis: University of Minnesota Press, 1968, pp 28-73.
- Brown, R. and Fraser, C. The acquisition of syntax. In. C.N. Cofer and B.S. Musgrave (Eds), Verbal behavior and learning: problems and processes. New York: McGraw-Hill, 1963, pp 158-197.
- Brown, R., Fraser, C. and Bellugi, U. Explorations in grammar evaluation. In: U. Bellugi and R. Brown (Eds), The acquisition of language. Monographs of the Society for Research in Child Development, 1964, 29 (1), 79-92.
- Brown, R. and Hanlon, C. Derivational complexity and order of acquisition in child speech. In: J.R. Hayes (Ed), Cognition and the development of language, New York: Wiley, 1970, pp11-53.
- Cairns, R.B. The information properties of verbal non-verbal events. Journal of Personality and Social Psychology, 1967, 5, 353-357.
- Cazden, C.B. Environmental assistance to the child's acquisition of grammar. Unpubl doctoral dissertation, Harvard University 1965. Summary in R. Brown. A first language: the early stages. London: Allen and Unwin, 1973.

- Cazden, C.B. The acquisition of noun and verb inflections. Child Development, 1968, 39, 433-448.
- Cazden, C.B. The hunt for independent variables. In: R. Uxley and E. Ingram (Eds) Language acquisition: models and methods. New York: Academic Press, 1971, pp 41-47.
- Chomsky, N.A. Syntactic structures. The Hague, Mouton, 1957.
- Chomsky, N.A. Aspects of the theory of syntax. Cambridge, Mass: M.I.T.
- Eisemberger, R. Is there a deprivation-satiation function for social approval? Psychological Bulletin, 1970, 74, 255-275.
- Erickson, M.T. Effects of social deprivation and satiation on verbal conditioning in children. Journal of Comparative and Physiological Psychology, 1962, 55, 953-957.
- Ervin, S.M. Imitation and structural change in children's language. In: E.H. Lenneberg (Ed). New directions in the study of language, Cambridge, Mass: M.I.T. Press, 1964, pp163-189.
- Fraser, C., Bellugi, U and Brown, R. Control of grammar in imitation, comprehension and production. Journal of Verbal Learning and Verbal Behaviour, 1963, 2, 121-135.
- Fygetakis, L. and Gray, B.B. Programmed conditioning of linguistic competence. Behaviour Research and Therapy, 1970, 8, 153-163.
- Guess, D. A functional analysis of receptive language and productive speech: acquisition of the plural morpheme. Journal of Applied Behavior Analysis, 1969, 2, 55-64.
- Guess, D., Sailor, W., Rutherford, G. & Baer, D.M. An experimental analysis of linguistic development: the productive use of the plural morpheme. Journal of Applied Behavior Analysis, 1968, 1, 297-306.
- Hart, B.M. and Risley, T. Establishing use of descriptive adjectives in the spontaneous speech of disadvantaged preschool children. Journal of Applied Behavior Analysis, 1968, 1, 109-121.
- Haugan, G.M. and McIntire, R.W. Comparisons of vocal imitation, tactile stimulation, and food and reinforcers for infant vocalisations. Developmental Psychology, 1972, 6, 201-209.
- Hursh, D.E. and Sherman, J.A. The effects of parent-presented models and praise on the vocal behavior of their children. Journal of Experimental Child Psychology, 1973, 15, 328-339.
- Lewis, M., Wall, A.M. and Aronfreed, J. Developmental change in the relative values of social and non-social reinforcement. Journal of Experimental Psychology, 1963, 66, 133-137.
- Lovaas, O.I. Cue properties of words: the control of operant responding by rate and content of verbal operants. Child Development, 1964, 35, 245-256.

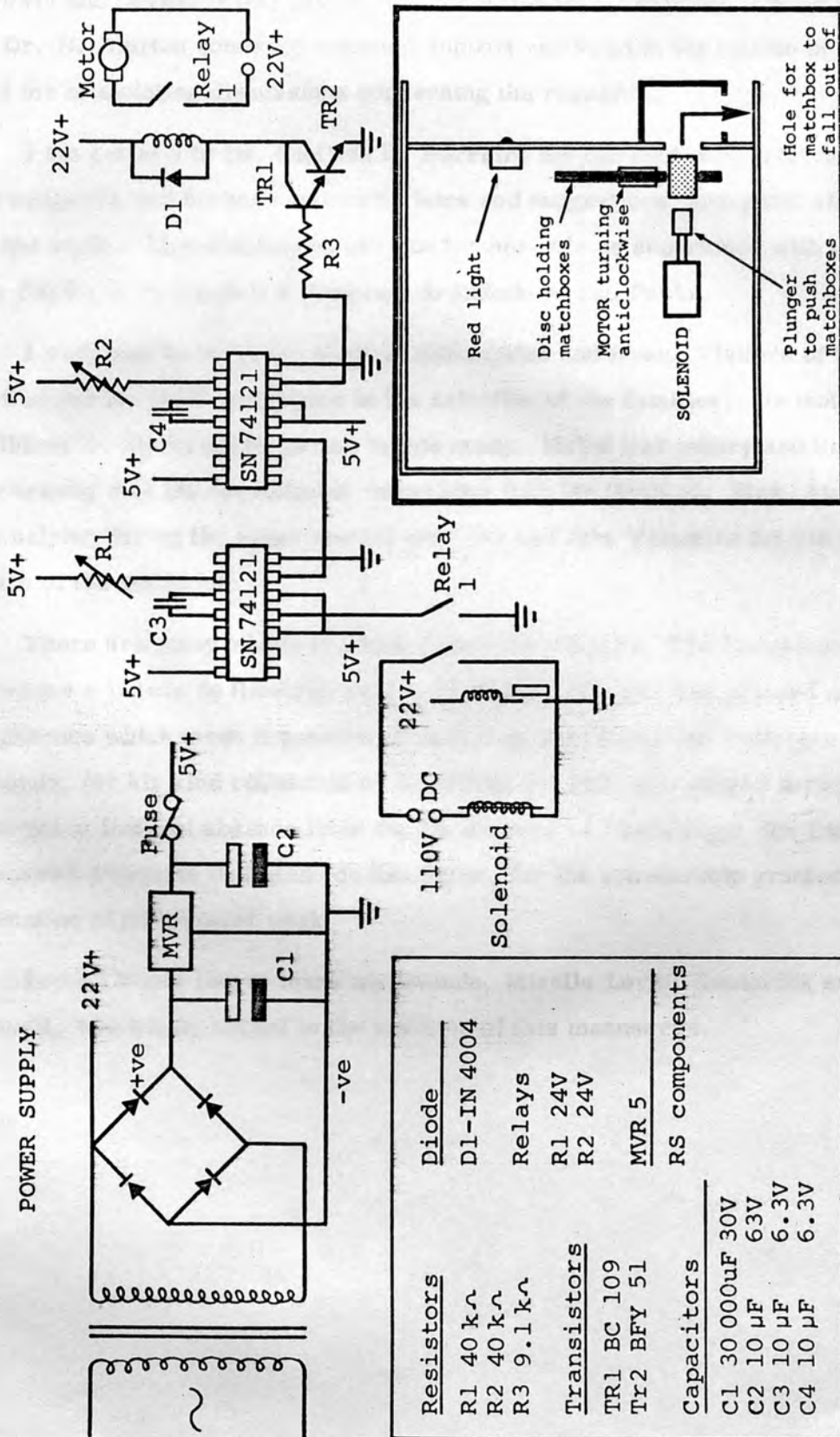
- Lovaas, O.I. A behavior therapy approach to the treatment of childhood schizophrenia. In: J.P. Hill (Ed). Minnesota Symposia on Child Psychology, vol 1. Minneapolis: The University of Minnesota Press, 1967, pp. 108-160.
- Massari, D. Reinforcer effectiveness in children as a function of stimulus satiation. Journal of Experimental Child Psychology, 1971, 11, 310-321.
- McCullers, J.C. and Stevenson, H.W. Effects of verbal reinforcement in a probability learning situation. Psychological Report, 1960, 7, 439-445.
- McNeill, D. The creation of language by children. In: J. Lyons, and R. Wales (Eds). Psycholinguistic papers. Edinburgh: University of Edinburgh Press, 1966, pp. 99-115.
- McNeill, D. The acquisition of language: the study of developmental psycholinguistics. New York: Harper and Row. 1970.
- Meddock, T.D., Parsons, J.A. and Hill, K.T. Effects of an adult's presence and praise on young children's performance. Journal of Experimental Child Psychology, 1971, 12, 197-211.
- Meyer, W.J., Swanson, B. and Kauchack, N. Studies of verbal conditioning: effects of age, sex, intelligence and "reinforcing stimuli". Child Development, 1964, 35, 499-510.
- Miller, W.R. and Ervin, S.M. The development of grammar in child language. In U. Bellugi and R. Brown (Eds) The acquisition of language. Monographs of the Society for Research in Child Development, 1964, 29, (1), 9-33.
- Paris, S.G. and Cairns, R.B. An experimental and ethological analysis of social reinforcement with retarded children. Child Development, 1972, 43, 717-729.
- Parton, D. and Ross, A.O. Social reinforcement of children's motor behavior: a review. Psychological Bulletin, 1965, 64, 65-73.
- Ramey, C.T. and Ourth, L.L. Delayed reinforcement and vocalisation rates of infants. Child Development, 1971, 42, 291-297.
- Reynolds, N.J. and Risley, T.R. The role of social and material reinforcers in increasing talking of a disadvantaged preschool child. Journal of Applied Behavior Analysis, 1968, 1, 253-262.
- Rheingold, H.L., Gewirtz, J.L. and Ross, H.W. Social conditioning of vocalisations in the infant. Journal of Comparative and Physiological Psychology, 1959, 52, 68-73.
- Rosenhan, D. and Greenwald, J.A. The effects of age, sex and socioeconomic class on responsiveness to two classes of verbal reinforcement. Journal of Personality, 1965, 33, 108-121.
- Routh, D.K. Conditioning of vocal response differentiation in infants. Developmental Psychology, 1969, 1, 219-226.
- Sailor, W. Reinforcement and generalisation of productive plural allomorphs in two retarded children. Journal of Applied Behavior Analysis, 1971, 4, 305-311.

- Salzinger, K. Some problems of response measurement in verbal behaviour. In: K. Salzinger and R.S. Feldman, (Eds). Studies in verbal behavior: an empirical approach. New York: Pergamon Press Inc., 1973, pp 5-15.
- Sherman, J.A. Modification of non-verbal behaviour through reinforcement of related verbal behaviour. Child Development, 1964, 35, 717-723.
- Shumaker, J. and Sherman, J.A. Training generative verb usage by imitation and reinforcement procedures. Journal of Applied Behaviour Analysis, 1970, 3, 139-149.
- Siegel, S. Nonparametric statistics for behavioral sciences. New York: McGraw-Hill Book Company, Inc., 1956.
- Skinner, B.F. Verbal Behaviour. New York: Appleton-Century-Crofts, 1957.
- Slobin, D.I. Psycholinguistics. Glenview, III.: Scott, Foresman, 1971.
- Spence, J.T. Factors contributing to the effectiveness of social and nonsocial reinforcers in the discrimination learning of children from two socio-economic groups. Journal of Experimental Child Psychology, 1973, 15, 367-380.
- Staats, A.W. Learning, language and cognition. New York: Holt, Rinehart and Winston, 1968.
- Steinman, W.M. The strengthening of verbal approval in retardates by discrimination training. Journal of Experimental Child Psychology, 1968, 6, 100-112.
- Stella, E.M. Controle de repostas verbais em crianças por estimulação social. Unpubl. M.S. Dissertation. Departamento de Psicologia Experimental do Instituto de Psicologia da Universidade de Sao Paulo (Brasil). 1972.
- Stevenson, H.W. Social reinforcement of children's behaviour. In: L.P. Lipsitt and C.C. Spiker (Eds). Advances in child development and behaviour, vol 2, New York, Academic Press, 1965, pp 97-126.
- Tood, G.A. and Palmer, B. Social reinforcement of infant babbling. Child Development, 1968, 39, 591-596.
- Wahler, R.G. Infant social development: some experimental analyses of an infant-mother interaction during the first year of life. Journal of Experimental Child Psychology, 1969, 7, 101-113.
- Warren, V.L. and Cairns, R.B. Social reinforcement satiation: an outcome of frequency of ambiguity? Journal of Experimental Child Psychology, 1972, 13, 249-260.
- Weisberg, P. Social and nonsocial conditioning of infant vocalisations. Child Development, 1963, 34, 377-388.
- Wheeler, A.J. and Sulzer, B. Operant training and generalisation of a verbal response form in a speech-deficient child. Journal of Applied Behavior Analysis, 1970, 3, 139-147.
- Whitehurst, G.J. Generalised labelling on the basis of structural response classes by two young children. Journal of Experimental Child Psychology, 1971, 12, 59-71.

- Whitehurst, G.J. Production of novel and grammatical utterances by young children. Journal of Experimental Child Psychology, 1972, 13, 502-515.
- Whitehurst, G.J., Novak, G. and Zorn, G.A. Delayed speech studied in the home. Developmental Psychology, 1972, Vol 7, 2, 169-177.
- Zigler, E. and Kanzer, P. The effectiveness of two classes of verbal reinforcers on the performance of middle and lower-class children. Journal of Personality, 1962, 30, 157-163.



Appendix A Figure 9a
SYSTEM OF COMMUNICATION BETWEEN CONTROL AND EXPERIMENTAL ROOM



<u>Resistors</u>	<u>Diode</u>
R1 40 k Ω	D1-IN 4004
R2 40 k Ω	<u>Relays</u>
R3 9.1 k Ω	R1 24V
<u>Transistors</u>	R2 24V
TR1 BC 109	<u>MVR 5</u>
TR2 BFY 51	<u>RS components</u>
<u>Capacitors</u>	C1 30 000uF 30V
C1 30 000uF 30V	C2 10 μ F 63V
C2 10 μ F 63V	C3 10 μ F 6.3V
C3 10 μ F 6.3V	C4 10 μ F 6.3V
C4 10 μ F 6.3V	

Appendix A Figure 9b ELECTRICAL CIRCUIT FOR SOLENOID AND MOTOR

ACKNOWLEDGEMENTS

I express my appreciation to my supervisors Professor B. Foss and Dr. N. Blurton Jones for their advice in this work and for the facilities rendered at the Department of Psychology, Bedford College, and at the Department of Growth and Development, Institute of Child Health. I express further appreciation to Dr. N. Blurton Jones for constant support rendered in the course of this work and for stimulating discussions concerning the research.

I am grateful to Dr. Clotilde R. Ferreira for her continued interest in this investigation and for her acute criticisms and suggestions throughout all the phases of the work. Especial thanks are due for her role as supervisor with regard to the Fundação de Amparo à Pesquisa do Estado de São Paulo.

I wish also to thank the Medical Authorities and Health Visitors of the Borough of Camden for their assistance in the selection of the families; the mothers and children for kindly participating in this study; Mabel Rattenbury and Robert Woodson for helping with the appointment-interviews with the families; Mrs. Audrey Tenner for helping during the experimental sessions and John Valentine for his advice on much of the statistics.

There are many others to whom I am also indebted: The Faculdade de Filosofia, Ciências e Letras de Ribeirão Preto, São Paulo, Brasil, who granted me a leave of absence which made it possible to carry out this work; my colleague, Dr. Lino de Macedo, for his kind collaboration in solving the problems raised during my two-years leave of absence from the Department of Psychology; the Fundação de Amparo à Pesquisa do Estado de São Paulo, for the scholarship granted during the execution of the present work.

Lastly I would like to thank my friends, Mirella Lorio, Daniel Sik and Jacek Prorok, who kindly helped in the revision of this manuscript.