PARENTAL SUPPORT OF COGNITIVE DEVELOPMENT IN INFANCY

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Parental Support of Cognitive Development

in Infancy

by

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ABSTRACT

This study examines the nature of parental involvement in the infants' play with objects (toys) and the effectiveness of the various forms of the parent's (mother's) intervention on the infant's cognitive growth. Assessment of the levels of the infants' cognitive competence were obtained through the administration of the Uzgiris and Hunt's "Infants Psychological Development Scales" which provided a formal measure of performance in various tasks that are related to specific areas of sensorimotor intelligence.

Videotapes of 15-minute mother-infant play sessions in their homes, involving 6-, 9-, 12- and 15-month-old infants were quantified in terms of maternal and infant categories of behaviour that described variations in the involvement and complexity of the mothers' participation and the cognitive and social components of the infants' orientation to toys in an interpersonal context. Besides this cross-sectional method of data-collection, for each group, a quasi-longitudinal approach was adopted to trace the developmental changes of interpersonal play with objects across a period of three months.

Analyses of maternal categories revealed quantitative and qualitative changes in maternal style of interaction as a function of the infant's age, as well as his level of cognitive abilities relative to age peers. Mothers of 6-month-olds were different from the mothers in the other groups in that they directed their infants' play into specific channels to an equal extent as their passive participation in the infants' spontaneous manipulative acts. All the other mothers adopted this latter 'enhancing'

role to a greater extent than the former 'modifying' one. All mothers engaged in very little structured 'teaching' and very little 'assistance' of their infants.

Analysis of the infants' data showed definite developmental changes in all forms of infants' orientation to objects in an interpersonal context. Cooperative play became noticeably more frequent and was more often infant-initiated after age 15 months. Rejection of play with the mother and lack of concentration on the play-task was characteristic of the 9-12 month-old infants.

From the data, three conclusions were derived with respect to parental support and its effectiveness. Firstly, parents encourage autonomy and spontaneity in the infant since they 'enhance interaction' with the toys more than they 'modify' it. 'Modifying' is situation-specific in the sense that it increased when the infants' spontaneous manipulations were relatively infrequent, or when they were characterised by a low-level of cognitive complexity, or when the infant was less advanced than his peers on the sensorimotor intelligence scales. However, with age increases the mothers increased their demands from the infants by initiating more tasks for them to reciprocate. The second conclusion is that when the mothers 'modify' interaction they time their activities in accordance with the infants' ongoing behaviour thereby encouraging the infants' attention to the mother and increasing the likelihood of achieving the goal set by her. The third conclusion relates to the effectiveness of parental intervention. Infants whose age was above 9 months seemed to be more dependent on, and more affected by, their mothers' directive intervention.

These findings are discussed in terms of the implication for child-rearing practices and pre-school education.

CERTIFICATE

I hereby certify that Miss Jean Moseley has completed nine terms of research under supervision after being admitted as a research student under Ordinance General, No. 12. She has fulfilled the conditions of the resolution of the University Court, 1967, No. 1 and is qualified to submit the accompanying thesis in application for the Degree of Doctor of Philosophy.

Research Supervisor

May, 1981

Declaration

I hereby declare that I alone wrote this thesis, that it reports my own work and that it has not been submitted in part, or entirely, in any previous application for a higher degree

Jean Moseley

May 1981

Dedication

In memory of

Professor Osman E Shahine

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CHAPTER I

INTRODUCTION : MOTHER-INFANT INTERACTION

AND

COGNITIVE DEVELOPMENT

CHAPTER I

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1.1 Trends in studies of mother-infant interaction

The last two decades have seen an increasing interest in naturalistic observations of interactions between mothers and their infants from the neonatal period to the third year of life. According to these studies mother-infant interaction provided an important context for examining the ontogeny of social behaviour such as sucking (Kaye, 1977), visual regard and attention (Stern, 1974; Collis, 1977), smiling and vocalising (Moss and Robson, 1968) and pre-speech and early verbal communication (Bates et al, 1975; Schaffer et al, 1977). As Schaffer (1977) has pointed out, the outcome of these studies was the realisation that such behavioural systems "derive their functional meaning" from the interpersonal context in which they were generally observed to occur.

The classic example of this new trend is the interactive approach to language development. Language is no longer regarded as a system that makes its first appearance with one-word utterances (McNeill, 1970); rather the process of learning to talk is now seen as a "continuous one that has no starting point" (Nelson, 1974), and one that is facilitated by the infant's interactions with others, particularly care-givers (Bruner, 1975; 1977; Bates et al, 1973; McShane, 1980).

Different functions were attributed to interactions involving verbal as well as non-verbal exchanges; Bruner (1977), for example, suggests that the requirements of "technical-social" living to which the infant is introduced from an early age contribute to the mastery of grammar. According to this view, the dyadic setting places demands on the infant to communicate while at the same time it provides him with an explicit context for verbal encoding of routines that characterise joint actions such as "give and take." This is achieved through the progressive acquisition of various functional routines or "modes" : the "demand mode", the "request mode", the "exchange mode" and finally the "reciprocal mode" that allows the two participants (adult and infant) to play reciprocal roles when engaged in joint actions.

More recently, a similar approach was adopted in relation to some aspects of cognitive development. Cognitive functions such as concept formation (Nelson, 1974) and directed problem-solving with older children as well as infants (Wood and Middleton, 1975; Kaye, 1976) were also examined in terms of their dyadic structuring. These studies emphasised the role of adults in providing opportunities for the child to develop new concepts or acquire complex skills, in modifying their behaviour for ensuring the infant's success in a task, and in participating in his achievements.

Likewise, this thesis provides further evidence that intelligence or cognitive competence in infancy is essentially an interpersonal phenomenon. Furthermore, development of competence in an interactive setting represents part of the process of socialisation and acculturation. The individual is pre-adapted to be social; when placed in a social environment, the human infant directs his efforts towards comprehending that environment, determining what it expects from him and how he could respond to its requirements as well as change it to satisfy his various needs. The animate environment functions along the same principles. Thus, cognitive competence reflects the infant's capacities to carry out transactions with its care-givers, in the course of which communication is sustained, and joint tasks are executed. In this context, competence has been taken to mean two different things: First, competence is the actualisation of the infant's potential to a greater extent or at a faster rate than peers (Bronson, 1976). This definition of competence is important when evaluating the effects of different environments or different styles of care-giving. Second, competence refers to the progression from one level of cognitive functioning towards more complex and advanced ways of dealing with the environment. This aspect is important for our understanding of the processes of cognitive development. Both meanings of competence are embodied in the ethological view of infancy which ascribes to the infant the qualities of adaptation as well as development (Konner, 1972).

1.2 Parents' contribution to competence

Previous and current research on mother-infant interaction is based on the assumption that early experiences may have profound effects on the infant's concurrent and later development (Ainsworth and Bell, 1973; Bradley and Caldwell, 1976; Lewis & Coates, 1976; Ramey et al, 1979; Wachs, 1976; White et al, 1979). The majority of these studies focused on correlating aspects of the environment with the infant's IQ scores. In Lewis and Coates' study, for example, infants of age three months were tested on the Bayley Scales of Mental Development and the Corman-Escalona Object Permanence Task. Their scores were correlated with global measures of maternal behaviour ("responsivity") as well as more specific ones. The results showed that the global measure was unrelated to the infants' performance in both scales while the specific measures were related to the scores in the Bayley Test. Thus, maternal responses to the infant's smiling by smiling, looking, or vocalising were positively related to the infants' IQ scores. Positive correlations were also found between frequency of episodes of mother-infant interaction and the infants' intelligence. From these findings it became clear to the authors that different forms of maternal involvement lead to different outcomes. For this reason it is necessary to devise appropriate techniques that would enable us to compare "specific interactions with specific outcomes" in terms of social and cognitive growth. While such outcomes can be measured through using intelligence tests, the IQ score is still an unreliable criterion of competence partly because of the numerous methodological problems that are associated with intelligence tests (Lewis, 1976) such as their culture bias, artificiality or inhibitory effects on the testees. However, the main problem with the IQ scores is that they dissociate cognitive competence from the interactive setting. In other words, they may be measuring a different set of abilities than the ones that characterise intelligence in relation to social settings. A more useful approach to studying cognitive development, like that of language development, is to examine it in a dyadic setting and in terms of the temporal patterning of infants' responses to parental activities that have the potential of regulating the infant's behaviour towards the inanimate environment.

As already mentioned, identifying and quantifying the parents' activities during joint play with their infants, allows us to examine in what ways, and to what extent the experiences parents provide during interactions with their infants are intellecually effective. Such measures are required for at least four reasons:

Firstly, our knowledge of what constitutes "intellectually valuable experience" and of the relationship between such experience and the development of cognitive capacities is still scanty.

Secondly, knowing what constitutes an adequate level of intellectual stimulation that is necessary for cognitive growth and how to mediate it, allows us to detect deviations from what is believed to constitute adequate stimulation; for example, it has been argued that parents with poor resources (material and intellectual) may contribute to their infants' cognitive deficits and poor school-performance in later years (Willerman et al, 1970). We want to know where exactly the source of inadequate environmental stimulation lies, before we can devise ways for improving pre-school experiences.

Thirdly, following from the second point, attempts at "intervention" have been made in the forms of enrichment programs for the "culturally disadvantaged" (Painter, 1969; Tulkin et al, 1973). Such attempts were not always successful. This is partly due to their ad hoc nature since a program may focus on one aspect of cognitive competence (e.g. verbal stimulation) and neglects other aspects. Furthermore, failure of some of the programs could be attributed to a discrepancy between the contents of the programs and the "para-educational" elements of mother-infant interaction such as affective components which may provide the favourable conditions that make infants receptive to their mothers' attempts to teach them. Furthermore, intervention programs were criticised on the grounds of imposing white, middle-class values and culture on infants from different social- and ethnic-backgrounds (Lewis, 1976; Starr, 1971). Thus failure of the programs could also be due to their alien cultural elements. Therefore, if authorities have to resort to intervention as a means of providing equal opportunities for children with higher intellectual risks due to their socio-economic or cultural backgrounds then one wants to design educational programs that are in harmony with the principles that govern the infants' "natural" interactions with their mothers, within a specific culture.

Fourthly, as Margaret Donaldson (1978) has pointed out, there seems to be a discontinuity between pre-school learning (at home and at nursery groups) and later formal school-education: The former takes place in an interpersonal context, while the latter is conducted in artificial settings and uses methods that bear little resemblance to the ways the child normally deals with the real world. She suggests that such a state of affairs has resulted in apathy and failure among the present generation of school pupils in this country. Thus, there seems to be a need for designing school curriculum that conforms to "real life situations" and that evolves round more interactive relationships, thereby maintaining the link between formal schooling and earlier relationships with care-givers.

1.3 Play and Cognition

In this research two approaches to the assessment of competence were adopted. The first is a formal or psychometric approach, based on standardised testing procedures which are designed to elicit specific responses from the infants. This will be discussed in detail in Chapter V. The second approach looks at manifestations of competence in the forms of the infants' interactions with objects in an interpersonal setting.

The association between play with objects and cognitive competence has already been made by some Developmental Psychologists, notably Piaget. According to him, play is characterised by "the primacy of assimilation over accommodation" (Piaget, 1962). This is because by the repetition of actions through "reproductive assimilation" the child assimilates objects to actions, giving rise to "schemas" which, once acquired, are repeatedly performed (through assimilation) and, sometimes, in a ritualised manner for sheer pleasure. In other words, play constitutes the repetition of actions that are already within the infant's capacity. Thus, as Piaget pointed out " ...... almost all behaviours (that relate to intelligence) are susceptible of becoming play as soon as they are repeated for mere assimilation" (Piaget, 1962; p89). In doing so, the child derives pleasure from being "a cause" and in bringing about changes in the world to suit his own needs. This is in contrast to imitation which is dominated by accommodation, rather than assimilation. Here the child adjusts his own schemas to match those of a model, a process that involves effort at adaptation. Thus, play may be preceded by imitation. At the final stage of sensorimotor development, symbolic play makes its appearance. It involves "distorting assimilation" since the child is performing actions in the absence of objects, or with an object that is normally not associated with that action (e.g. a child pushing a box, as if it was a car). Together with these two forms of play, Piaget mentions the combining of two or more objects, either fortuitously or intentionally. When the child's actions are fortuitous, they represent extensions of the mere assimilation of the "practice games" already mentioned. When his actions are intentional, combining objects "lead to real adaptation and leave the realm of play for that of practical intelligence" (p117). In terms of its developmental functions, Piaget perceives play as allowing the child to consolidate prior learnings (schemas) and prevent their loss or decay through disuse (Millar, 1968). It also develops the child's creative imagination which is the essence of adult's reasoning that incorporates experimenting with reality together with deduction and the formation of logical concepts.

For Bruner (1972), play is a pre-requisite for problem solving and transmission of culture. During the course of evolution, "sub-routines" are practiced, perfected and expanded to enable humans and, in some cases, primates, to accomplish complex tasks involving tool-use. The process of learning takes place either during solitary, tension-free experimentation, or by observing, and later imitating, adults' modelling in a "pressureless environment". Bruner's view had received support from experimental studies which showed that children with prior experience with a certain toy, later achieved solution to a problem involving the same toy, in a more organised manner and at a faster rate than a control group of children who had no prior exposure to the toy (Sylva et al, 1974; Smith and Dutton, 1979). It was suggested that the facilitatory effect of play is due to the construction of internal models of the objects and the action routines that could be carried out with that object; later hypotheses are generated from the model to aid the solution of a novel problem (Fagen, 1975).

Both Piaget and Bruner interpret play in terms of its cognitive structure. In the case of Piaget, play is an expression of the process of assimilation, while in Bruner's case play has a facilitatory effect on problem-solving. In both cases, objects are central to play. In the present research object-play is perceived differently, for as well as serving other functions it is seen as a phenomenon in its own right. In other words, play is cognitive competence. Thus, while playing, the infant may practice already acquired skills (e.g. repetitive banging or hitting of two objects together) or he may be attempting a novel task (e.g. matching shapes to a posting box). Since the infant is an adapted organism, his play can be considered as analogous to adults' planning, their performance of skilled operations (manual or mental) and their execution of joint actions. Since he is also a developing organism, the infant's play is initially more rudimentary, involving a limited repertoire of actions; as the infant gets older, his play becomes progressively more complex in a fashion similar to that described by Piaget. Furthermore, as already indicated in Piaget's and Bruner's views, play is influenced by the infant's human environment through its provision of models and through "indoctrinating" the infant by making available to him the objects that are relevant to his culture and determining his relationship with the animate and inanimate environments. In this respect, cultural differences in infants' play are expected to emerge since the role of objects varies from one culture to the other. In a non-Western, less individual-centred society, for example, objects with immediate social utility would be more prevalent, while the adults' efforts may be directed not only towards instructing the infant on how to perform tasks with such objects, but also on how to perform tasks for the benefit of others, as well as in cooperation with others. Likewise, toys with social attributes (e.g. dolls) may be used to strengthen affectional ties between the infant and members of his society. Thus, in a sense, adult-infant engagements in cooperative tasks with objects may be regarded as a prototype of the infant's later "material" achievements in a social world. (The main difference is that adults' dealings with their environments, unlike infants' play, are not conducted in a leisurely atmosphere, nor are they always "self-motivated" and "self-rewarding"). Finally, as Piaget and Bruner had suggested play is useful for later intellectual achievements, since it equips the individual with strategies for approaching problems and performing logical operations.

1.4 Aims and Methods

Since cognitive development in infancy is expressed through the infants' spontaneous activities with objects, and since such activities may be structured by-, or shared with a care-giver, we need to understand the nature of the mother-infant interaction when objects are involved. In order to do so, we need reliable records of the infants' range of activities, the forms of experiences provided by care givers, as well as measures of the infant's level of cognitive functioning. Problems of categorising behaviour and the methods that were developed to overcome such problems are presented and discussed in Chapters III and IV, together with a description of the range of maternal and infant activities that were observed in this study and that involved infants of four age-groups. For a formal measure of the infants' performance in cognitive tasks, Piagetian scales were used. These are described in Chapter V. The relationship between these scales and corresponding, specific environmental experiences are also considered in this chapter.

Having specified the two participants' range of activities, and the infants' levels of competence, there remains the need to examine the significance of parental participation to cognitive development. This was carried out in Chapter VI, and through the correlation of the mother's behaviour with the infant's complementary free-play activities, as well as the scores in the Piagetian scales. As Whiten and Milner (in press) have pointed out, such correlations cannot conclusively demonstrate any causal links between what the mother does and how the infant performs. Nonetheless, the correlational approach renders useful information on the extent to which the participants balance the rate of their activities so that their interactions are smooth and their goals are achieved.

Finally, as in language studies, examination of detailed sequences of interaction involves large amounts of data and extended periods of study. For this reason, observational studies often involve small samples ranging from one (Halliday, 1975) to five subjects (McShane, 1980). This approach provides accurate and realistic accounts of infants' experiences and their responses to those experiences but it does not permit the establishment of norms on mother-infant interactions. For this reason, in the present research each mother-infant pair can be regarded as a separate case-study. Detailed analysis of eight separate cases, is, therefore, presented in Chapter VII.

CHAPTER II

GENERAL METHODOLOGY

CHAPTER II

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2.1 The Sample

19 mother-infant pairs were the subjects of this study. They were recruited through St Andrews Child Welfare Clinic. The experimenter visited the Clinic when the mothers were attending it with their babies, and she invited them to participate in a project on 'the development of children's play'.

Mothers and infants were then chosen on the basis of whether the infant's age fitted with any of four developmental periods that were pre-selected for study and whether they lived within short travel distance, since the experimenter had to rely on taxis for transport to-and-from the subjects' homes. All selected mothers showed willingness and eagerness to participate. Only one mother-infant pair had to be replaced due to the presence of an older sibling who interfered with the observations in a manner that made it impossible to treat the data as comparable.

Since St Andrews is a small place, births are few and, therefore, it was not possible to match the infants for sex. Two of the infants were retarded in their bone-age. The first one, a six-month-old, first-born male was retarded by three months, and the second one, a 15-months-old, second-born female was retarded by six months. I became aware of the condition of the first infant before commencing the observations, and of the second one after the study was completed. In both cases, routine medical check of the infants' height showed a slow rate of development which led to their referral for special X-ray examinations that confirmed the bone-age retardation. According to the paediatrician's opinion this condition is most likely to have an adverse effect on motor development but its effects on mental development are not known. Since both infants showed no particular differences from the others in the way they reacted to the observations, it was felt that they need not be excluded from the study. Furthermore, this presented an opportunity for examining whether the condition of the infants affected in any way the mothers' behaviour. Data on these two cases will be presented later for comparison with other normal, matching cases.

Nine of the subjects came from a middle-class background while the remainder could be regarded as upper-working class. This categorisation into social class was determined from the parents' occupation.

The sample is divided into four groups based on the infants' age as shown in Table 2.1.

2.2 Procedure

Each mother-infant pair were seen on average 8 times, although this number varied in some cases. An introductory visit was made to each mother to make the necessary arrangements for visiting times, to explain to her more about the project and to establish rapport with her and the infant. During that visit the mother was told that the study in which she was asked to participate examined the developmental progression of infants' play with objects. The experimenter emphasised that it was the infants' behaviour which we were interested in, although the mother's presence was vital. Her role was defined to her through the following instructions (the wording of the text varied slightly in each case but the gist remained unchanged):

> "I would like you to behave as naturally as possible, and to consider the situation as part of your daily routine with the baby. Just take it as if you have 15 minutes to spare from your house-work, and to sit and play with him/her. Perhaps you already practice that. Feel free to join his/her play in whatever manner you wish. You can play with any toys which the baby may favour, together with the one I shall bring

Table 2.1 Distribution of the sample according to the infants' age

Group	Age at start of observations	Mean	Range	Age at end of observations	Mean	Range	Number of infants	
							Male	Female
A	6 months	6m,1wk	6 - 6½ months	9 months	8½ months	8m,1wk - 9m	3	1
B	9 months	9½ months	9m,1wk - 10m	12 months	12 months	11½ - 12½m	3	2
C	12 months	12m,1wk	12 - 12m,3wks	15 months	14m,3wks	14½ - 15m	1	4
D	15 months	15½ months	15½ - 16 months	18 months	18m,1wk	18 - 19m	3	2

along. On one occasion I shall play with the baby myself, with some other toys which I shall provide."

Subsequent to the introductory visit, each pair of subjects were observed, on average, twice every month for a period of three months. Details on the interval between each observation, together with the age of the infants at each visit are given in Figure 2.1.

All observations were carried out in the subjects' homes and between the mother and the infant. Only in one case, S14, the father interacted with the infant on three occasions. These were not included in the analysis but were used as comparative data for the case studies to be presented in Chapter VII. Episodes of child-infant interaction were also excluded from the analysis. Each visit lasted for about 45 minutes, but the recording of interpersonal interaction with objects went on for only 15 minutes. This was recorded on a portable Sony video-tape recorder.

On arrival to the home the observer began by setting up the equipment and getting it ready for filming. When the observer judged it convenient to start the session, she presented the mother with the standard toy which consisted of a set of nesting beakers manufactured by Merit. The camera was then focused on the mother, baby and toys, but if the infant was not in proximity to mother and toys, priority was given to tracking his movements rather than focusing on the mother. In all instances care was taken to lead to object-play as naturally and smoothly as possible, that is, the infant was not suddenly confronted with the toys and demanded to play with them.

Once the filming was begun it continued for 15 minutes. However, if during that time the interaction was interrupted by external events such as visitors' arrival or other callers, the recording was stopped to be resumed again when the mother was ready to settle down to play with the

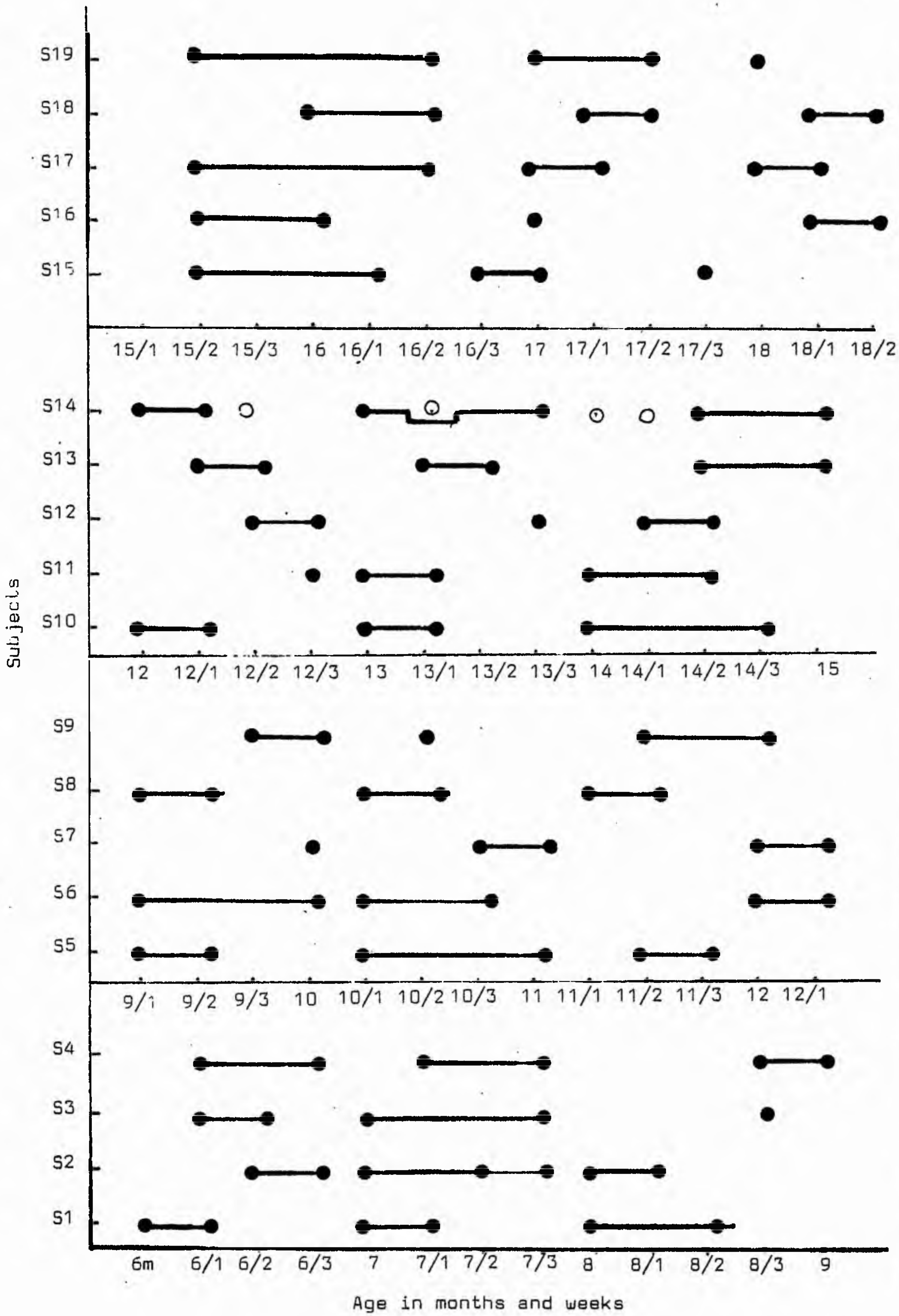

Figure 2.1 Distribution of visits and age of infant at each visit. The blobs represent visits and the lines joining two or more blobs represent visits continued in longitudinal analysis. The white blobs (S14) represent father-infant interaction

baby. The recording was also stopped if the infant left the field of play or cried for a duration that exceeded 3 minutes. The decision to limit the period of recording to 15 minutes was reached after pilot observations which showed clearly that the span of attention of infants and the co-operation and involvement of mothers begin to dwindle after that time.[1]

At the beginning of the observational visits, the Uzgiris and Hunt's Scales of Infants' Psychological Development were administered to each infant. This took place during two visits. In the first visit one of the Scales (Scale VI) was administered in conjunction with an observational visit and after the completion of the recording of the mother-infant interaction session. The remaining Scales were administered within the next twenty-four or forty-eight hours. When the tests were being administered the experimenter was usually accompanied by an assistant who scored the infants' performance while the experimenter carried out the tests and, when possible, scored the infants' performance. This followed establishing inter-observer reliability between the experimenter and the assistant. Further details of the testing and scoring procedures are provided in Chapter V.

2.3 Analysis of the Observational Data

The contents of the videotapes were transcribed onto data sheets. Each sheet was divided vertically into 2 columns, the left hand column for

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1. These pilot observations followed the same procedure as the main study, except that each pair was visited once a week for a month and the recording lasted for 45 minutes. There were 6 participants in that part of the study. Two of the infants were aged 3 months, one was 6 months, another was 10 months and two non-identical twins were 12 months.

the mother's activities and the right-hand one for the infant's activities. Horizontal lines divided these columns into blocks, each block representing 15 seconds-time-intervals. Each sheet represented $2\frac{1}{2}$ minutes and the whole session was transcribed in 6 sheets. At the top of the sheet information regarding the subjects was entered (e.g. age, sex, number of visits, etc). The number and type of toys were also recorded according to their appearance in the film.

At the onset of the film an electronic bleeper with an ear-piece was switched on. Behaviour of one partner was recorded in the appropriate column and opposite it, on the same level, was entered the behaviour of the other partner that was sequential to the first behaviour or that occurred simultaneously with it. For this purpose, abbreviated forms of each of the mother's and the infant's lowest-level-categories of behaviour that were described hierarchically, (see Chapters III and IV), were used. The direction of the flow of interaction was indicated in the following manner:

	Mother		Infant
(i)	x	$\longrightarrow$	y
(ii)	x	$\longleftarrow$	y
(iii)	x	$\longleftrightarrow$	y

In (i) maternal behaviour x is followed by infant behaviour y.

In (ii) infant behaviour y is followed by maternal behaviour x.

In (iii) mother did x simultaneously with the infant's performance of y.

At the end of each 15 seconds the bleeper gave a tone and at that signal behaviours were entered into the next 15-seconds-block. The process continued until the end of the film. Each film was re-played three times in order to double check the coding of all behaviours.

The first stage in computation utilised a programme which, when supplied with the coded occurrences of lowest-level categories in the hierarchies, constructed the corresponding frequencies of superior categories.

The data was then combined according to two designs:

(i) A Quasi-longitudinal design. The present research can be regarded as partly longitudinal since the same subjects were studied repeatedly over 3 months. The purpose of distributing the visits along the three months is to examine any behavioural change that may take place within short periods of time. For this reason the 6 visits were spaced in such a way as to make it possible to combine data on every two consecutive visits as representative of a period of one month. Thus, for each month a fixed age range was selected and any visits falling within that range were used as data for that month. (Figure 2.1).

(ii) A Cross-sectional design. This made reference to four developmental periods that provided the basis for the groupings of the subjects which was described earlier in this chapter. The four periods were chosen because each of them is characterised by important developmental landmarks. Thus, at 6 months, grasping and ability to handle objects develop. At 9 months, locomotion, first by crawling and then by walking, begins. At 12 months infants begin to use speech, while at 15 months infants incorporate abilities from various domains and they are less dependent on their mothers than previously. With this design, all visits for each subject are combined together and their mean is used as the final score.

Since the number of subjects in each group was small, a cross-sectional design was further utilised whereby two different developmental periods were examined and with a larger number of subjects per period. (8 subjects at ages $7\frac{1}{2}$ to $10\frac{1}{2}$ months and 10 subjects at ages $13\frac{1}{2}$ to $16\frac{1}{2}$ months). However, this design was applied only to the mothers' data which is presented in Chapter III.

CHAPTER III

DESCRIBING PARENTAL SUPPORT

CHAPTER III

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3.0. Introduction

In order to find out how parents may affect the cognitive development of their infants we need to develop a system that would describe adequately the wide range of parental behaviour shown during interpersonal interaction with objects, and which can be directly related to specific aspects of cognitive competence. Recent studies that have focused on the significance of early experience for cognitive competence (Hess and Shipman, 1965; Kaye, 1976; Lewis and Coates, 1976; Yarrow et al, 1975; Wachs et al, 1971, and Rubin and Balow, 1979) are still lacking in this respect since they confined early experiences to socioeconomic status and to restricted and laboratory structured situations in which they asked the mothers to perform a limited range of activities such as teaching the infants a new skill. Others have used gross concepts such as "stimulation" and "sensitivity" whose relevance to particular cognitive abilities is not well understood.

An exception to such types of studies is the Harvard Preschool Project (White et al, 1973; 1978; 1979), which I became acquainted with after the present system was constructed. Part of this longitudinal study involved describing the infants' environment largely by describing the mothers' forms of interaction and the types of activities mother and infant engage in (Carew-Watt and Barnett, 1973). Carew-Watt and Barnett identified three forms of interaction which they regarded as influential in shaping development. These are the parent's participation in a "developmentally pertinent experience" the parent's increasing the likelihood of the occurrence of such an experience, and her making it "more or less pleasurable for the child." These aspects correspond to three roles which the mother may perform: direct participation, such as when the mother tells her baby the names of his animal toys, indirect participation, for example, when the mother tells her baby to play with his animal toys, and a neutral or non-participatory role, as when the mother "observes" her infant's play. These roles can be achieved in relation to various activities which Carew et al had labelled in terms of the cognitive abilities that they were believed to foster; for example, book-reading was labelled verbal/symbolic activity, and building towers with bricks was labelled fine motor/spatial activity. In this respect the Harvard Preschool method differs from the present one since, rather than identify the cognitive contents of activities, I emphasise the description of the strategies which mothers use for initiating or maintaining an infinite number of activities pertaining to cognitive growth. To specify apriori the cognitive contents of these activities would be unwise since an activity could be responsible for the development of more than one ability, for example, book-reading fosters language development (McShane, 1980), but it may also foster turn-taking skills in dyadic interaction (Bruner, 1975), or enables the child to acquire social conventions governing ritualised activities (Bruner, 1977). Similarly, to guide the infant by the hand to a distant toy fosters gross motor skills, but it could also help to develop fine motor skills or concrete reasoning or any kind of skill depending on the particular toy to which the infant was led. Furthermore, when examining the role of experience in cognitive development, one should consider the possibility that what the infant gains from favourable experiences is not only specific information or specific practice of certain cognitive skills, but also general strategies for developing various abilities (Hess and Shipman, 1965). An infant who is always taught how to play with his toys may develop less adventurous strategies for solving problems than one who is given the toys and encouraged to discover their properties and their uses by himself. Therefore, beside looking at what activities mothers make available to their infants, we should also look at the ways the mothers make possible such activities. In their system, Carew et al make provision for that by describing the techniques by which the mothers facilitate various cognitive activities. These include _teaching_, _facilitating_, _scolding_, _preventing_, etc. However, from this example, it is not clear why various techniques which seem to be related are regarded as separate, for example _prevent_, _scold_ and _restrict_ all deal with a negative course of action. Other techniques such as '_facilitate_' or '_teach_' do not specify the manner by which they are achieved, and which can be an important determinant of consequential success or failure of the behaviour; Wood, Wood and Middleton (1978) found that teaching a child the solution to a problem by using forms that are contingent to his trials and errors is more effective than "demonstrating" the solution at the beginning of the task. Specifying the forms of such techniques can also help us to determine the level of cognitive complexity which characterises an act and distinguishes it from others, for example, to model an action for the child to imitate requires memory; instructing him how to perform a task requires verbal comprehension.

In order to be able to group together various acts that fulfil the same function, a hierarchical system of classification was adopted in this study. This system allows us to combine objective, small units of behaviour together with larger meaningful units, in the most economical way. It is mainly concerned with the identification and classification of parental behaviour that creates possibilities for the child's manipulation of objects. Thus, quantifying parental behaviour is one of the aims of the study which is described in this chapter. Another aim to be presented in Chapter VI, is to examine the significance of the present quantitative measures for the cognitive development of infants. A brief description of the hierarchy will be presented now, to be followed later by a more detailed one.

For the most part the hierarchy extends to five levels, although in other parts it extends to 9 levels (Figs. 3.1 to 3.8). The total structure

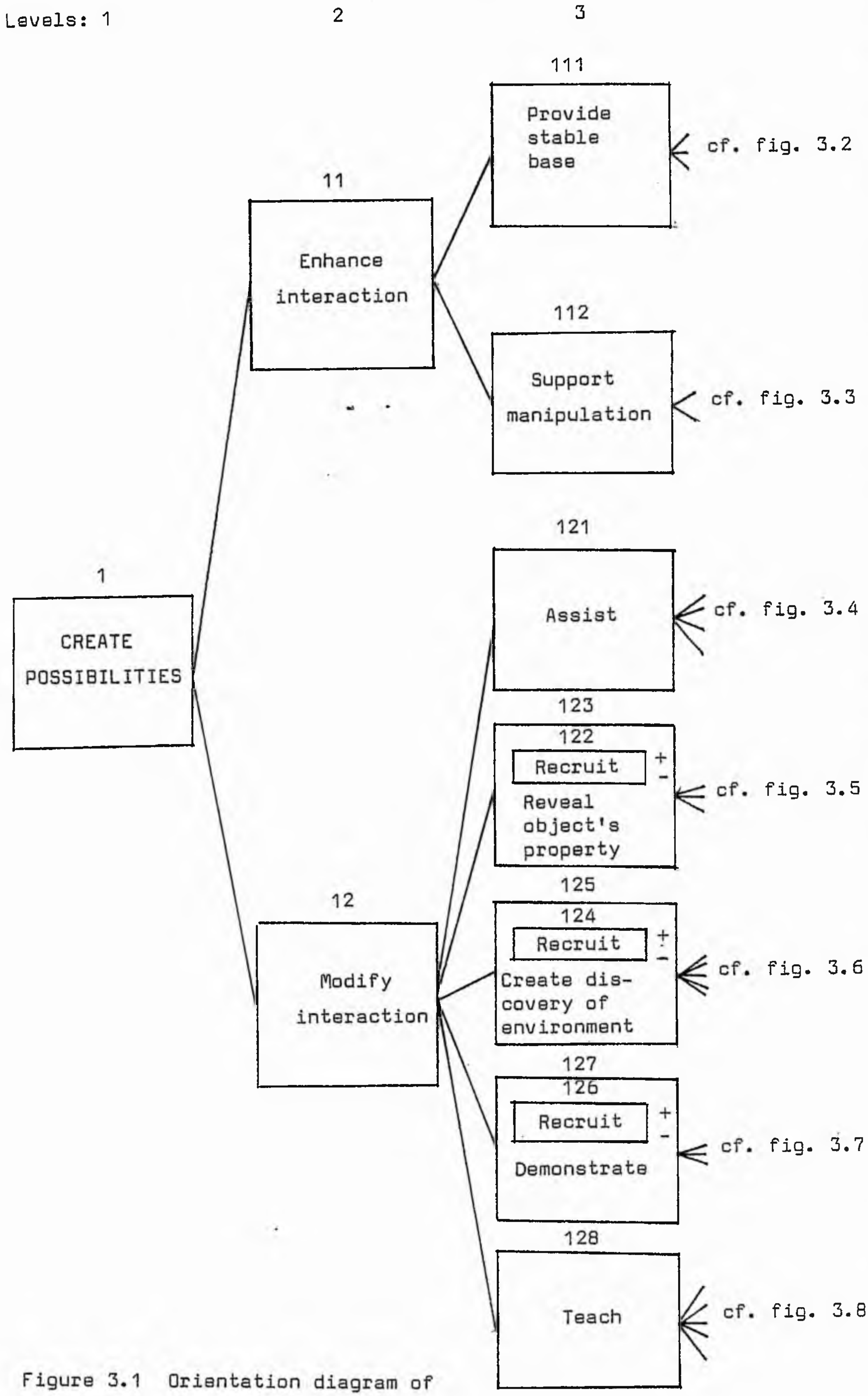


Figure 3.1 Orientation diagram of the Hierarchy

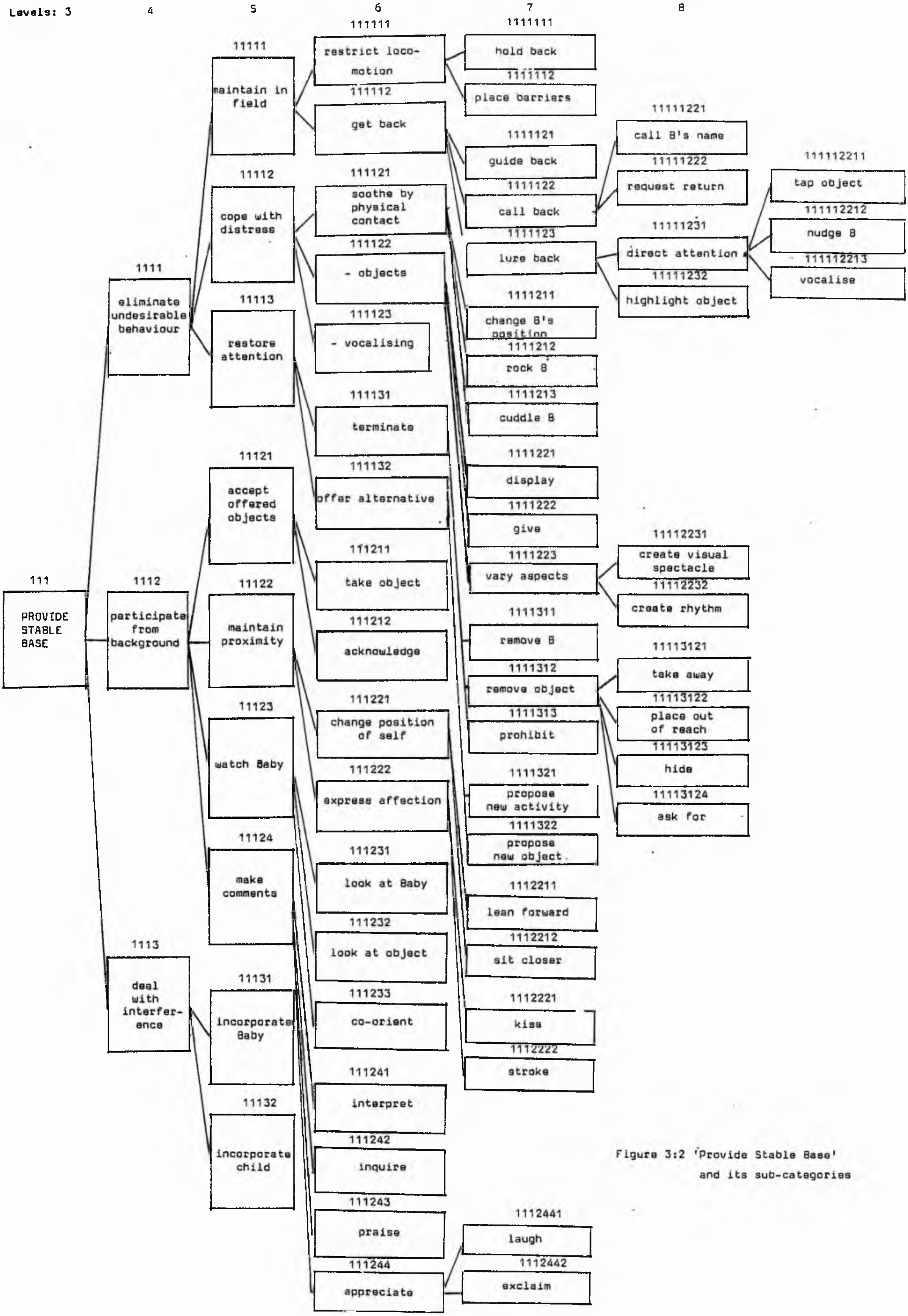


Figure 3:2 'Provide Stable Base' and its sub-categories

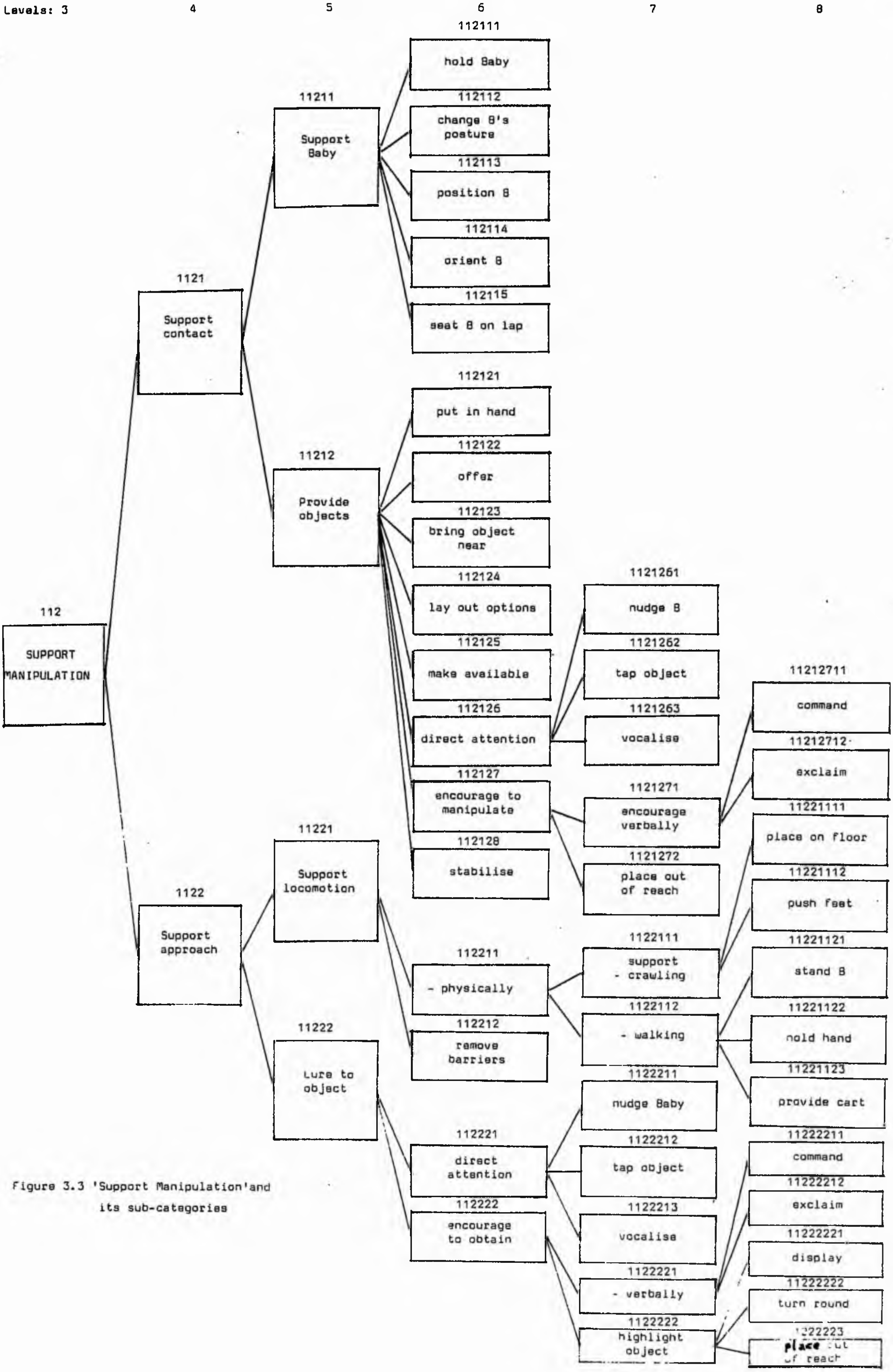


Figure 3.3 'Support Manipulation' and its sub-categories

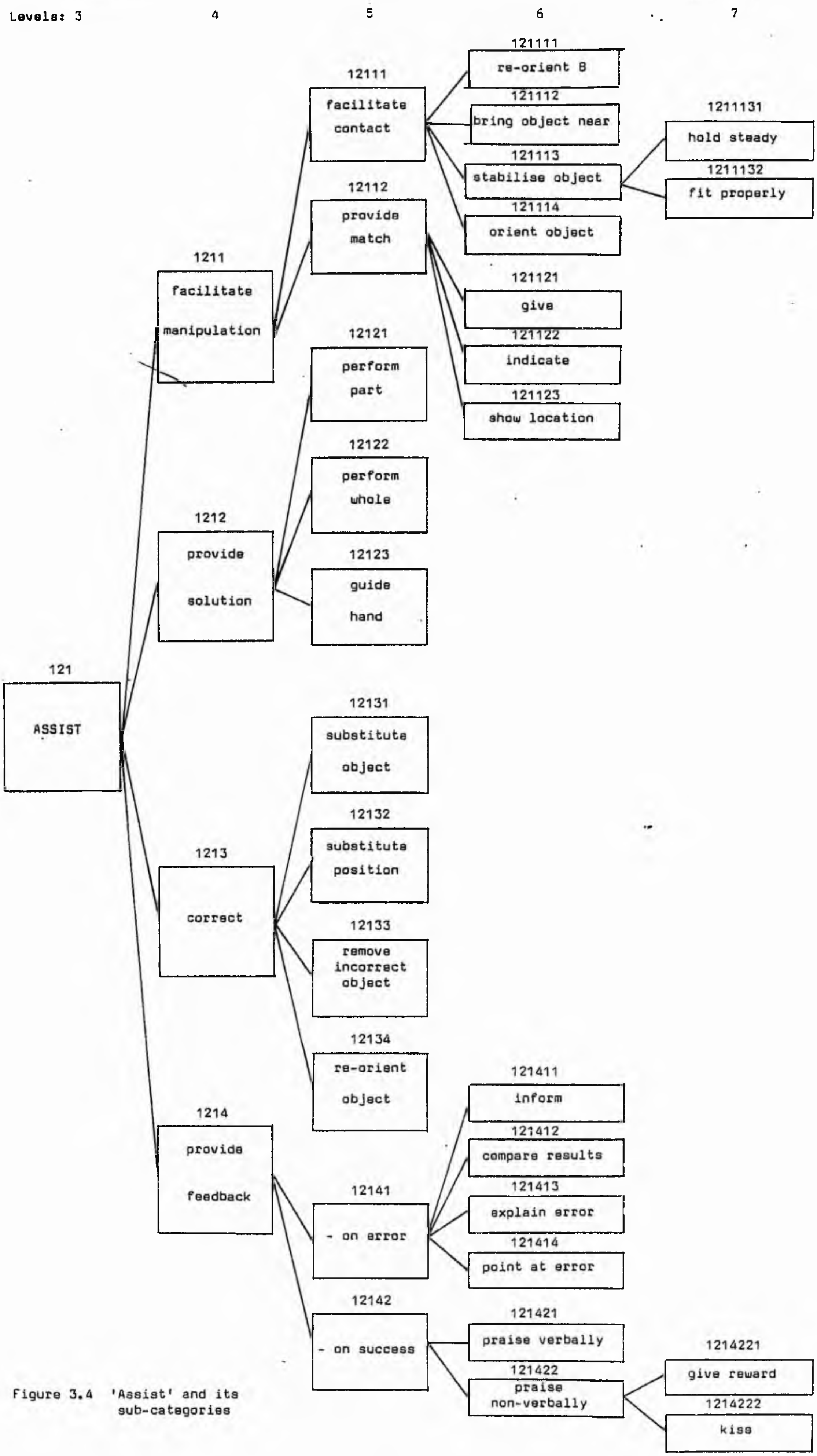


Figure 3.4 'Assist' and its sub-categories

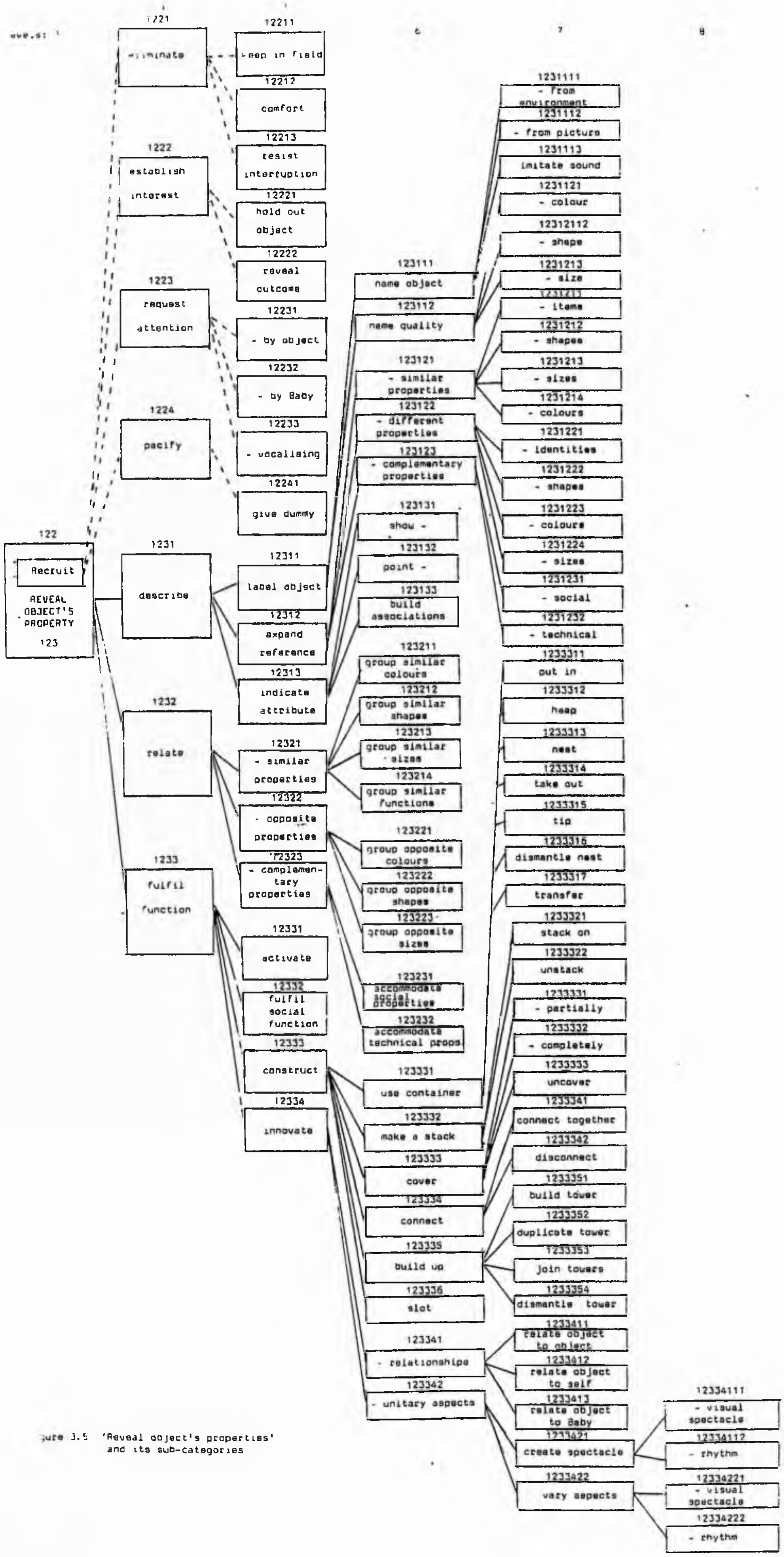


Figure 3.5 'Reveal object's properties' and its sub-categories

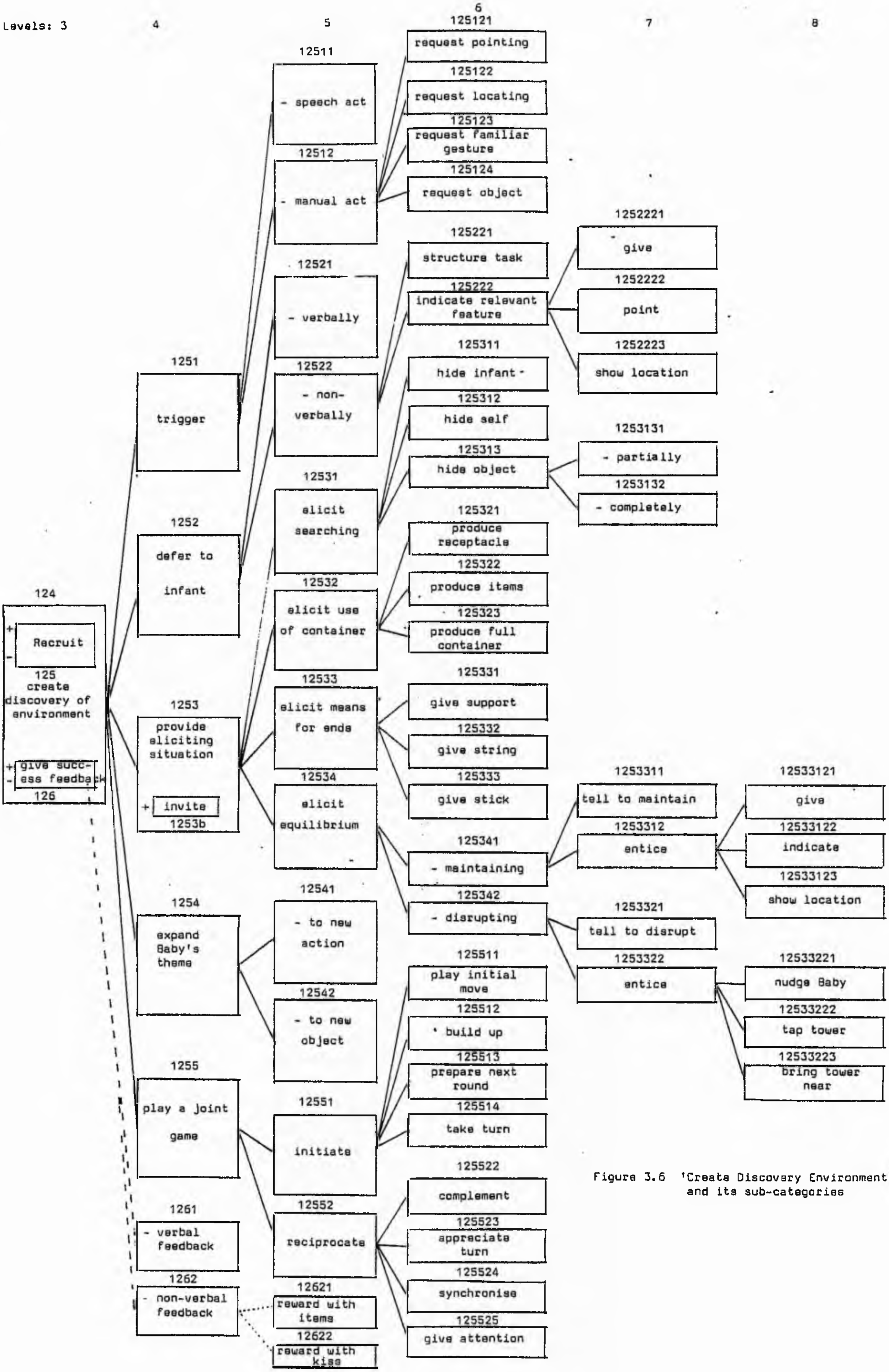


Figure 3.6 'Create Discovery Environment' and its sub-categories

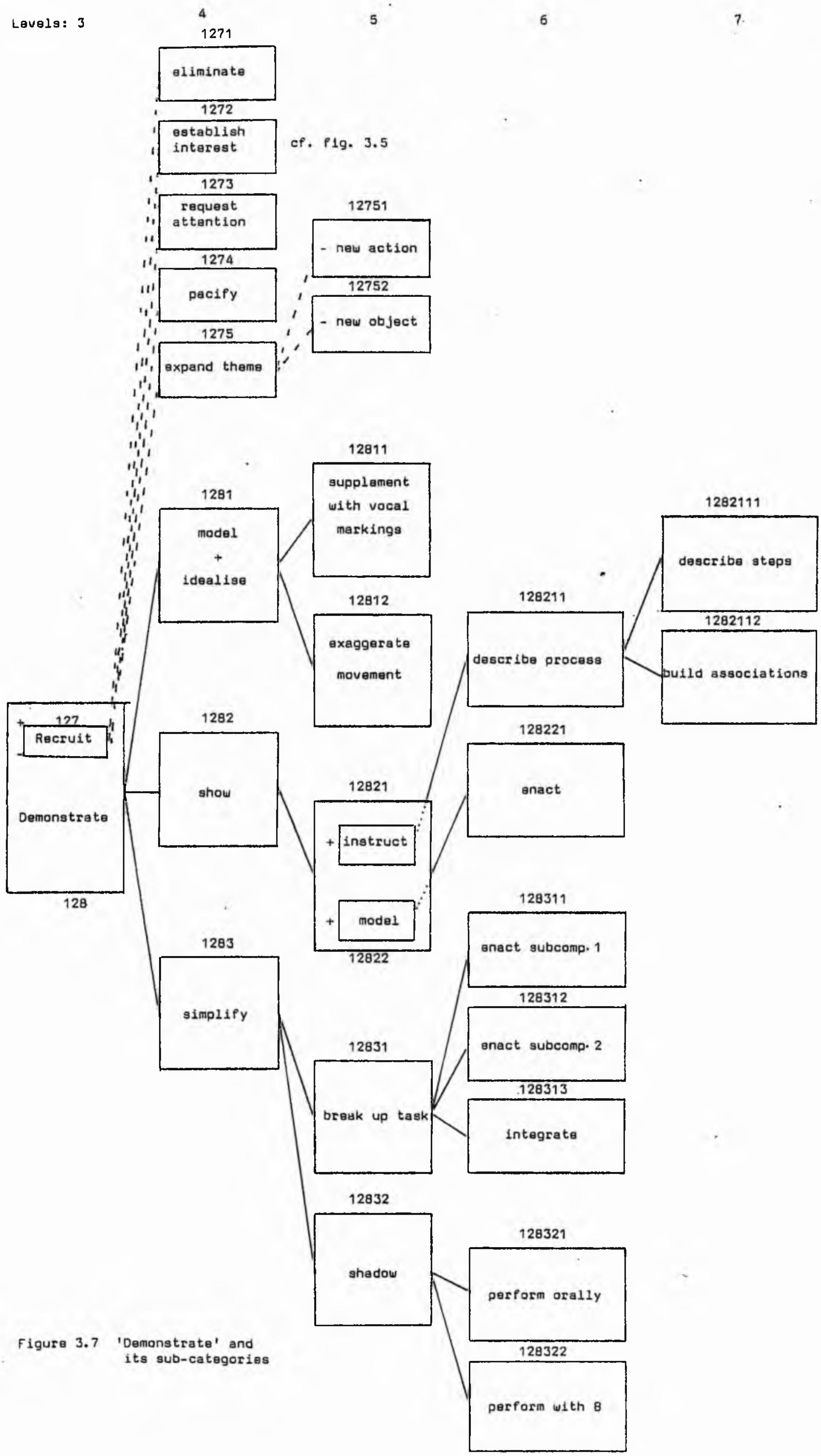


Figure 3.7 'Demonstrate' and its sub-categories

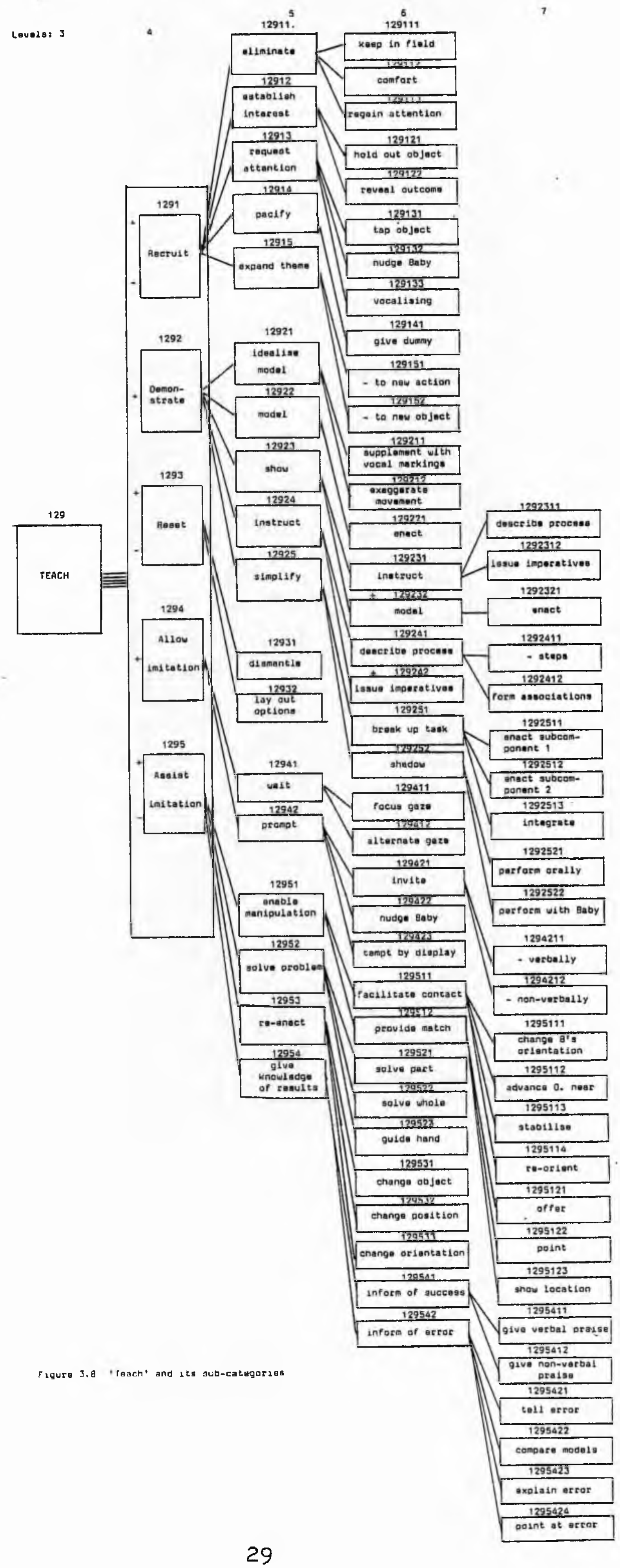


Figure 3.8 'Teach' and its sub-categories

is defined in terms of the level 1 category of 'create possibilities' which describes the whole range of experiences by which a human agent directs the infant's encounters with objects. Level 2 describes two main modes of creating possibilities: the agent (in our case, the mother) can either enhance the baby's activities, i.e. make manipulation more likely to be initiated and maintained, or she can modify the interaction by directing it into specific channels. Level 3 shows that each of the two categories at level 2 can be achieved by a number of alternative activities; for example, 'enhance' can be achieved either by 'provide stable base' or by 'support manipulation' (for definition of categories see appendix A). This pattern is consistent for the other categories at this level, as well as the other non-terminal categories on the levels below 2. An exception to this procedure is the category 'teach' whose subordinate categories (i.e. the categories grouped under it), describe a temporal sequence of actions and not a number of alternatives. In this case a teaching sequence starts with a recruiting behaviour and terminates with an assisting behaviour. Within this sequence some categories are obligatory (i.e. they are integral to the process of teaching), and they are indicated by a + sign. Other categories are optional (i.e. they may or may not occur) and these are indicated by a ± sign. The embedded 'recruit' categories, as in 'reveal object's property,' indicate that prior to or in the course of revealing the mother attempts to control the infant's behaviour in order to direct his attention to her activity. Categories at the tips of the branches of the tree represent the directly observable behaviour and the ones that were used in the initial coding. The category at level one is referred to as a "superior" category while those at level 2 are referred to as "sub-ordinate" in relation to level 1 category, but superior in relation to level 3 categories, and so on for the categories on subsequent levels. In this way each category represents a function of parental support;

at the same time it represents one of a number of forms of achieving a function superior to it.

The relationship between form and function will be explained fully in the next section which deals with the conceptual-methodological issues that led to adopting a hierarchical classification; it also describes the categories it contains. The section will be followed by another that describes the method of coding, transcribing and analysing the behaviour under consideration (Section 3.2), to be concluded by the presentation of the results and their discussion in Section 3.3.

3.1. Hierarchical Classification of Parental Behaviour

The need for adequate classificatory techniques which facilitate scientific description, interpretation and prediction of behaviour, has been partially met by the development of hierarchical systems. In psychology, there are three main disciplines that deal with describing behaviour in terms of its hierarchical structuring. These are the cognitive (Neisser, 1967), linguistic (Chomsky, 1957), and ethological (Fabricious and Jansson, 1963) studies of behaviour. Two basic assumptions and principles underlying these approaches served as guide lines for a similar hierarchical classification that was established in the present work.

3.1.1. Principles underlying Hierarchies

(i) Classification and Connection

In all three disciplines, hierarchies can be ones of classification or ones of connection (Dawkins, 1976). A hierarchy of classification is one in which the elements are grouped together by virtue of their membership to the same class (as in biological taxonomy), while a hierarchy of connection is one in which the elements are linked together by causal relationships, as in ethological systems where motivational states acting on various parts of the nervous system cause certain patterns of behaviour to emerge while inhibiting others. Very few hierarchies represent extreme examples of either classification or connection. The majority of them are a mixture of both; for example, in biological taxonomy, Carnivores and Rodents are both classified as mammals because they resemble each other in features denoted by the taxon, Mammal; at the same time they are connected to it by evolutionary factors (Dawkins, 1976). Similarly, the present hierarchy is one of classification as well as of connection. Since the hierarchy describes elements of interaction and relationships between them, it cannot be regarded as purely taxonomic. There is a relationship of connection between the elements in the sense that subordinate elements not only specify what the superior element consists of, but they also have the potential to achieve it. Accordingly, the superior elements represent developmental functions, i.e. behaviours that have the potential of resulting in competent developmental outcomes. The lower levels ennumerate the various possible ways of achieving such functions, without necessarily being executed in a hierarchical program.

(ii) Inherent Hierarchical Structure

As with the previous disciplines adoption of the present system was prompted by the realisation that aspects of behaviour under study have an "inherent" hierarchical organisation. Miller, Galanter and Pribram (1960) noted that any behaviour can be described on a "molar" level as well as on a "molecular" level. They argue that,

> "In describing behaviour, one is describing a process that is organised on several levels, and the pattern of units at one level can be indicated only by giving the units at the next more molar level of description."

Thus, adopting a hierarchical classification requires that the behaviour under study must comprise a general concept or system that serves to generate a series of elements, which themselves generate further elements. As an example in a study by Restle (1970) on serial pattern learning, it seemed to him "overwhelmingly obvious that long and complex serial patterns are divided into natural sub-parts, and that mastery (i.e. recall) is facilitated if the incoming sequence of events is somehow marked off into natural sub-parts." In his case, patterns are seen as an inherent property in the sequence of events, with evidence of emergence of patterns, and, therefore, a hierarchy. Examples of ethological hierarchies based on the assumption of an existent hierarchical structuring of behaviour, are ample. To illustrate with one example, Baerends (1970) perceived incubation behaviour of the Herring Gull as organised into three main functional systems, each system is served by subsidiary systems which are ultimately reflected by elementary patterns of behaviour such as sitting on eggs.

Pilot observations of human adults' behaviour proved no exception to this principle. Initially, my aim was to describe behavioural events in terms of categories that refer only to physical and/or temporal features related to body movements and changes in the states or positions of infants and toys, e.g. 'push baby's feet' and 'hold toy steady'. However, it became evident that this criterion was difficult to maintain since such examples of isolated categories seemed to imply other dimensions superimposed on the observable features: stabilising a tower while the infant is adding more bricks to it seemed to assist the infant to build a tower. Thus, directly observable behaviour seemed to generate increasingly more abstract categories which facilitate a more meaningful interpretation of the effects of maternal behaviour on the infant's cognitive competence.

Further evidence for an underlying tree-structure in maternal behaviour was suggested from previous attempts to describe it. In his study on the effects of perinatal events on the success of mother-infant relationship, Whiten (1977) observed instances of maternal behaviour which he described as 'creates possibilities', a general category that referred to the mother's manipulation of toys in a way that seemed to "enhance the infant's scope for acting on objects." Examples of this ranged from 'give toy' to 'build tower' and 'assist'. Not only were the same instances observed during my initial pilot observations, but each was also seen to reflect a different level of perception from the others. To illustrate, on a higher level one instance of 'creates possibilities' was seen when the mother revealed to the infant the function for which a toy was designed. Another instance consisted of the mother handling the object to promote the infant's contact with it. On a lower level the first instance was reflected in the mother's building a tower with bricks, and the second instance was reflected in 'give toy' to baby. Therefore, 'build tower' and 'give toy' are readily observable behaviours which can be given a higher level of interpretation. A behaviour such as opening a box after the infant had attempted the act, assists the infant to achieve his goal by 'solving' the problem for him; holding the box while the infant tries to open it is regarded as another instance of assistance, this time by facilitating the conditions for goal achievement ('facilitate manipulation', fig. 3.4). In these examples 'assist' which refers to a higher level of perception was specified by different concrete, readily observable activities. For these reasons, and others to be described shortly, an explicit hierarchy was constructed to describe the implicitly perceived hierarchical relationships between units of maternal behaviour.

3.1.2. Methodological considerations that led to the use of a hierarchy

The categories that make up this hierarchy are described in terms of forms of behaviour and their functions.

The form of a behaviour refers to its simple, observable features such as spatio-temporal movements that make no reference to motivational systems

(Blurton Jones et al, 1979). The ethological movement has emphasised this type of description as one of the means for objective interpretation of human behaviour (Blurton Jones, 1972). While this approach is commendable, in practice it is rarely attained since researchers are still unable to decide on what constitutes the smallest unit of observable behaviour, and which is devoid of motivational descriptions. One can describe behaviour on a very fundamental level of perception by reference to fine movements of muscles and limbs, but employing such a technique is cumbersome since it involves the use of large numbers of categories. Alternatively, one may choose a less fundamental level, and describe behaviour in terms of a final position of fine sequences of movements. Here again one is faced with the problem of deciding on what constitutes a final position, and whether a final position reached in one behaviour is of the same magnitude as another position reached in a different behaviour, e.g. 'sit' and 'walk'. Furthermore, even if we could define natural units in a uniform way, thereby describing all behaviour by form, the descriptions may still be of limited help to answering the questions a researcher is investigating. In the area of mother-infant interaction we need to make reference to features of the behaviour other than its observable form for several reasons. We also need a system that would provide us with the adequate and objective criteria of description. In the following, I shall describe how the hierarchy provides such a system, and how it helps to minimise the problems of description by form:

(i) Coping with Diverse Activities

Among the advantages of using hierarchies that were mentioned by Baerends (1970) is that a hierarchy "provides a comprehensive survey, a kind of inventory of units of behaviour and relationships between them." Such a survey is indispensible in ethological studies due to the diversity of behaviour that is being observed. Furthermore, an understanding of the full behavourial repertoire of an animal is a necessary pre-requisite to further attempts at identifying underlying mechanisms or (in our case) developmental significance of the behaviour. A system such as the present hierarchy, with its set of finite rules enables us to describe infinite forms of behaviour through devising categories that would abstract similarities and highlight differences. For example, the similarity between "I see, you are sleepy" and "I see, you want to build a tower" is designated by a single label, 'interpret'. At the same level, the dissimilarity between these two examples and "that is a lovely tower" is denoted by the label 'praise' to the latter. However, a functional similarity between those three examples is depicted at a higher level by the label 'comment' under which all three are clustered. To sum up, the establishment of the hierarchy according to a definite structure helps us to classify mothers' behaviour in a more economical and meaningful manner than ordinary "one-level" description.

(ii) Objectivity of Descriptions

I have already stated that description by form allows us to recognise the behaviour directly since the description is objective. However, as Hinde (1976) pointed out, " ...... objective criteria are essential for purposes of description and communication, but this need must not lead to a neglect of the complexity and intersubjectivity inherent in relationships."

The need for combining objective criteria with subjective interpretations has been met by the present hierarchy that leads to a gradual progression from objective categories at the lowest levels to subjective ones at higher levels. If we look at fig. 3.2 we see that the categories at the end of the tree refer to recognisable forms but they become increasingly less concrete as we go upwards. The category 'provides stable base', for instance, may evoke in one's mind a less concrete image than the categories 'participate from background' and 'comment'. Nonetheless, the category 'provide stable base' is rendered easily recognisable by progressively specifying the string of categories that give rise to it. All through the hierarchy similar subjective functions are derived from objective forms. Making reference to forms and functions helps us to understand certain aspects of behaviour which become meaningful only in terms of the configurations of the smaller units of which the act consists. An illustration of this is Kaye's study (1976), in which he examined the developmental significance of different maternal teaching strategies. His aim could be achieved only by using functional categories such as 'model', 'tempt', 'reset', etc.

(iii) Combining Motor, Vocal and Visual Behaviour

Since the aim of this study was to examine maternal influences on infants' cognitive development, we needed to look at the mothers' overall repertoire of activities: what does she do with the toys, what does she say about them, and what do her gazing patterns contribute to the infants' play. Our emphasis was on how these modalities combine to produce the effects we were interested in. Therefore, we needed a system that will enable us to quantify by uniform measures behaviour that stem from diverse modalities.

The hierarchy provides a useful system in this respect, since it distinguishes between visual, verbal or manipulative behaviour at lower levels. Thus the modalities are kept distinct. However, all sensory systems are integrated together at higher levels by virtue of the common function which they fulfil (cf. fig. 3.2).

(iv) Specifying the Direction of Interaction

In order to identify the patterns of relationship between interactants and objects during cooperative play we need to make reference to more than one level of description.

In figure 3.9a, the mother initiates an action on the object through acting on the infant. This relationship becomes apparent only by reference to level 4 of the hierarchical diagram that describes it. Level 5 tells us that the mother acted on the baby. Levels 3, 2 and 1 stress the relationship between the mothers' behaviour on the one hand, and the functions of that behaviour in terms of the infants mode of interaction with the object.

Figure 3.9b shows that the mother acts on the object to the benefit of the infant. This dimension is depicted at level 2 of the hierarchy of this example.

Figure 3.9c shows how the mother directs her activities towards infant and object. This is the only example where the relationship between mother, infant and object is apparent at the lowest level of description.

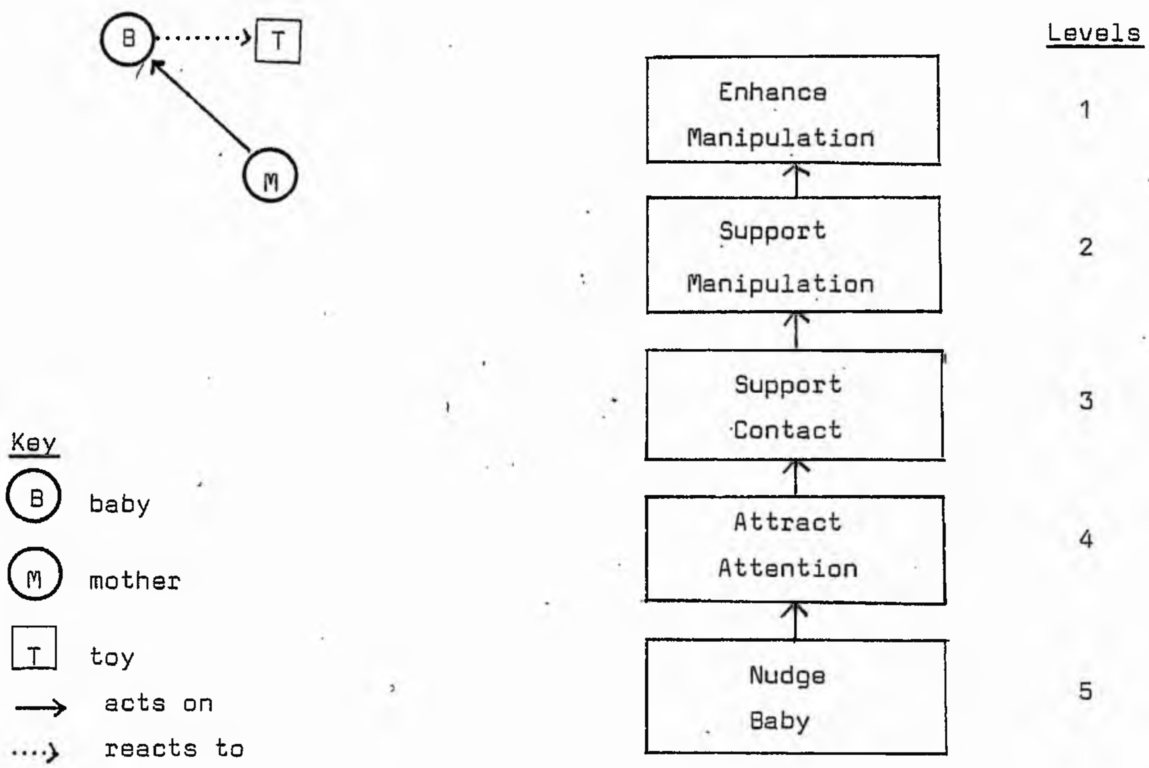


Figure 3.9a. Mother acts on infant; infant reacts by attending to object

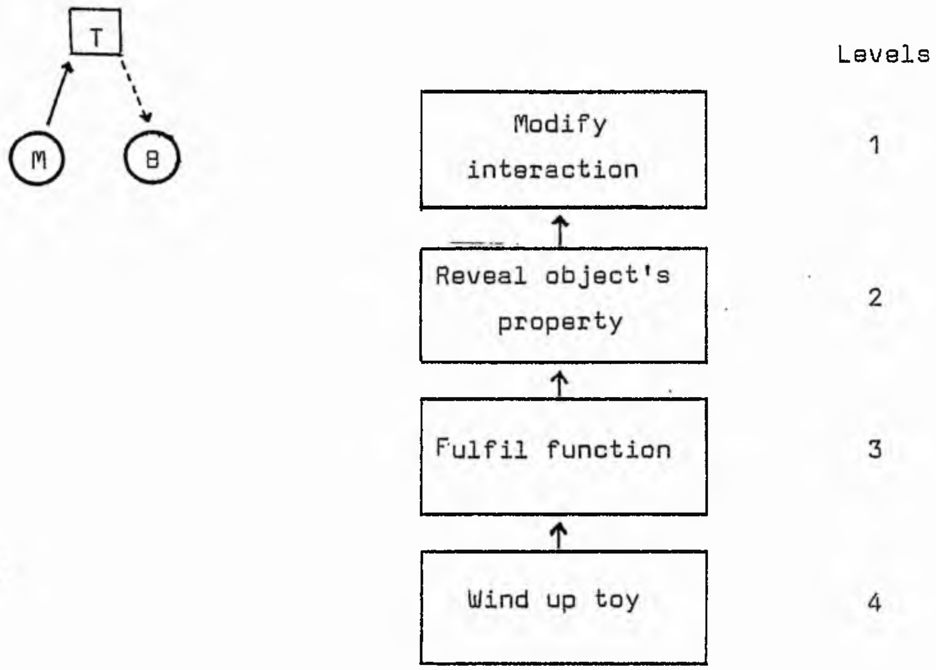


Figure 3.9b Mother acts on toy for the benefit of the infant

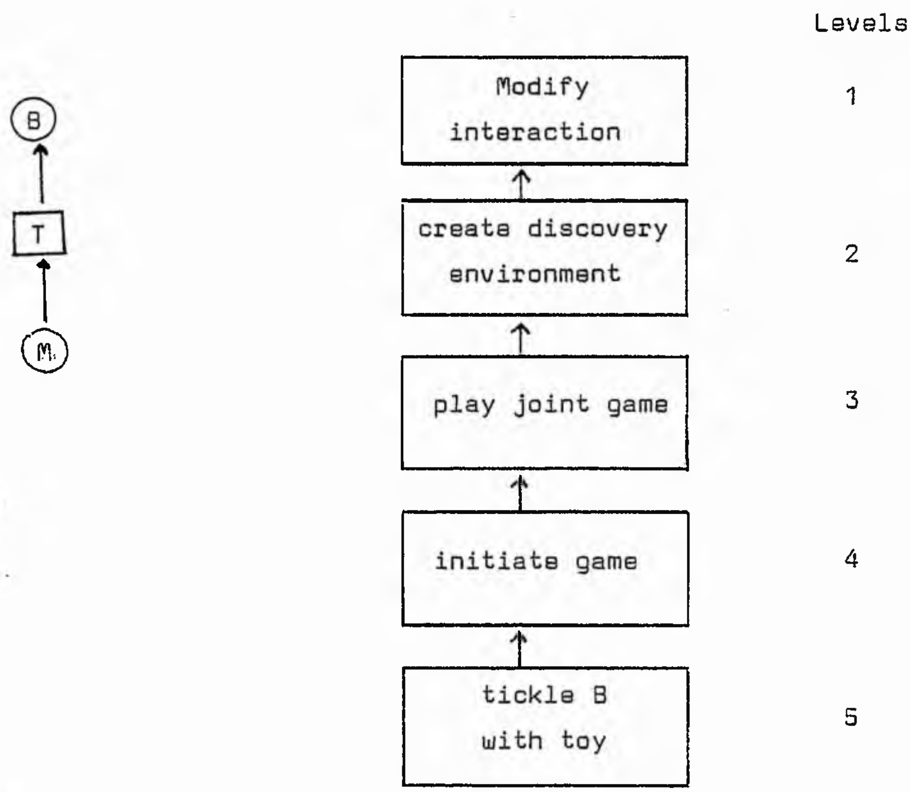


Figure 3.9c Mother acts on both infant and toy

(v) Choosing the Appropriate Level of Analysis

Describing parental behaviour at more than one level gives the investigator the opportunity to choose between these levels for the final analysis of data.

If, for example, we are interested in the behaviour identified as provide stable base, (fig. 3.2) we can compare its frequency among several individual mothers. In this case we will be focusing on only one level (level 3) and ignoring how the mothers differed on the lower levels. On the other hand, we may wish to know whether mothers differ in the way they provide stable base: do they eliminate undesirable behaviour, or do they participate from background; or if they perform both, which of the two is predominant? Here, level 3 will be the candidate for this issue. Thus, depending on the questions we are asking we can determine the level of details of description and thereby choose the hierarchical level that specifies those details.

Forms, Functions, Consequences and Intentions

An alternative to describing behaviour by form and function is to describe it by consequences, or by intentions. Consider the example of the behaviour of a mother 'tap toy' during joint play with her infant. The observer can classify the activity by its observable form in which case s/he will denote it by the category 'tap toy'. However, the observer may have reasons to believe that the mother wants the baby to attend to her and that is why she tapped the toy. Here the action of tapping the toy will be classified as 'attract attention' since this was the mother's intention. The same label will be used if the observer noted that tapping the toy was followed by the infant directing his attention to the mother. Thus, 'attract attention' will refer to a consequence which the observer judged to have resulted from tapping the toy. A third meaning of 'attract attention' would be in terms of the potential function of tap toy, i.e. the effect the activity is capable of producing whether the behaviour was intended or not, and whether it actually happened or not. It is this aspect which characterises the descriptions of the majority of the categories in the present hierarchy, where the function of a behaviour involves its potential outcomes with reference to the infant's cognitive competence. Thus, when we describe a behaviour as 'assist' we are describing its potential for helping the infant to achieve his goal, thereby increasing or accelerating cognitive abilities.

Description by function was preferred to description by consequence for two reasons:

Firstly, a consequence always refers to an event that has taken place or to a goal that has been achieved, while function need not refer to actual effects. Hence, a definition based on consequences will not take into consideration maternal behaviour that had failed to achieve a goal (i.e. produce an effect or consequence on the infant). This will be a drawback since what we want to examine in the first place is the nature of the infants' experiences and not the ones which the infant reacts to.

Secondly, a consequence implies causal relationships between one event and another. Thus, in effect we would be saying 'attract attention' caused the mother to tap the object. Causal connections are ruled out in the present system (at least at this stage) since the hierarchy describes a hypothetical structuring of behaviour. It is not based on causal relationships since we are not dealing with a motivational system such as in the case of the ethological hierarchies mentioned earlier (page 33) and where a certain behaviour (e.g. sensory) is triggered by another system (e.g. hormonal).

Description by intention has also been excluded from the present hierarchy except for a few instances which will be mentioned later. The exclusion is for three reasons.

Firstly, its unfeasibility: we cannot always have direct access to why mothers behave in one way or another.

Secondly, mother-infant relationship need not depend on intentional behaviour for its effectiveness on infants' development. As Levenstein (1973) puts it,

> "whether she is aware of it or not, the mother of a pre-school child is likely to be the principal environmental agent of her child's intellectual growth."
>
> (p.286)

Thirdly, a non-intentional behaviour to which the infant responded with a behaviour indicative of competence e.g. mother placing an object on a support to keep it out of baby's reach, responded to by the baby pulling the support and obtaining the object, would be missed out and not regarded as an instance of parental support when in fact it is insofar as it enabled the infant to discover about means for obtaining an end.

Although intentions were largely excluded from descriptions of the categories, reference to intentions was unavoidable in two circumstances. The first circumstance is where intentions are integral to the definition of some categories. This refers to the category 'teach' which constitutes deliberate efforts on the mother's part to get the infant to perform specific acts. Secondly, intention-markers (verbal or non-verbal acts performed by the mother to make her intentions explicit to the infant), served as indicies to help to assign a category that occurs more than once in the hierarchy, to its appropriate superior node; for example, the category 'build tower' occurs twice in the hierarchy: once as an instance of 'reveal object's property' (fig. 3.5, level 5) and once more as an instance of 'create discovery environment' (fig. 3.6, level 6). If the mother had built a tower without supplementing her activity with intention markers, then the activity was regarded as a sub-category of 'construct' to reveal properties. However, if after building the tower the mother told the infant to knock it down, then the activity was classified as an instance of 'create discovery' by'eliciting' a response.

3.1.3. Content of the Hierarchy

In this section the major categories which occupy levels 1 to 3 will be described. Categories below that level are defined in Appendix A. Categories that are embedded in others (figs. 3.2 and 3.3) or that constitute an attribute of another category will also be presented. The section will be concluded by presenting the hypotheses generated from the major categories.

Level 1 : 'Create Possibilities' (CP)

The category of 'create possibilities' can be regarded as a summary of results of the extensive studies on mother-infant interaction that have focused on maternal influence in shaping cognitive and social developments of the pre-school child (Ainsworth, 1974; Hess and Shipman, 1965; Carew and Barnett, 1973).

The category assumes that the mother's involvement in the infant's play with toys influences what he may learn from the environment, but it does not specify the ways by which her influence is made manifest, nor can we infer from it the specific areas of cognitive competence likely to be affected. The label 'creates possibilities' is apt since it mentions the existence of possibilities but leaves open the specification of their nature.

Level 2 : 'Enhance' (EN) and 'Modify' (MD)

Categories at this level represent the roles which mothers may adopt (intentionally or unintentionally) towards their infants' play. Mothers may adopt a role that is characterised by minimal participation but nonetheless influential for facilitating the conditions that help the infant to pursue his activities ('Enhance'). Alternatively, mothers may adopt an active role which determines the course and outcome of their infants' play ('Modify'). In 'enhance' what the infant learns depends on his capacities and willingness, as well as on the qualities of the toy made available. In 'modify' what the infant learns depends on what the mother does.

At this level the categories describe what the mother does in relation to the infants' play. They make no reference to what she does with the toys.

Level 3:

This level is central to the present research in that it is the one focused on in analysis of mothers' behaviour. It is regarded as central since it provides most information about the significance of mothers' activities for infants' cognitive growth. Each of the categories can be directly linked to specified developmental outcomes e.g. 'teach' can be related to problem-solving activities, 'create discovery environment' can be related to almost all aspects of sensorimotor intelligence. The type of category also allows the prediction of immediate outcomes from the infant, which enables us to examine whether the infant response was appropriate or not, for example, if the mother teaches we expect the infant to imitate her models; if she 'supports manipulation' we expect him to achieve contact with toys. Finally, the categories serve to identify qualities of the mothers: for example, a mother who 'provides stable base' is less demanding than one who teaches. We shall now examine those aspects with reference to each of the seven categories.

'Provide Stable Base' (PSB); Figure 3.2

In PSB the mother performs those activities that increase the likelihood of the infants' solo activities with toys, either by eliminating competitive behaviour ('eliminate' level 4), or by keeping close to the infant and assuring him of her presence ('participate from background', level 4). The latter is one of the functions of 'mothering' that has been extensively studied (e.g. Ainsworth et al, 1974; Rheingold & Echerman, 1971).

'Support Manipulation' (SM); Figure 3.3

As with PSB, in SM what the infant learns is dependent on him, but the likelihood of learning is increased by the mother's actions which seek to promote contact between infant and toys. SM is, therefore, a less passive form of maternal intervention than PSB, but one equally likely to lead to solo activities which foster the acquisition of, and practice of various sensorimotor skills. It can be either spontaneously initiated by the mother, or it can be responsive to something the infant has done or is doing.

'Assist' (AS); Figure 3.4

Here the mother's activities could help the infant to achieve a goal with which he is finding problems, thereby modifying to some extent the course of his actions e.g. opening a box only partially, is modified to opening it completely. Thus the behaviour is modified from the direction the infant is capable of, on his own, to a more advanced and successful one. For AS to fulfil its technical and interactive functions, the mother must be sensitive to her baby's signals, and the baby must realise her role as a source of help and be able to communicate his needs to her. Mothers who assist are also likely to be concerned with the emotional aspects of play, in that assistance prevents the infant from getting frustrated. They may also be concerned with task achievements as integral to object-play. This aspect of mother-infant interaction has not been studied previously.

'Reveal Object's Property' (ROP); Figure 3.5

In ROP the mother makes known to the infant what the object is, and/or what its uses are, thereby specifying what the infant may learn. The mother may reveal the abstract qualities of an object such as its name, which may affect the infant's linguistic abilities, or she may reveal a technical quality which may affect fine motor/spatial abilities. A mother who reveals object's property adopts a directive approach towards her infant's play but one that makes no specific demands from the infant.

'Create Discovery Environment' (CDE); Figure 3.6

Here the mother performs an act that enables the infant to discover a specific quality about the object or to perform a certain skill with it. It involves essentially a dyadic activity since the mother performs an act that needs to be reciprocated by the infant. The nature of the task which the mother structures determines the type of response that is required for reciprocating the act, and, therefore, CDE modifies the baby's play. Through CDE the infant is given the opportunity to exercise familiar actions and words or to acquire new ones, and to discover about hidden objects, means and ends, causality, etc.

'Demonstrate' (DM); Figure 3.7

By demonstrating the mother makes known to the infant how a task is performed but without demanding from him an imitation of her actions. The mother may enact the activity (model) or she may show the infant how to perform it partly by enacting and partly by describing the procedure (show). 'Modelling' to demonstrate is distinguished from 'fulfilling function' to 'reveal properties' by the differences in styles of performances of the two activities. In 'modelling', the mother enacts an activity in an idealised manner while in 'revealing' the performance is relatively casual and hurried.

'Demonstrate' emphasises the pedagogic aspects of play, a topic which has received considerable attention in the last few years. In this study, demonstrating and teaching also receive special emphasis in a later chapter (Chapter 7).

'Teach' (T); Figure 3.8

This is the same as DM but it also demands from the infant a replication of a model by the infant or enaction of a teaching procedure, following the mother's instructions. The mother, therefore, plays the role of teacher, and the infant plays the role of learner. Like DM and AS the activity may emerge from the mother's own initiatives, or in response to what the baby is doing: in some instances, when the infant encounters a problem, instead of assisting him to solve it, the mother may teach him the solution.

Embedded Categories

These are categories which are joined to others and serve to achieve them or to distinguish them from others. They are divided into 4 types:

(i) Recruit Categories (RC 1-3; Figures 3.5 - 3.7)

These accompany some of the behaviours which modify the infants' play. They serve 3 functions: firstly, they are used by the mother to direct her infant's attention to her 'revealing', 'creating' or 'demonstrating' behaviours, ('direct attention'). Secondly, they are used to terminate infant's activities that compete with or hinder the effectiveness of the mother's modifying behaviour ('eliminate undesirable behaviour'). Thirdly, they are employed to establish the baby's interest in the toys to be used for a modify-type of activity. Fourthly, they are used to 'pacify' a fretting child by responding to his demands which do not interfere with the mother's activities(e.g. giving the infant his dummy). In all cases, recruiting the infant to the modifying task increases the likelihood of the infant's participation in it.

(ii) Feedback

Besides recruit categories, pursuing a goal by infant which was initiated by mother may be made possible by giving the baby information on the results of his activities. This is the case where the mother elicits a response from the infant and then offers 'feedback' on whether the response was appropriate and/or successful (fig. 3.6, level 3).

(iii) Invite (IV),(Figure 3.6, level 4)

This is an example of a behaviour that helps to distinguish one function from another. Here it is used to distinguish actions that are performed to elicit a complementary response from the infant in CDE, from actions that are performed simply to reveal a property of the object e.g. if the mother fills a large container with smaller items and then invites the infant to take them out again, she is eliciting a behaviour that pertains to the use of container and contained: if, on the other hand, she fills the container without inviting, she is only revealing to the infant that the object in question can be used as a container.

(iv) Idealise (Id), Figure 3.8, level 4

This is an example of a behaviour that constitutes an attribute of another, and, accordingly, helps to differentiate the latter from others that share with it characteristics other than the attribute in question. In idealising any action, the mother slows down her movements, thus exaggerating her performance of the action. Alternatively, she may accompany her movements by vocal markings whose rhythm matches the tempo of her movements. By idealising the mother highlights the crucial aspects of performance.

Having presented the contents of the hierarchy I shall now conclude this section by outlining the outcomes one would expect when observing actual behaviour of the mothers, with the aid of the hierarchy.

Since the present classification is the first of its kind it can act as an original tool to test how parents structure the play environment. There are three questions one can ask regarding the nature of the structure.

1. Do mothers exhibit the whole range of activities specified in the classification?

2. Do mothers 'create possibilities' by performing some functions more than others, or do they distribute their behaviour evenly between several functions?

3. Do mothers of one group 'create possibilities' differently from mothers in another group? i.e. does parental support vary between mothers, depending on their infants' age?

Regarding the third question, since we have defined the categories in terms of the aspects of cognitive development they may foster, we can predict certain age trends in parental support. We predict that modifying activities would increase with age since they make more demands from the infants.

Enhancing behaviour would increase, since the older the infant, the more solo activities he would be capable of engaging in. However, this trend would be manifested only in relation to 'provide stable base' and not in relation to 'support manipulation'. The latter would decrease with age increase since older infants would have developed complex motor coordinations and locomotion which would facilitate proximal and distal contact with toys.

Within 'modify' we would expect 'reveal object's property' to decrease with age since its demands from the infant are minimal.

To sum up, I am postulating that as infants get older mothers would demand more complex activities from them, but they would also pace their infants' own activities by appropriate enhancing behaviour. In other words, the rate of 'create possibilities' would increase with age as a function of increases in both 'enhance' and 'modify'.

3.2 Methodology

All the categories contained in the hierarchy were given abbreviated codes to make their recording easier.

The activities of the 19 mothers, observed with their infants, were categorised in terms of their hierarchical structuring.

3.2.1 Reliability

In order to establish the reliability of the classification system another observer was introduced to it and became familiar with its application. Sample sessions representing the different age groups (represented by the infants' ages) were randomly selected from the total collection of visits. Both observer and experimenter categorised the mothers' behaviour using all levels of the hierarchy. The two sets of categorisation were compared and the percentage of agreement was computed for each category at all levels. Table 3.1 shows the percentage of agreements on the categories at level 3. In all cases, agreement between observers was above 67% with a mean of 78.6 which is fairly good. The agreement was generally greater on categories at lower levels.

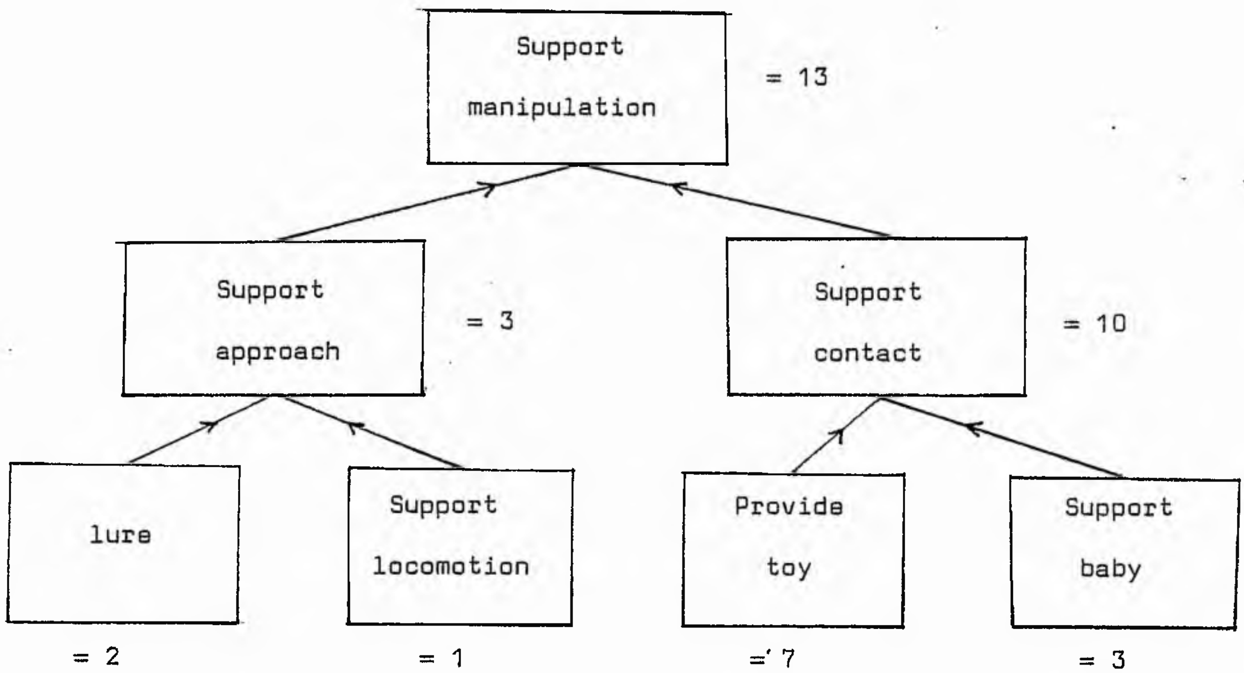
Table 3.1 Percentage of agreements between two observers on categorisation of maternal behaviour.

Category	PSB	SM	AS	ROP	CDE	DM	T
Percentage of agreement	76.4	79.0	89.5	72.5	88.9	76.6	67.5
Observed frequency	201	98	54	291	50	8	46

3.2.2. Frequency Analysis

For each visit, maternal behaviour was categorised from video-tapes, using the terminal categories of the hierarchy. A computer program combined the frequencies of those categories that form a cluster to give the frequency of the category forming the superior of the cluster. This process is represented in figure 3.10. The process then continued across all levels until finally the frequency of 'create possibility' on each visit was computed in terms of the cumulative frequencies of its two subordinate categories.

Figure 3.10. Computation of frequencies of categories at each level.



3.2.3. Comparative Analysis

Visits were combined together in 3 different ways to give 3 sets of data:

(i) Quasi-longitudinal Data

The rationale and procedure for collecting this data was described in Chapter II.

Using the cumulative frequency data, visits on every month were combined together and the mean frequency of each category was obtained for every month. For each group, the time interval between visits from one month and the next varied slightly as shown in Table 3.2.

Table 3.2 Distribution of visits across the 3 months period

Groups	N	Observation intervals			
		1st month	2nd month	3rd month	Mean No. of Visits
A	4	6 months - 6 m,3wks	7 months - 7 m,3 wks	8 - 9 months	3
B	5	9 m,1wk - 10 months	10 m,1wk - 11 months	11 m,1wk - 12 m,1wk	2
C	5	12months - 12 m,3wks	13months - 13 m,3wks	14 - 15 months	2
D	5	15 m,2wks - 16 m,2wks	16 m,3wks - 17 m,3wks	18 - 19 months	2

(ii) Cross-Sectional Data on Four Periods

Detailed description of the rationale and procedure is given in Chapter II.

All visits for each mother were combined together and the mean frequency of each category was obtained for the whole period of three months.

Details of intervals between visits to one group and the next are given in Table 3.3.

Table 3.3. Cross-sectional distribution of data, with 4 groups

Groups	N	Intervals	Mean no. of Visits
A	4	6 - 9 months	6
B	5	9 months, 1 week - 12 months, 1 week	6
C	5	12 months - 15 months	6
D	5	15½ months - 19 months	5

(iii) Cross-sectional data with two groups

Two age-ranges were selected which were used to represent two groups. The first range extended from 7½ to 10½ months, and the second range extended from 13½ to 16½ months. Visits made within either range were combined together, and the mean frequency of each category was obtained for that period. Details of observations are given in Table 3.4.

Table 3.4. Cross-sectional distribution of data with 2 groups

Groups	No. of Subjects	Age range	Mean no. of Visits
1	8	7½ - 10½ months	3
2	10	13½ - 16½ months	3

3.3. Results and Discussion

3.3.1. Range of activities exhibited by mothers during object-play with their infants.

In reporting the findings of the ways mothers structure their infants' play with toys, I shall first briefly discuss the data on maternal activities which did not represent instances of 'create possibilities'.

Three types of non-CP behaviour were observed. The first consisted of the mother's talking to another child (sibling) or to visitors or to the observer; second was disengaging herself from play either by leaving the room or by directing her attention to other activities such as watching television; third was engaging in social play with the infant and without objects, as in affect displays (hugging and stroking), physical activities like bouncing and rocking the infant, and playing games such as 'This little Piggie'.

'Talking to others' was most frequent among group-D mothers who spent 4% of session time in that activity[1]. 'Social play' was most common among group-A mothers and it constituted 5% of session time. Overall, the most predominant non-CP activity was 'talking to others' (11.5%), followed by 'social play' (8%). When we combine together all three types, we find that mothers in group A had spent, on average, 8.5% of session time in non-CP behaviour, group-B mothers had spent 5.5%, group-C mothers had spent 7% and group-D mothers had spent 5%. Thus, groups A and C had the highest proportion of non-CP activities.

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1 Details of the distribution of non-CP activities throughout the 3 months of observation are provided in Appendix C.

CP Activities

Figure 3.11 shows that the 19 mothers who participated in this study performed almost the whole range of 'create possibilities' activities that were described earlier (figs. 3.1 to 3.8). It also shows that not all of these activities occurred at equal frequencies.

As can be seen from figure 3.12 the most striking finding is that, on the whole, mothers enhanced their infants' interaction with toys, more than they modified it. The average frequency of 'enhance' was 144 while that of 'modify' was 67 (fig. 3.11). Converting this into percentage, we find that 'enhance' accounted for 67% of CP behaviour, while 'modify' accounted for the remaining 33%. In order to determine whether this difference is significant for all groups, a 4(age) x 2 (categories) anova was carried out and it showed that the difference between the two categories was highly significant: $F\ (1,15) = 62;\ p < .0001$. This means that parental support was largely by making play materials available and by creating favourable conditions for the manipulation of those materials, but without directing the infant to a specific course of activity.

Similar findings were also reported by Carew-Watt et al (1973) who found that mothers adopt a less directive role in their children's play (age 1 to 3 years), which involves encouraging the child's activity, supplying needed material and admiring his achievements. Using the same system of classification as the present one, Whiten and Milner (in press) found that mothers from two different cultures (Britain and Nigeria) enhance twice as much as they modify. We can, therefore, conclude that 'enhance' is the common experience of infants from different cultures and of different ages.

The predominance of 'enhance' in infants' experience can be attributed to two reasons.

Firstly, enhancing may stem from the mothers' natural tendencies and

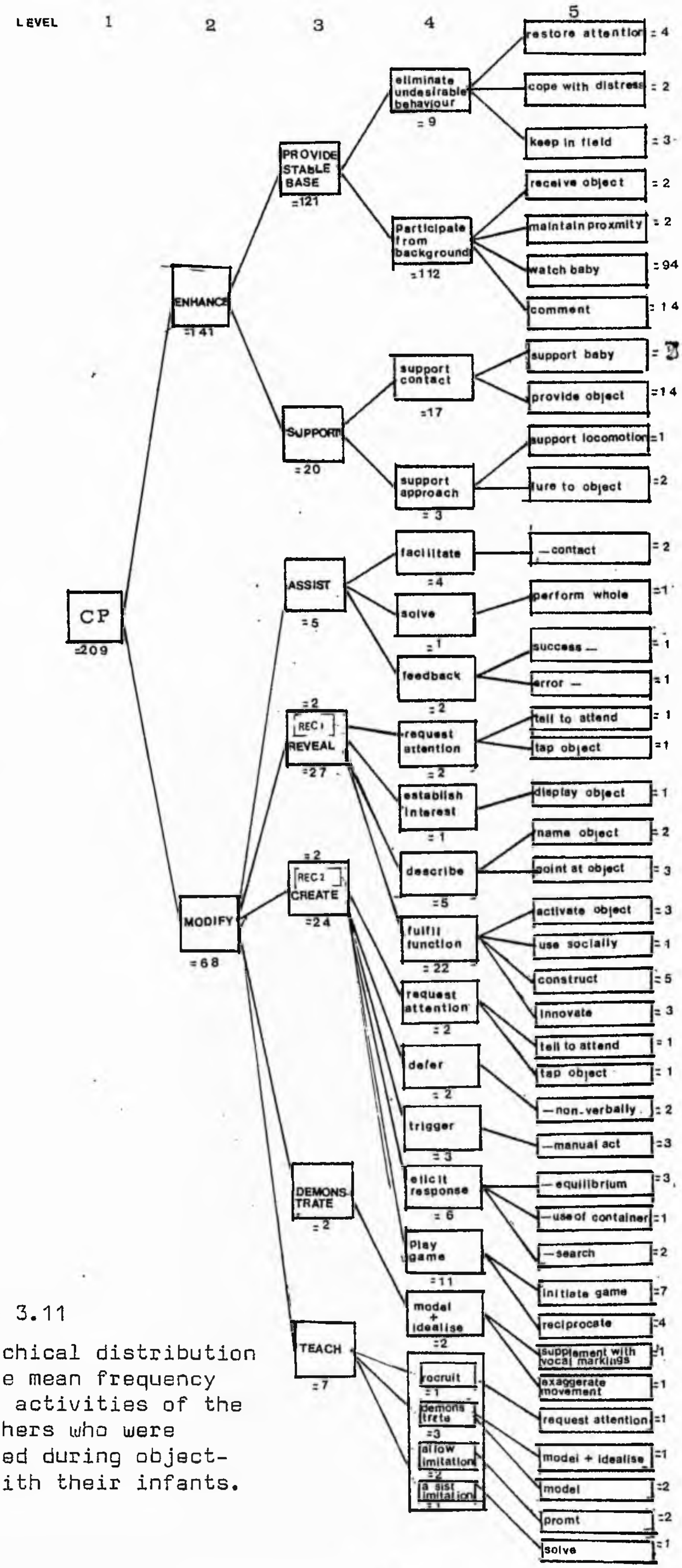

Figure 3.11

Hierarchical distribution for the mean frequency of the activities of the 19 mothers who were observed during object-play with their infants.

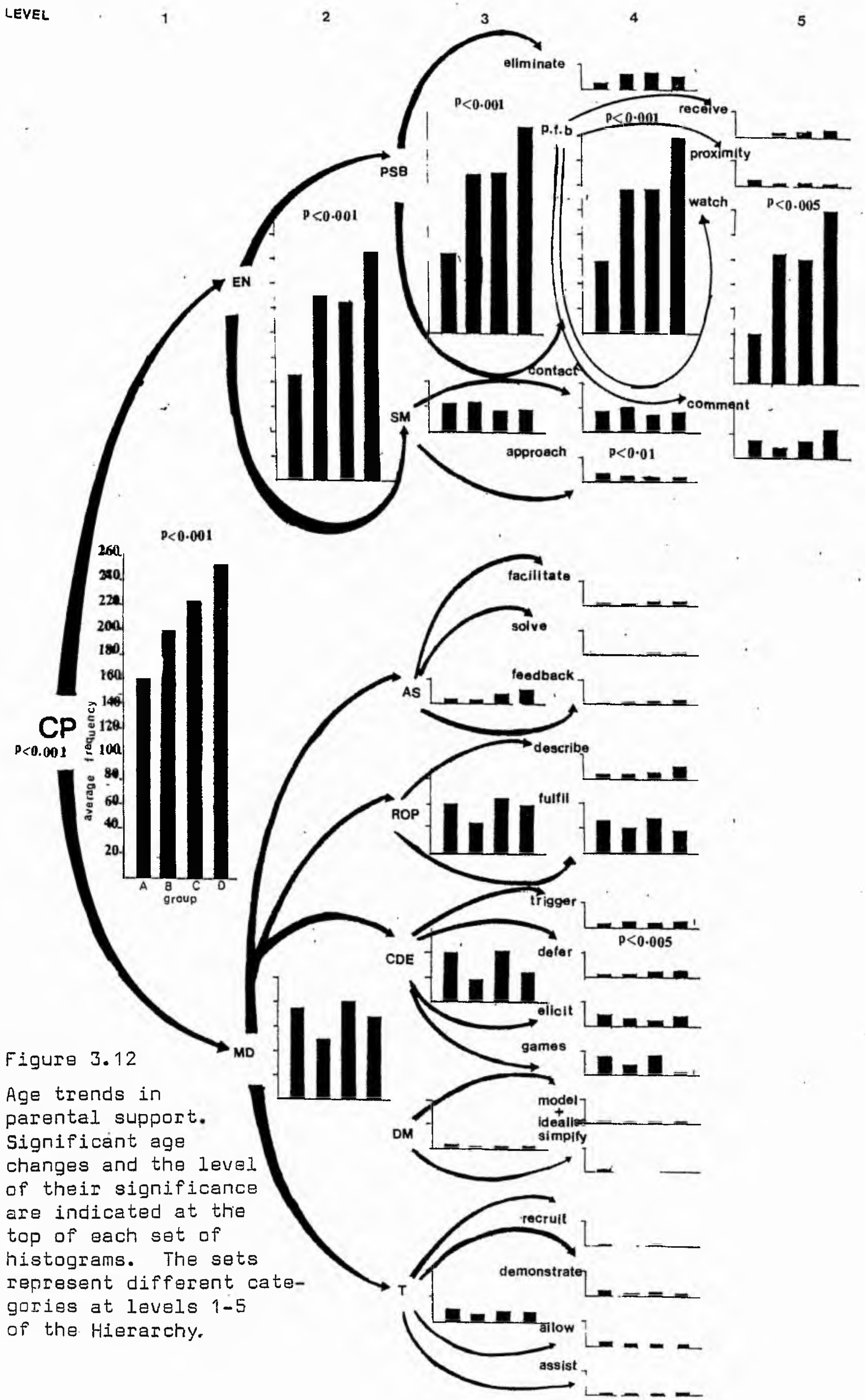

Figure 3.12

Age trends in parental support. Significant age changes and the level of their significance are indicated at the top of each set of histograms. The sets represent different categories at levels 1-5 of the Hierarchy.

their sensitive perception of their infants' needs, namely, the provision of emotional support without much intervention in the content of the baby's activities.

Secondly, the practice of 'enhance' in the present context may have resulted from 'habit' : under normal circumstances busy mothers cannot afford the time to sit and direct their infants' play, and, therefore, the common practice is to place the infant in a safe location and to provide him with play materials that would keep him occupied. All that is needed, then, is to assure the infant - from time to time - of the mothers' proximity, affection and attention to his activities. When confronted by the structured observation procedure that demanded from the mothers to participate directly in their infants play, they resorted to the equivalent of their familiar role, namely being onlookers and facilitating contact with toys. (There is the third possibility that the predominance of 'enhance' is due to a combination of the above two factors: some mothers may 'enhance' because to them this constitutes a natural role while for others 'enhance' may provide one of the means of bringing up a child in the most convenient manner).

The first explanation seems more likely since it is supported by two pieces of evidence. Firstly, according to the results representing the age trends of maternal behaviour (which will be discussed in the next sub-section), mothers with the youngest infants (group A) did not show a significant difference between the frequencies of 'enhance' and 'modify'. This indicates that the mothers had at their disposal both roles and used them at a similar rate probably because the infants were incapable of sustaining long sequences of solo play due to their limited repertoire of cognitive schemes. In such a case, 'modify' helps the young infant to widen that repertoire. Accordingly, although 'enhance' behaviour constitutes the natural tendency for mothers,under special circumstances it was complemented by the more directive modifying behaviours. The second piece of evidence comes from an experimental study in preparation by the author, in which the mothers were asked to engage in only one form of behaviour, namely, to teach the infants how to perform a specific task (slotting shapes in a posting box), i.e. mothers were asked to 'modify' their infants' activities. Even then, mothers enhanced much more than expected from the restricted task. In this case 'enhance' constituted 38% of all CP activities, which suggests that for those mothers the two types of activities complemented each other. To what extent 'enhance' was beneficial to cognitive growth remains to be seen when relating the potential function of 'enhance' to observed consequences in infants' behaviour (Chapter VI).

'Enhance' sub-categories

Enhancing interaction was performed almost exclusively by 'provide stable base': the average frequency of 'provide stable base' for the whole sample was 123 while the average frequency of 'support manipulation' was 20 (figure 3.11). The difference between these two categories was highly significant ($p < .0001$). On level 4 'provide stable base' was achieved largely by 'participate from background', and significantly less by 'eliminate undesirable behaviour' $F(1,15 = 501, p < .001)$. On level 5 this pattern of the predominance of one category over all others within the same cluster was repeated; here 'participate from background' was achieved mainly by 'watch baby' ($\bar{X} = 94$), and only partly by 'comment' ($\bar{X} = 14$), followed by 'receive' objects from baby ($\bar{X} = 2$), and by 'increase proximity' ($\bar{X} = 2$). From these figures we can see that the frequency of 'watch' exceeded that of 'modify interaction' (average, frequency of 'watch' is 94, and average frequency of 'modify' is 68). 'Watch baby' constituted 44.7% of CP behaviour, while 'modify' constituted less than that: 32%. This means that the mothers structure their infants' play, generally by enhancing more than modifying and particularly, by watching the baby play more than modifying.

In terms of the hierarchical organisation of maternal behaviour, the results show that of all the range of activities described, the one that was observed most frequently is the behaviour characterised by minimal involvement in infant's play. The developmental implications of this will be discussed with reference to each age group, which is the concern of the next sub-section.

Of the other sub-categories, 'eliminate undesirable behaviour' (figs. 3.9 and 3.10, level 4) occurred on average, 9 times only. Within these instances, all forms of 'eliminate' were performed (level 5) with the following order of preference: 'restore attention' ($\bar{X}$ = 4), 'maintain in field' ($\bar{X}$ = 3.0) and 'cope with distress' ($\bar{X}$ = 2). 2-way anova showed that the differences in frequency between those forms is significant at 0.001 level. It follows that the main problems the mothers had to deal with was to control the infants' attention and prevent him from wandering away from the task of play.

'Support manipulation' was achieved almost exclusively by 'support contact' (fig. 3.9, level 4). On average there were 17 occurrences of 'support contact' and only 3 acts of 'support approach'. This is due to the latter category being less appropriate to the observation task, and consequently less likely to occur. During observation the field of play was restricted to one location in the room with the infant very close to the toys. Thus, approach to toys from a distance was, on the whole, unnecessary. In some instances when 'support approach' was observed, it was directly related to enhancing gross motor skills, namely, walking; in the course of the activity objects may be picked up and handled briefly. For one subject in particular (subject 8) this was his favourite theme of play, and the mother encouraged it by holding his hand and walking him round the room.

'Modify' sub-categories

Unlike 'enhance interaction', 'modify interaction' was achieved by more than one sub-category (figure 3.11, level 3). 'Reveal object's property' and 'create discovery environment' occurred with similar frequency and were significantly predominant over the other sub-categories of 'demonstrate', 'teach' and 'assist' ($p < .001$). This means that when mothers modify their infants' play they may use the same themes such as naming objects or constructing towers, but balance their activities between a less directive form in which they enact the themes to the infant, and a more directive form in which they influence the infant to perform those themes himself.

The infrequency of 'demonstrate' and 'teach' show that pedagogic activities are not a common experience of the pre-school child. This finding receives increasing support from previous and current studies (Carew Watt and Burnett, 1973; Hubely and Trevarthen, 1979; Whiten et al, in preparation).

The occurrence of 'assist' at a low frequency is surprising especially in view of the great frequency of 'provide stable base' which indicates that the mothers' efforts were centred round facilitating the conditions of play. 'Assist' behaviour contributes to this aspect since it minimises the infant's frustrations and it emphasises maternal attentiveness and responsiveness to the infant's signals. However, the result is rendered less surprising if we consider it in the light of the "technical" function of 'assist', namely that it modifies the infant's play by helping him to achieve his goal. If the infant's play is lacking in goal-directed activities there will be no opportunity for assistance. Besides, as Garvey (1977) pointed out, a lot of children's play is "more of an enjoyment of means than an effort devoted to some particular end" (p 10). In such a case, by withholding or refraining from assistance the mothers may help to prolong the play and to maximise the infants' enjoyment of it.[2]

As can be seen from figure 3.11, recruiting the infant in order to modify his activities was very infrequent. Table 3.5 presents the percentages of recruiting events relevant to the modifying activities of 'reveal object property', 'create discovery environment' and 'demonstrate'. Overall, only 7% of ROP acts were recruited; the figure is very similar to CDE, while none of the 'demonstrate' events were recruited. This adds to the similarity between 'reveal object property' and 'create discovery environment' which was pointed out previously (p 61). In both cases the major form of recruiting was by 'restore attention' and 'keep in field'. Very little recruiting was performed by 'establish interest', but the difference between the three forms was not significant.

Taking these results in conjunction with the data on 'eliminate undesirable behaviour' we find that, on the whole, controlling infant's actions was not very common and it largely centred on controlling his attention to the task, with little prohibitions and little 'cope with distress'.

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2 The relationship between 'assist' behaviour and goal-achievement will be examined in Chapter VI.

Table 3.5. Mean percentage of 'modify' sub-categories that were supplemented by recruiting activities

		main category and recruit category					
		ROP	Rec 1	CDE	Rec 2	DM	Rec 3
Group A	average	28	2	27	2	3	0
	percentage	7%		7%		-	
Group B	average	22	2	17	1	1	0
	percentage	9%		6%		-	
Group C	average	32	2	29	2	1	0
	percentage	6%		7%		-	
Group D	average	26	2	22	1	1	0
	percentage	7%		4%		-	
Overall	average	27	2	24	1.5	3	0
	percentage	7%		6%		-	

Level 4 'modify' activities

(i) Assist

With reference to forms of 'assist' figure 3.11 level 4 reveals that none of the mothers did so by 'correcting' the infant's model (fig. 3.4, level 4). On average there were three episodes of 'facilitate manipulation', two of 'feedback' and one of 'solve', but the differences between them were not significant. Nonetheless, there was a tendency for the mothers to be more passive in their help, in that they indirectly helped the infant to achieve goals.

(ii) Reveal Object's Property

Concerning forms of 'reveal object's property, figure 3.11, level 4 shows that these consisted largely of 'fulfil function' ($\bar{X}$ = 22), and to a lesser extent of 'describe' ($\bar{X}$ = 5). There was no incidence of 'grouping' (figure 3.5, level 4). A 4 (age) x 2 (category) anova showed that 'describe' and 'fulfil' differed significantly ($F = 38.2$; $p < 001$).

The predominance of 'fulfil' over 'describe' could be attributed to the types of toys used during the observations and which tended to favour 'fulfil function' activities. Four sets of toys were generally used. The first set consisted of the standard toy that was provided by the experimenter (Merit Build-up Beakers), as well as others with similar technical properties that were available in the homes. This set elicited 'construct' activities such as building towers and nesting beakers inside one another. Occasionally, 'describe' behaviour was elicited when mothers pointed at and/or named the pictures of animals at the base of beakers or the colours of the beakers, but since these qualities are subsidiary to the technical properties, not much attention was paid to them generally.

The second set was made up of mechanical toys of the type of "Mr Men". Winding them was more readily elicited than naming them, although it was customary to name the toy at its initial introduction to the infant.

The third set belonged to social toys such as dolls, teddies, tea-pots, hair-brushes, etc. Fulfilling the social functions of these was more common, although this set elicited more 'describe' behaviour than the others through naming and pointing at bodily features of dolls and teddies.

The fourth set was made up of picture-story books, which were less common than the first and second sets. Naming pictures constituted the majority of describe behaviour observed, but where book-reading was sustained for a prolonged period and in a ritualised manner, the activity was classified only as a 'joint-game' and an instance of CDE.

Within fulfil, 'construct' was the most predominant form, followed by 'innovate', 'activate' and least of all 'use socially'. The different frequency of these being significant at .001 level. This distribution reflects the frequencies of each set of toys, where technical toys were the ones mostly played with.

(iii) Create Discovery Environment

'Create discovery environment' was achieved mostly by 'joint-games' ($\bar{X}$ = 11), followed by 'elicit response' ($\bar{X}$ = 6) and lastly by 'defer' and 'trigger' ($\bar{X}$ = 2 and 3 respectively). These were significantly different at 0.001 level.

The reciprocal activities denoted by the category of 'create discovery environment' centred round performing a task in a game-like manner, be it reading a book or constructing a tower. By doing so, the mothers modified the infants' behaviour within a context that emphasised the social features of the task, and that made it a shared activity characterised by cooperativeness and predictability. This is consistent with the other findings described so far which all emphasised maternal sensitivity to the emotional aspects of play.

(iv) Demonstrate and Teach

The most common strategy of 'demonstrate' and 'teach' was 'model + idealise', followed by 'simplify'. No significant difference between these was found.

A larger proportion of teaching episodes were initiated by 'recruit' activities than the episodes of ROP, CDE or DM. Moreover, an equal number of incidents of 'assist imitation' ($\bar{X}$ = 5) and 'assist' ($\bar{X}$ = 5) were observed. This supports the argument that 'assist' is situation-specific and is elicited more readily in relation to a specified goal. Since teaching is always goal-directed, we expect it to be accompanied by assistance, more than spontaneous play activites which may not always be goal-directed. Within the sequence of 'teach', 'reset' was not observed on average, although some individuals employed it.

To recapitulate, the general quantitative results of maternal behaviour point out that mothers adopt a non-didactic form of support and one which places least demands on the infant. For the most part, mothers retreat to the background from where they watch what their babies are doing. They perform activities that keep the infants' attention focused on the play task. They show him what objects are for and they share with him the task of discovering the qualities of objects. They occasionally change between technical play and social play probably employing the latter as a buffer to dispel boredom and tension and to strenghten the bond between learner and supporter. Most of the functions of support rely heavily on one or two forms to the exclusion of others.

'Creating possibilities' is consequently kept within the limits of the infants' readiness and acceptability of support. This allows the infant to construct his own cognitive reality, with adults only providing the necessary stimulation.

3.3.2 Age Trends in Maternal Behaviour

Having identified the varieties of infants' experiences in terms of maternal behaviour, we shall now examine whether these experiences undergo age changes. For this purpose we shall discuss each category at levels 1-3, with reference to the three sets of data which were described in the section on methodology. Categories at levels 4-5 will be discussed only with reference to the cross-sectional data on four groups.

Level 1

'Create Possibilities'

From figure 3.13 it can be seen that the frequency of 'create possibilities'

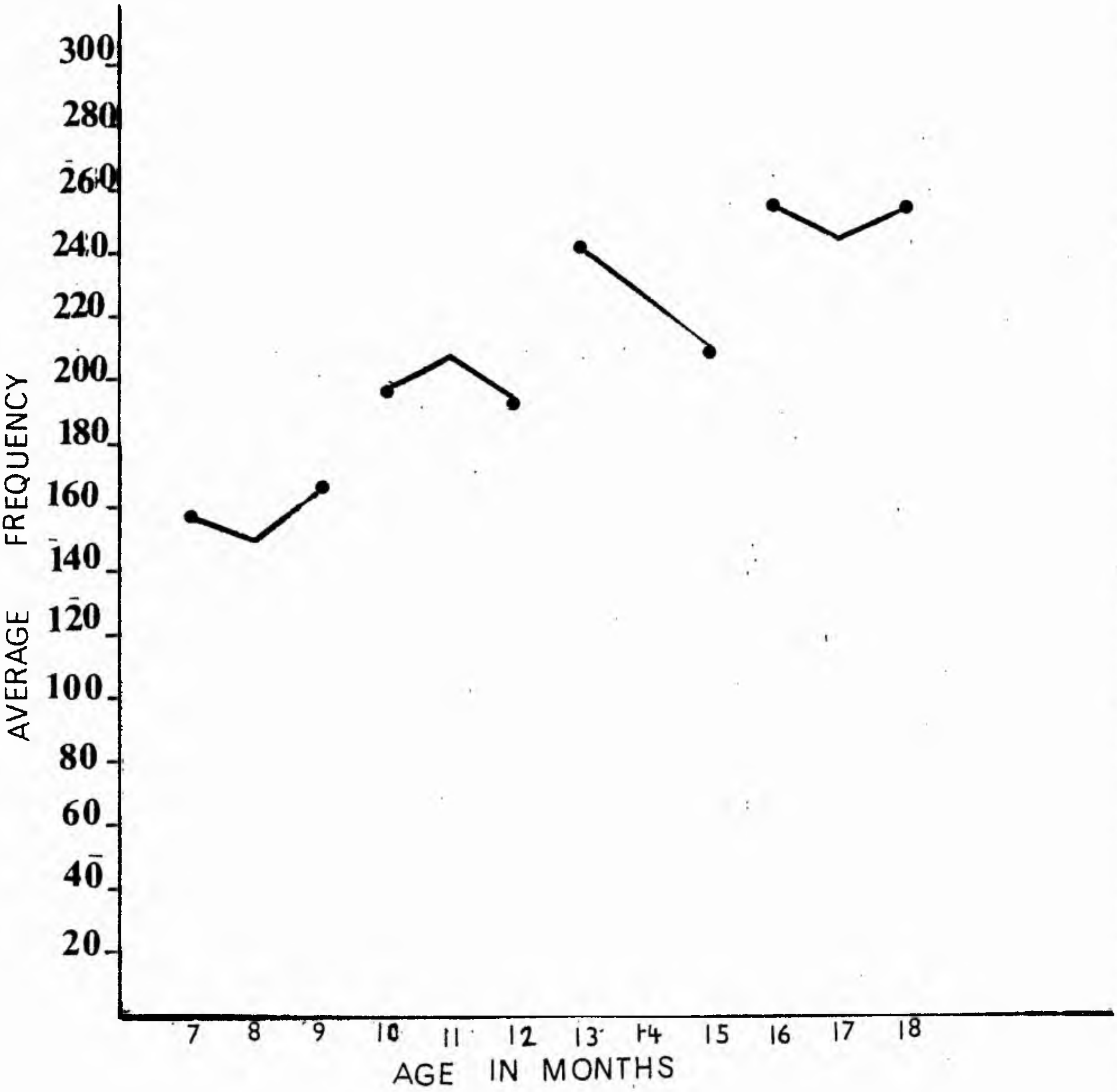

Figure 3.13 Monthly distribution of 'create possibilities'

fluctuates from month to month, but follows a step-wise progression. A steady increase can be seen from the 7th month to the 11th month; this represents the only consistent pattern. In order to determine whether the pattern of change within each group was significant, a one way anova was carried out for each group. There was no significant monthly change for groups A, B and D, but group C showed a significant decrease of CP activities. $F(2,8) = 13.34$; $p < .005$. This pattern of decrease was manifested by all five members of the group, and therefore it is not due to individual variability. For this group the rate of CP decreased by 16 units (6.6%) from the first to the second month, and by 24 units (9%) from the second to the third month. After the first month only 'enhance' decreased. Within this, 'provide stable base' accounted for 62% of the decrease, while 'support manipulation' was responsible for the remaining 38%. After the second month there was no decrease in 'enhance' and, therefore, the decrease in CP was brought about by a decrease in 'modify'. 58% of the decrease was brought about by 'reveal object's property', 30% by 'create discovery environment', and 12% by 'teach'. It is worth noting that group-C mothers increased their non-CP behaviour after the first month, so that 4% more session time was spent in non-CP activities during the second and third months. Thus, it is possible that the decrease in CP was due to an increase in non-CP activities, namely, 'social play' and 'talking to others' (Appendix C).

To examine whether there was a continuity of maternal behaviour between one group and another, three t-tests were carried out, comparing the third month for group A with the first month for group B, the third month of group B with the first month for group C, and the third month of group C with the first month for group D. None of the three comparisons showed a significant difference.

When we consider the cross-sectional data on four groups, we see from figure 3.12 that the frequency of CP increases steadily with age. To test whether the increase is statistically significant, a one-way anova was applied. It showed that the rate of CP activities was significantly different between the four groups ($F (3,15) = 12.47; p < .001$). Furthermore, the Newman Kuels method was applied to detect the sources of the differences. It revealed that as the age gap between the groups increases, the difference between them becomes significant. Thus, adjacent groups (A and B, B and C, and C and D) did not differ significantly from one another while non-adjacent groups (A and C, B and D) showed a significant difference at 0.005 level. Since the groups showed a steady increase of CP, the Scheffe method was used to determine whether there was a significant linear trend. The linear trend was found to be significant beyond 0.01 level.

With reference to two age-groups only, figure 3.14 shows that group 1 had less CP activities than group 2. T-test showed the difference between them to be significant at 0.005 level.

These results indicate that the rate of CP is affected significantly only by age progression that exceeds six months. Increases in infants' age by one to three months are not accompanied by a significant increase in CP activities. We conclude, therefore, that subtle changes in the frequency of CP were taking place between shorter periods, but they became noticeable only when we examined extreme age ranges such as between group 1 and group 2. This means that as the infants get older, mothers increase their CP activities at a steady rate, and it is not the case that at a certain period of development there is a sudden rise in these activities. This finding confirms the hypothesis that the rate of CP would increase with age.

Level 2

'Enhance' and 'Modify'

Looking at age trends in 'enhance' and 'modify' enables us to determine how the changes in the frequency of CP were brought about. From figure 3.15

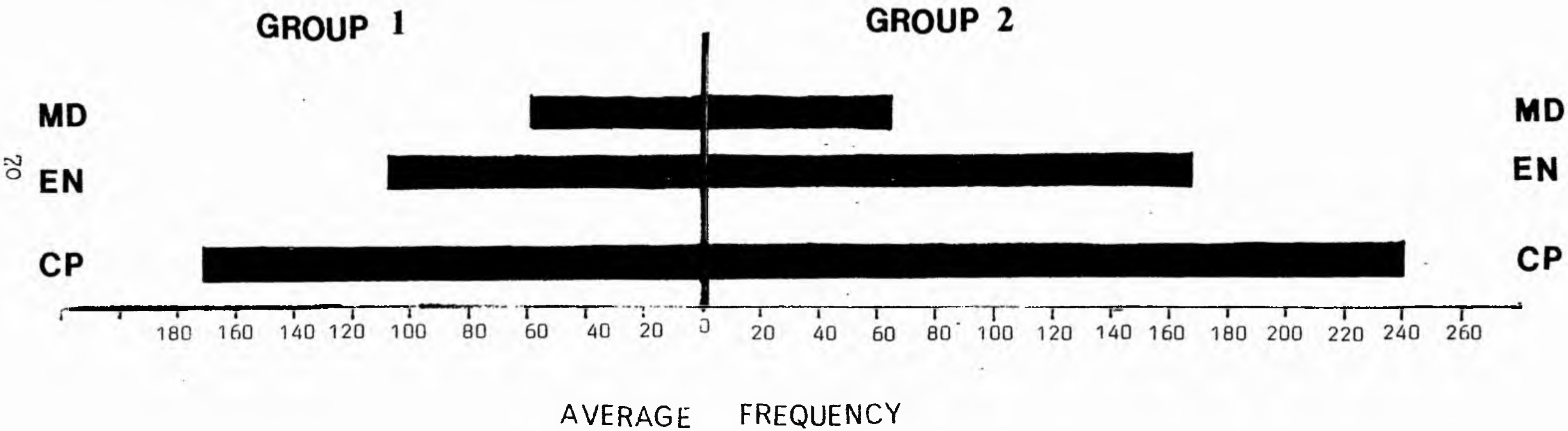

Figure 3.14 Distribution of 'create possibilities' and its immediate sub-categories for two groups of mothers. Group 1 had infants with an age range of 7½-10½ months; Group 2 had infants with an age range of 13½-16½ months

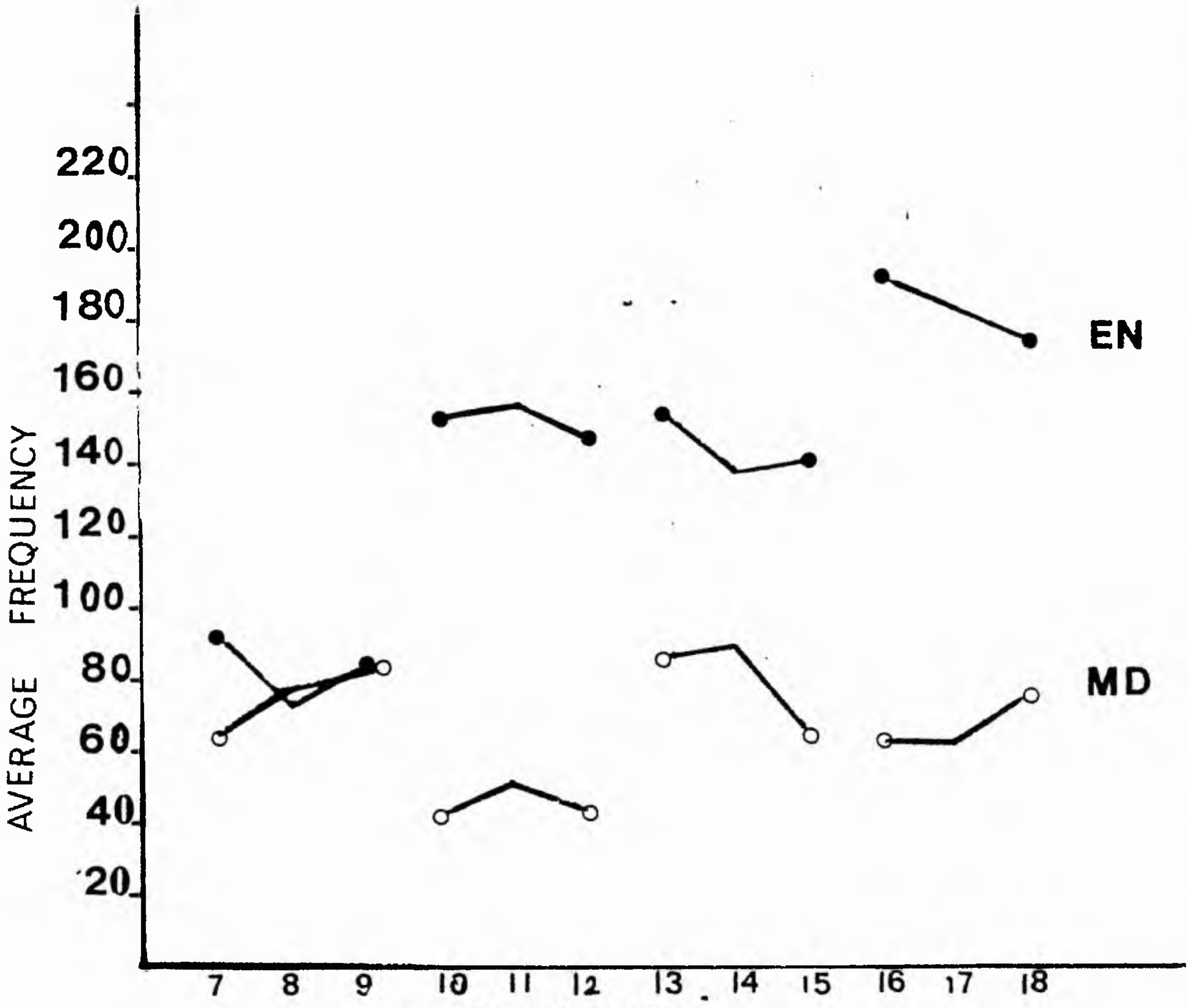

Figure 3.15 Monthly distribution of 'enhance interaction' and 'modify interaction' for the 19 mothers

we can see that the rate of 'enhance' and 'modify' increases and decreases from one month to another in an irregular manner. The only consistent pattern is seen with 'enhance' which declines steadily from the 15th to the 18th month. From the 16th to the 18th month the decrease in 'enhance' is compensated for by an increase in 'modify'. However, using four sets of one-way anova, these monthly changes were not significant. Furthermore, according to the t-tests, the transition from group to group was not significant either.

With reference to the four groups, figure 3.12 shows that 'enhance' appeared to have increased with age whereas 'modify' did not. Two-way anova showed a significant age effect ($F(3,15) = 13.01$; $p < 0-005$), a significant category effect ($F(1,15) = 62.2$; $p < 0.001$), and age/category interaction ($F(3,15) = 5.39$; $p < 0.01$) which, as figure 3.16 shows, was brought about by differences in the rates of 'enhancing' between group A and the other groups, whereas the frequency of 'modify' was similar for all 4 groups. Thus, for group A the difference between 'enhance' and 'modify' was less pronounced than for groups B, C and D. According to one-way anova, no significant difference was found between 'enhance' and 'modify' in the case of group A. Furthermore, the rate of 'enhance' was significantly different for the four groups ($F(3,15) = 13.01$; $p < 0.005$). The Newman Kuels method showed that only group A was different from the others at 0-01 level. For 'modify' there were no significant age differences.

These results indicate that after age 9 months mothers may change their behaviour by 'enhancing' more than before, and that 'enhance' is the more typical form of support among mothers with older infants. Furthermore, since 'enhance' showed age changes while 'modify' did not, we infer that the significant age changes that were observed with 'create possibilities' (page 67) are a reflection of the age changes in 'enhance' only.

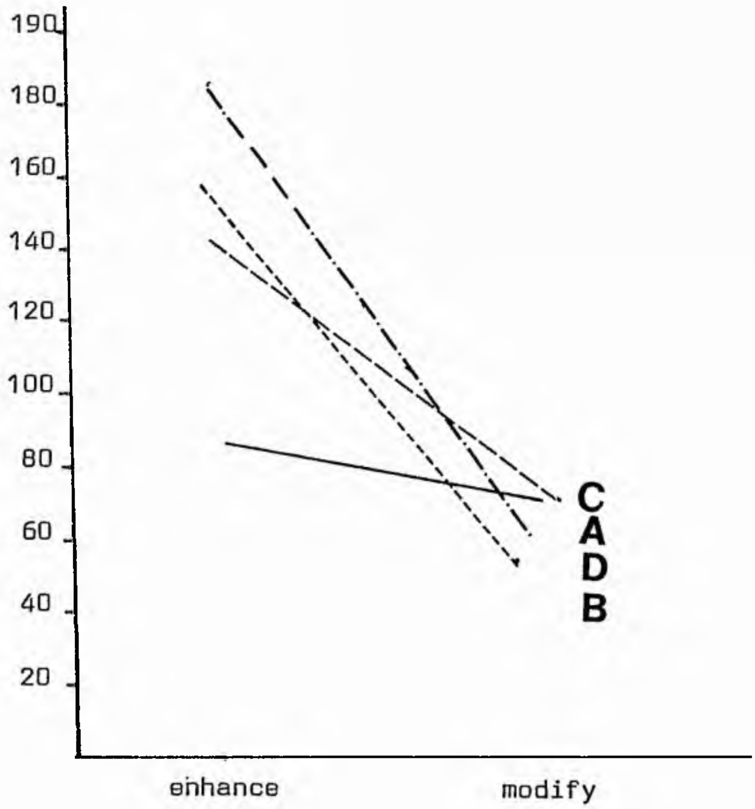

Figure 3.16 Interaction between infants' age and frequency of 'enhance' and 'modify'

As with the other sets of data, the cross-sectional data on two groups showed that a larger proportion of CP activities consisted of 'enhance'. Furthermore, the frequency of 'enhance' was greater for group 1 than for group 2. Two-way anova showed a significant age effect, $F(1,16) = 10.83$; $p < 0.005$, as well as a significant category effect, $F(1,16) = 32.6$; $p < 0.001$, but no interaction was found. To determine whether the age effect was brought about by one category or both, two t-tests were applied, comparing between groups 1 and 2 first on 'enhance' and then on 'modify'. The two groups showed a significant difference on 'enhance' ($t = 2.57$; $p < 0.05$). However, no significant differences were found on 'modify'.

These results indicate that parental support is achieved by a major role, 'enhance' and a subsidiary role, 'modify'. The major role is affected by age changes while the subsidiary one is not affected. With the youngest group of infants, the rate of 'enhance' was depressed to the level of 'modify'. Also there was a tendency by mothers of older infants to increase the rate of modifying activities, although the increase was not statistically significant. Thus, it seems that when infants are of a very young age and of an older age, mothers adopt a more directive role when participating in their infants' play.

The findings provide some support for the hypothesis that different forms of support fulfil different developmental functions in that adopting an enhancing role could be reactive to what the infant is capable of doing (or is doing). As infants get older they become more capable of maintaining longer bouts of solitary play and hence the increase in maternal activities which enhance that type of play. The youngest infants in the sample were least capable of prolonged solo play and, therefore, their mothers enhanced least.

Level 3

Enhance sub-categories

From Figure 3.17 we can see that the pattern of 'provide stable base' repeats that of 'enhance' in figure 3.15, while that of 'support manipulation' remains fairly stable. This indicates that provide stable base' is more influential to the achievement of 'enhance' than 'support manipulation'.

Like the other categories, the present two categories did not show any significant changes from one month to another, nor was there any significant change during the transition from one group to the other.

The period of 9 to 10 months has the greatest frequency of 'support manipulation'. This is probably because at this stage the infants began to learn to walk with their mothers' support. However, a look at the individual profiles (figure 3.18) shows that subject 8 had the greatest frequency of support and hence the group score was affected by this exceptionally high individual score.

The four-groups data reveal that the frequency of 'provide stable base' changes from one group to another, while that of 'support manipualtion' remains relatively constant. Two-way anova showed a highly significant category effect ($F(1,15) = 317.80$; $p<0.0001$), thereby indicating the extreme predominance of 'provide stable base' over 'support manipulation'. Furthermore, the analysis showed a high interaction between age and categories ($F(3,15) = 13.01$; $p<0.0005$). As we can see from figure 3.19, as age progresses, the discrepancy between 'provide stable base' and 'support manipulation' becomes greater. This is due to the increments in 'provide stable base' which were not complemented by

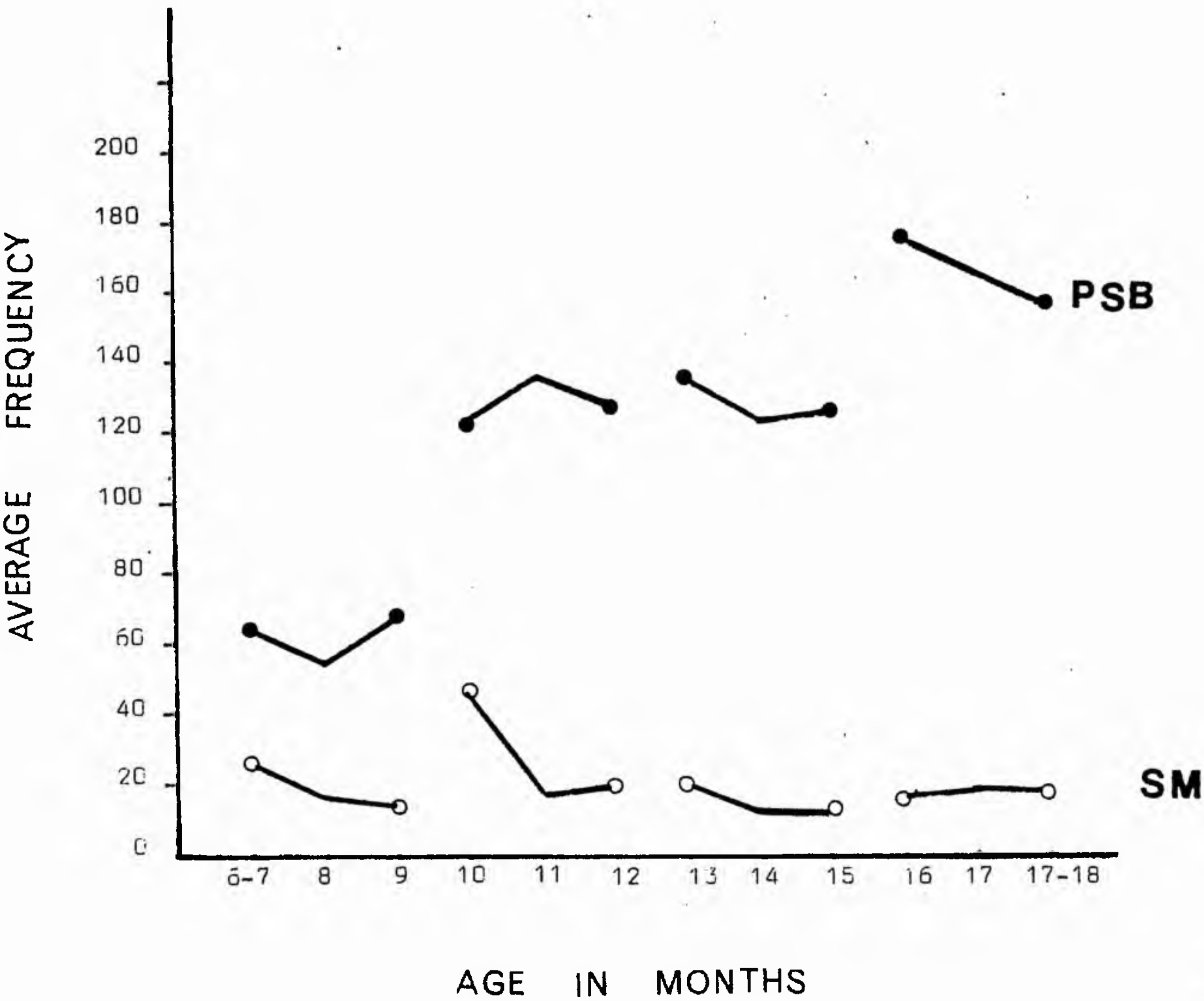

Figure 3.17 Monthly distribution of 'provide stable base' and 'support manipulation' for the 19 mothers

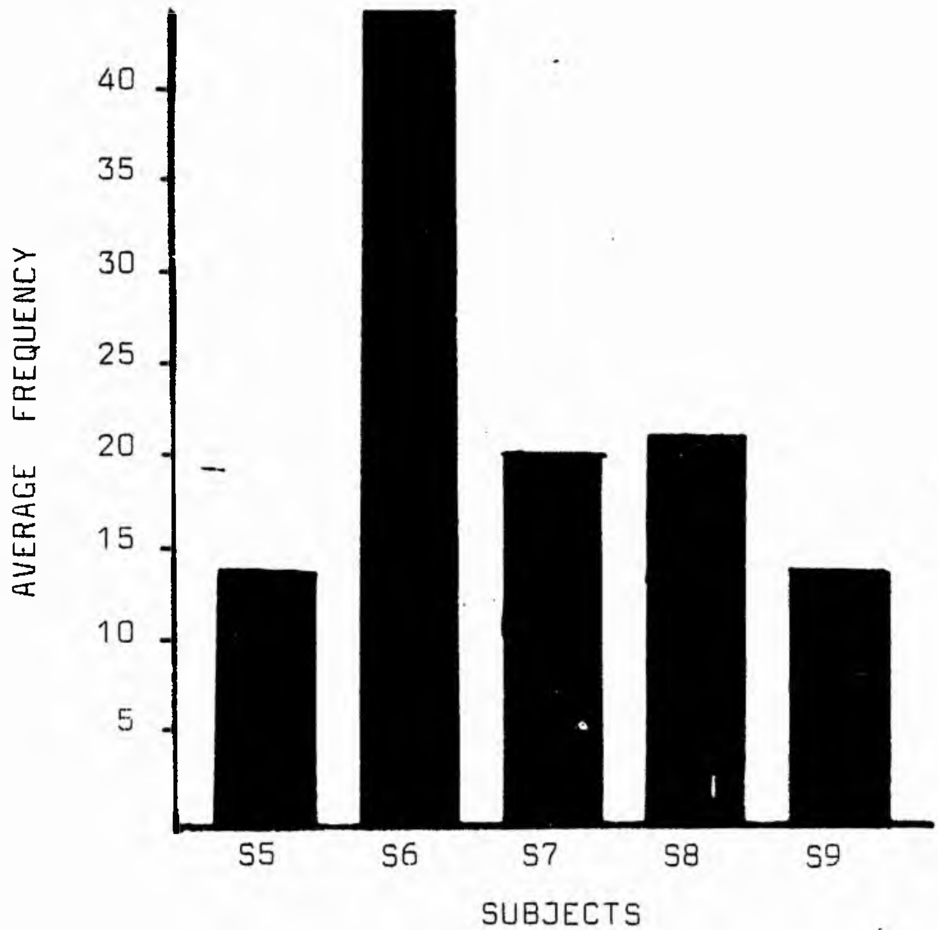

Figure 3.18 Frequency of 'support manipulation' for the individual mothers in group B

increments in 'support manipulation' (One-way anova showed that the changes in 'provide stable base' were highly significant; $F(3,15) = 18.58$; $p < 0-0001$, while no signifcant age changes were found with 'support manipulation'). In this way the distribution of 'provide stable base' relative to 'support manipulation' is similar to the distribution of 'enhance' relative to 'modify'. Thus, it seems that whenever two forms achieve the same function, one of them not only exceeds the other in rate, but also increases as a function of age.

With reference to the two groups, figure 3.20 shows that 'provide stable base' was predominant over 'support manipulation'. Furthermore, the frequency of 'provide stable base' was greater for group 2 than for group 1, while the frequency of 'support manipulation' was greater for group 1 than for group 2. Two-way anova showed a highly significant category effect; $F\ (1,16) = 101.01$; $p < 0.0001$. It also showed a significant age effect; $F\ (1,16) = 7.88$; $p < 0.01$, and an interaction between age and category; $F = 11.02$; $p < 0.005$. The interaction effect was brought about by the discrepancy between 'provide stable base' and 'support manipulation' which was greater for group 2 than group 1.

From these findings we can see that just as 'create possibilities' was achieved by a major role and a subsidiary one, 'enhance' was achieved

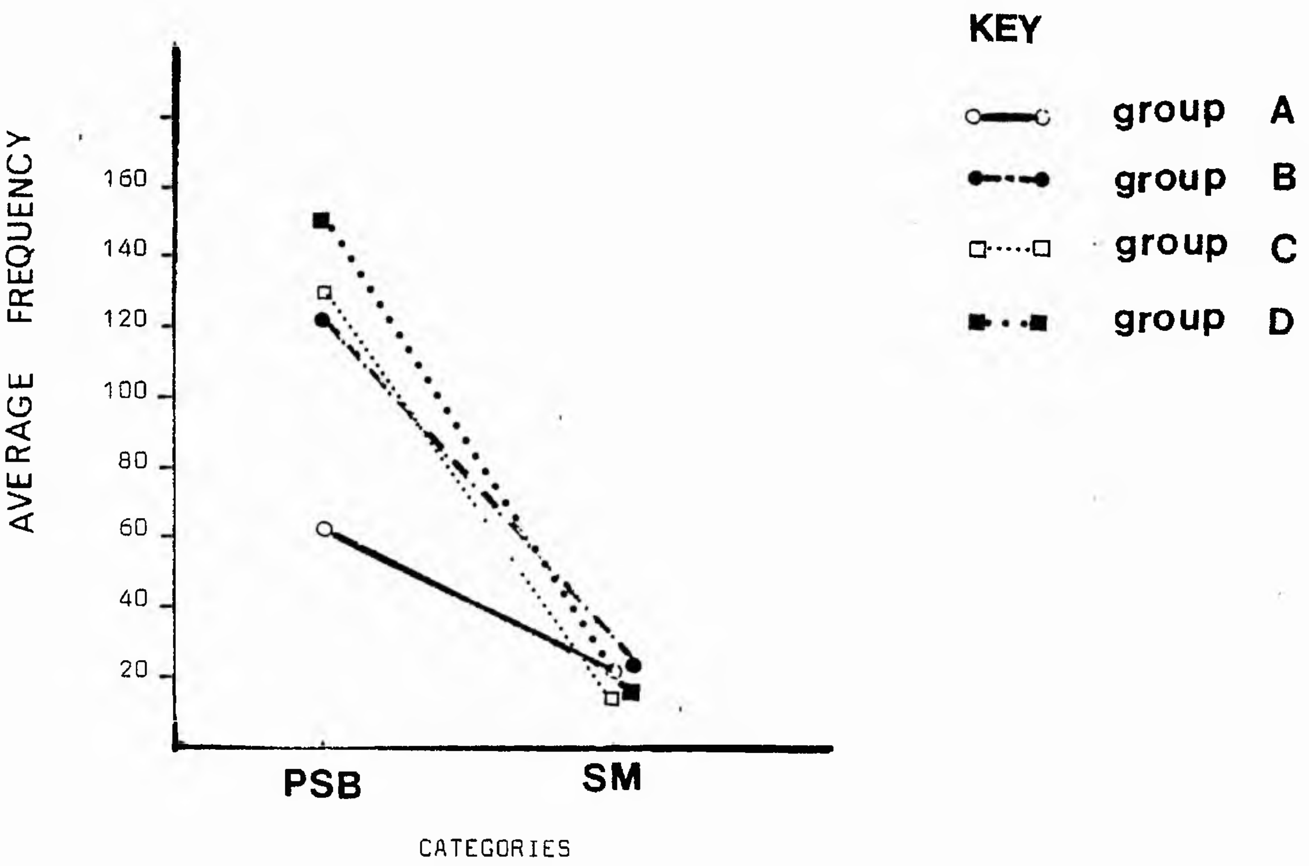

Figure 3.19 Interaction between infants' age and 'provide stable base' and 'support manipulation'

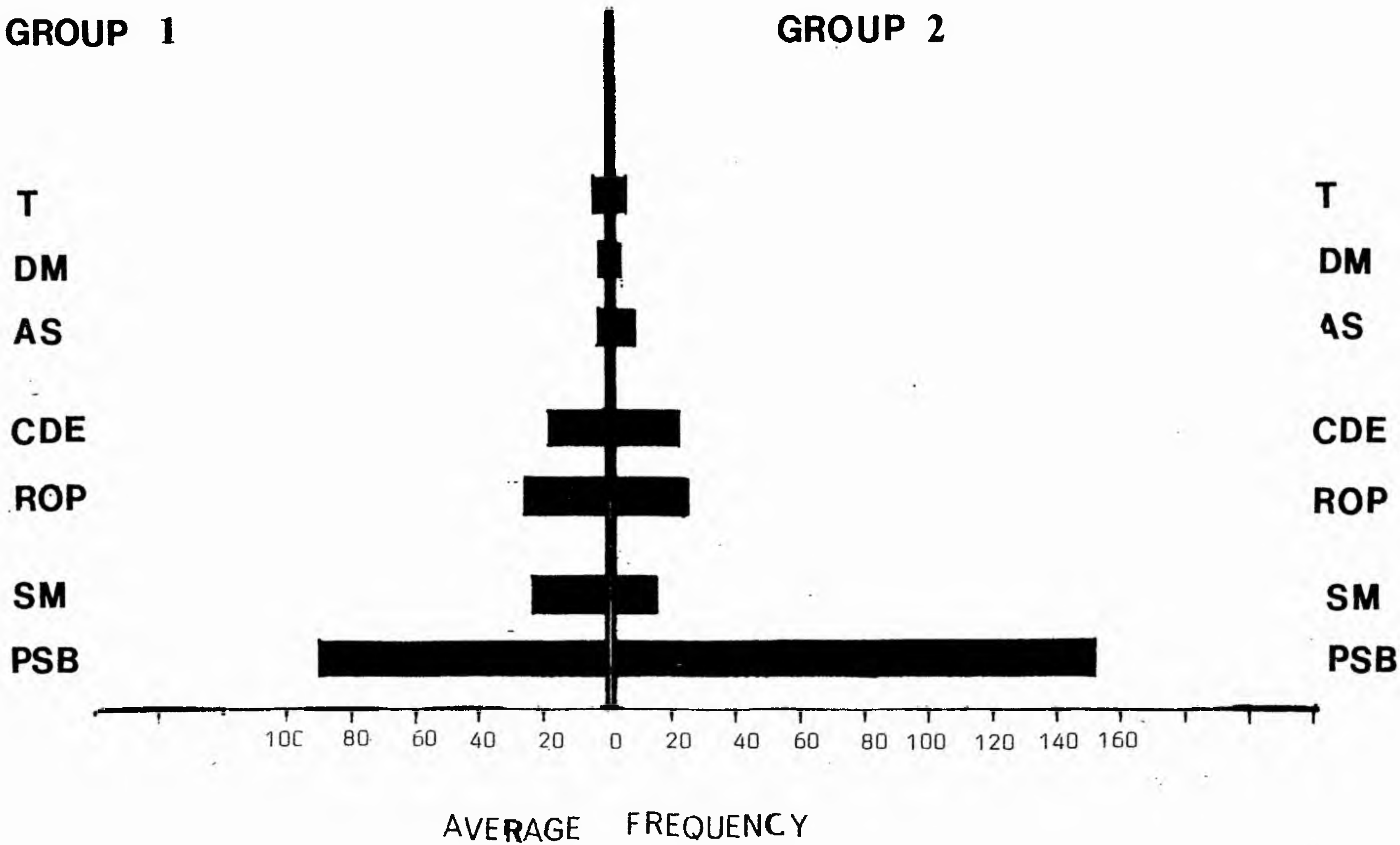

Figure 3.20 Distribution of level-3 categories for two groups of mothers

mainly by 'provide stable base' and only partly by 'support manipulation'. Mothers of the youngest group of infants showed the same tendency as before: they engaged in less 'provide stable base' than the other groups, which brought 'provide stable base' closer to the level of 'support manipulation'.

Modify sub-categories

Since the majority of modifying activities were performed equally by 'reveal object's property' and 'create discovery environment', I shall discuss first these two together, while the other sub-categories will be considered later.

Figure 3.21 shows that 'reveal object's property' does not undergo a change in its pattern of distribution throughout the period of 6 to 12 months, even though the frequency changes between 6 to 9 months and 9½ to 12 months. After 12 months the pattern becomes irregular. This tendency, however, was found to be statistically insignificant. The pattern of 'create discovery environment' is more irregular but, again, no significant changes from month to month were observed.

Regarding the four groups, as we can see from Figure 3.12, group B had the lowest frequency of 'reveal object's property' and groups B and D had the lowest frequency of 'create discovery environment'. However, two-way anova showed no age effect and not category effect. Since no age effect was found, it follows that the functions of 'reveal object's property' and 'create discovery environment' are not performed differently with respect to development progresses. The lack of a signficant difference between the two categories also indicates that 'modify' was achieved by both forms to an equal extent. For the two groups, Figure 3.20 shows that the frequency of 'reveal object's

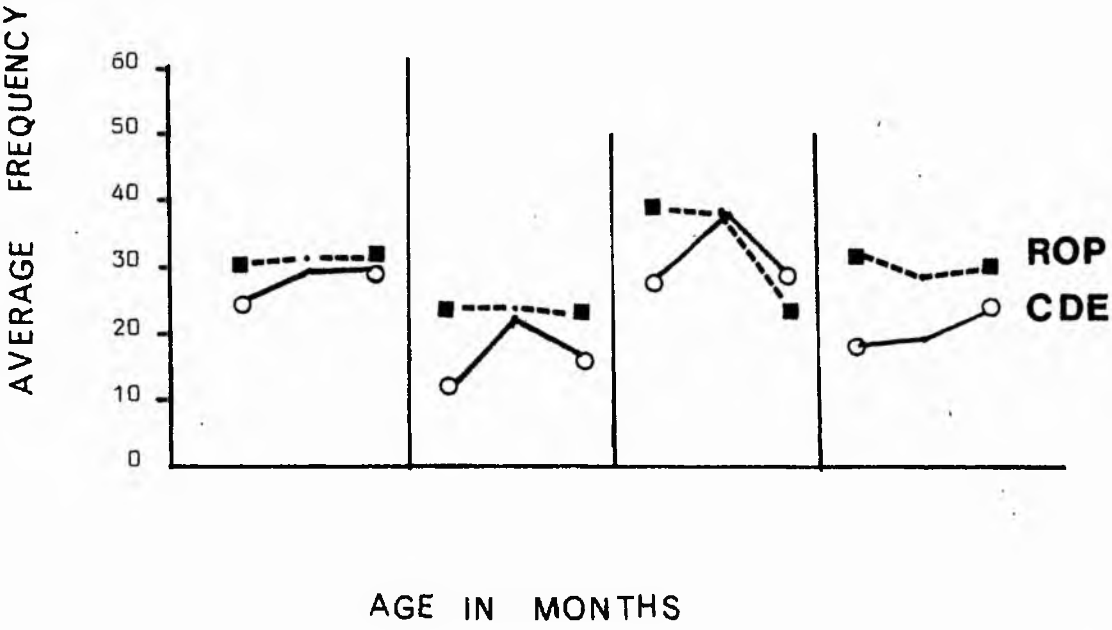

Figure 3.21 Monthly distribution of 'reveal object's property' and 'create discovery' for the 19 mothers

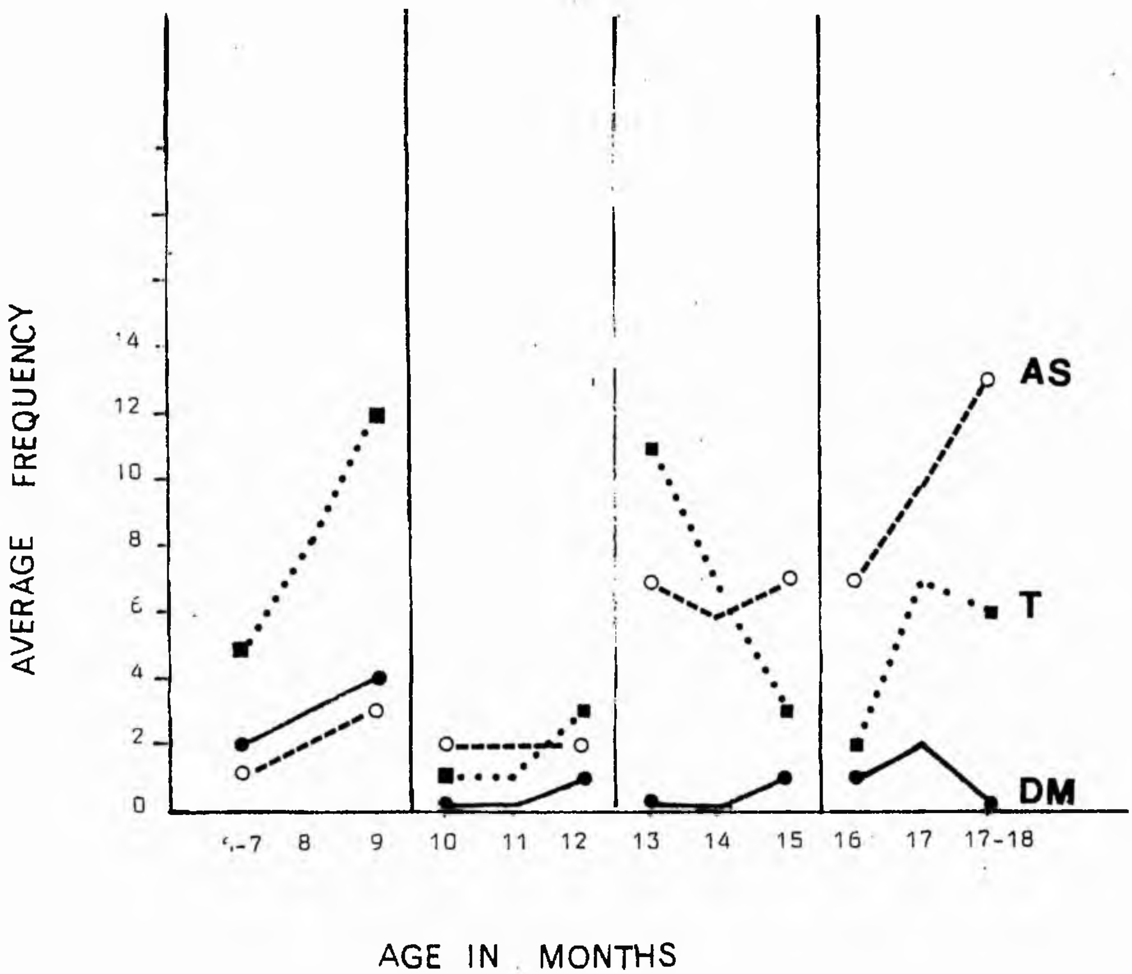

Figure 3.22 Monthly distribution of 'assist', 'demonstrate' and 'teach' for the 19 mothers

property' was slightly greater than 'create discovery environment', with both groups having an almost equal amount of both. Two-way anova showed no age effect, no category effect and no interaction.

Figure 3.22 shows the distribution of the other sub-categories of 'modify'. Since the three had low frequencies, the enlarged scale allows a better examination of the differences between their patterns.

Concerning 'assist', it follows an irregular pattern except on the period of 9 to 12 months. 'Demonstrate' and 'teach' have an irregular pattern throughout the whole period. However, like the other categories, none of these three showed significant monthly changes, although there was a significant transitional change in 'assist' between 12 and $12\frac{1}{2}$ months ($t = 2.86$, $p < .05$) and in 'teach' between 9 and $9\frac{1}{2}$ months ($t = 6.30$, $p < .005$). This means that after age 12 months 'assist' gains importance to the way mothers modify their infants' activities, in that significantly more assistance is given to the infants from that age onwards. Similarly, teaching becomes less important after the infants are $9\frac{1}{2}$ months. These two periods mark important developmental changes since changes in maternal behaviour become significant.

Concerning the four groups on 'assist', 'demonstrate' and 'teach', figure 3.12 shows that the frequency of 'assist' and 'demonstrate' changes with age, while 'demonstrate' does not change. However, two-way anova showed no age effect for these categories, and from this we can infer that the categories fulfil similar developmental functions.

A very significant category effect was found, $F(2,30) = 13.01$; $p < 0.001$, in favour of 'teach' and 'assist', for all groups except group 8. In the case of group 8, 'teach' was predominant over 'assist' and 'demonstrate'. Thus it follows that among the three categories, teaching is the most common form of modifying, followed by assisting.

From figure 3.20 it can be seen that for the two groups 'assist' and 'teach' occurred at similar rates, while 'demonstrate' was less frequent.

Figure 3.20 shows that 'assist' and 'teach' occurred at similar rates, while 'demonstrate' was less frequent. These categories were more common among mothers in group 2 than in group 1. However, the differences between the groups were not significant. A category effect was found: $F(2,32) = 6.58$; $p<0.005$ and there was an age/category interaction; $F = 8.64$; $p < 0.001$. This implies that mothers of younger infants (group 1) do not discriminate between 'assist', 'demonstrate' and 'teach' while mothers of older infants do discriminate by assisting more than demonstrating or teaching.

Level 4

'Provide Stable Base' sub-categories

Figure 3.12 shows that 'eliminate undesirable behaviour' did not change with age, except in the case of group A where it was least frequent. On the other hand, 'participate from background' showed age changes; it was least frequent for group A and most frequent for group D. Two-way anova showed a significant age effect ($F(3,15) = 18.58$; $p < 0.0001$) and an age/category interaction ($F(3,15) = 16.55$; $p < 0.0001$), which, as Figure 3.23 shows, is due to a steady increase in the discrepancy between the two activities. This discrepancy between the rate of 'eliminate' and the rate of 'participate' was least for group A, similar for groups B and C, and greatest for group D. Separate one-way anova showed that the age differences on 'eliminate' were non-significant, while 'participate' showed significant age changes ($F(3,15) = 18.58$; $p < 0.0001$). Furthermore, the frequency of 'participate from background' greatly exceeded that of 'eliminate' ($F(1,15) = 501.23$; $p < 0.0001$). Therefore, as infants get older, the mothers discriminate more between the forms of 'providing stable base' increasing 'participate from background' at a greater rate than they 'eliminate'. The findings also indicate that for all groups the majority of 'provide stable base' acts consisted of 'articipate from background'. This result exemplifies another occurrence of the pattern of predominance of one form of parental support over the others, and the increase in the frequency of that form with age progression.

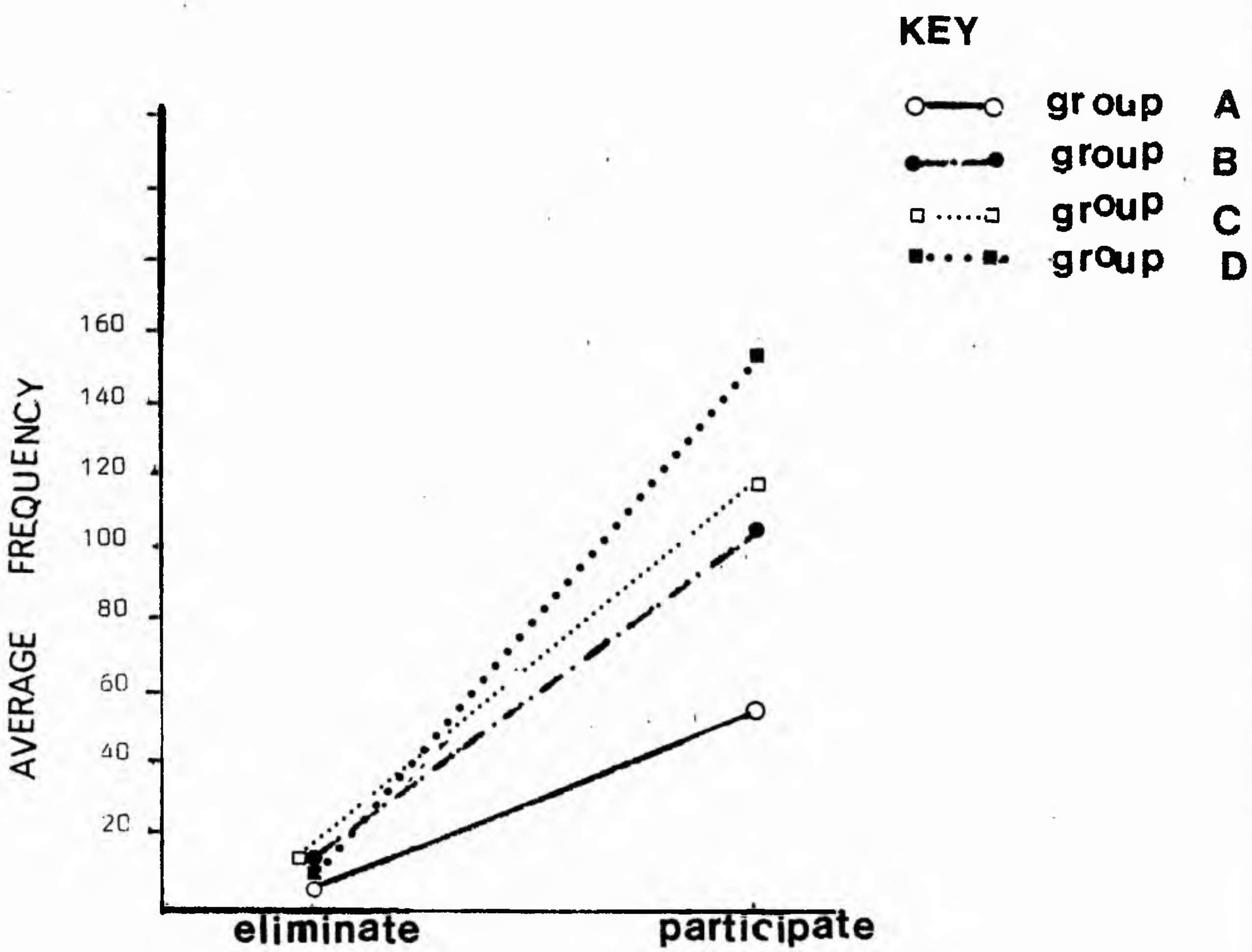

Figure 3.23 Interaction between infants' age and the frequency of the two categories of 'eliminate' and 'participate'

'Support-manipulation' sub-categories

Figure 3.12 shows little age changes in 'support contact' and 'support appraoch'. Two-way anova showed no significant age effect which means that the function of these two activities is similar at all four age ranges. On the other hand, a highly significant category effect was found, $F(1,15) = 69.45$; $p < 0.0001$. Therefore, in supporting manipulation of toys, mothers rely on supporting contact almost exclusively.

Although 'support manipulation' was less predominant than 'provide stabel base', yet for its fulfilment it consisted largely of one form. This emphasises the pattern of parental support where functions are fulfilled by one form more than the others.

'Assist' sub-categories

From Figure 3.12 we can see that both 'facilitate manipulation' and 'feedback' changed with age. Overall, there was a signfiicant age effect at 0.05 level due to age differences on 'facilitate' ($F = 3.2$; $p < 0.05$). It follows that the age changes on 'assist' were brought about by changes in 'facilitate' only.

Group D mothers showed the highest rate of 'facilitate' as well as the highest rate of 'feedback'. This indicates that the older the infant, the more facilitating and feeback they receive presumably because their play is more goal-directed.

'Reveal Object's Property' sub-categories

As we can see from Figure 3.12, the frequency of 'describe' and 'fulfil function' changes with age. Such changes were not statistically significant, although there was a tendency for group D mothers to describe most and groups A and C mothers to fulfil function more than the other two groups.

'Describe' and 'fulfil function' differed significantly in their rates ($F = 38.27$; $p < 0.0001$), where 'fulfil function' was predominant over 'describe'. This pattern was manifest for all groups except group D. The lack of difference between 'describe' and 'fulfil' for this group, together with their having the highest rate of 'describe' indicate that mothers of older infants emphasise the abstract qualities of objects, which may enhance the linguistic development of their infants.

'Create Discovery Environment' sub-categories

Figure 3.12 shows age changes on 'elicit', 'defer', and 'games'. However, two-way anova showed no age effect. It follows then that forms of achieving 'create discovery environment' were not affected by age, although there was a tendency for mothers to place greater demands on older infants, by requiring them to perform more tasks on their own ('defer').

Most eliciting occurred in group A, probably due to the young infants' need for direct prompting.

'Demonstrate' sub-categories

Figure 3.12 shows that mothers demonstrated their actions by 'modelling-and-idealising', as well as by 'simplifying'. For the other groups, 'demonstrating' was performed only by 'modelling-and-idealising'. Due to the very low frequency of 'demonstrate' and its sub-categories no statistical analysis was carried out.

'Teach' sub-categories

As we can see from Figure 3.12, there were no age changes in the sub-categories of 'teach'. Two-way anova showed no significant age effect and no interaction, but it showed a category effect in favour of 'demonstrate' $F(3,45) = 19.92$; $p < 0.001$. It follows that demonstrating is most important for teaching. As can be seen from the Table, recruiting was least important. For all groups, teaching episodes did not employ the whole sequence of events, for example, group C mothers did not initiate their teaching by recruiting, and only in two cases did they allow imitation and assisted imitation after they had demonstrated.

Level 5

(i) 'Eliminate' sub-categories

There was no overall age effect with regard to 'eliminate undesirable behaviour', although there was a tendency as Table 3.6 shows, for groups to favour some categories more than others. Thus, group A had the highest frequency of 'cope with distress', while group B infants required most control to keep them in field. For groups C and D, 'restore attention' was most frequent.

Table 3.6 'Eliminate' sub-categories (mean frequency)

Group	Sub-category		
	restore attention	keep in field	cope with distress
A	2	1	3
B	4	5	1
C	7	3	2
D	5	3	1

(ii) 'Participate from Background' sub-categories

Figure 3.12 shows that in each group the frequency of 'watch' and 'comment' changed, while 'receive' and 'maintain proximity' did not. Two-way anova showed a highly significant category effect, ($F(3,45) = 26.1$; $p < 0.0001$), but no age effect or interaction. Therefore, 'participate from background' was performed mainly by 'watching' baby.

(iii) 'Support Contact' sub-categories

Table 3.7 shows that neither 'support baby' nor 'provide object' undergo changes. Two-way anova showed no age effect but there was a category effect in favour of 'provide object'. $F(1,15) = 57.7$; $p < 0.001$. It follows that mothers do not change the frequency of their 'support contact' activities as a function of the infants' age, but they do rely on one form of support more than the others.

(iv) 'Support Approach' sub-categories

On the very few instances when mothers supported infants' approach to toys they did so mainly by 'luring' the infant to the toy rather than physically guiding him to it ('support locomotion'). Infants in Group A were lured more than others.

(v) 'Describe' sub-categories

Table 3.8 shows that 'naming toy' increased with age while pointing at a toy or its attribute did not. This is because infants from six months onwards can follow the direction of their mother's pointing, especially when it involves objects within the infant's visual field. Most pointing in this study was directed towards objects the infant was already looking at, and the activity usually served the function of highlighting some of the features of the object rather than requiring the infant to locate it. Naming, on the other hand, is more age biased. Overall, there was an almost equal number of 'naming' and 'pointing' episodes.

Table 3.8 'Describe' sub-categories (mean frequency)

group	sub-category	
	name	point
A	2	1
B	1	2
C	1	3
D	6	3

(vi) 'Fulfil Function' sub-categories

As can be seen from Table 3.9 'activate', 'construct' and 'innovate' showed some age trends, with group A showing the highest frequency of 'activate', group C had the highest frequency of 'construct' and group B had the highest frequency of 'innovate'. 'Use socially' did not change its rate from one group to another. However, none of these age changes were statistically significant.

Table 3.9 '<u>Fulfil Function' sub-categories</u> (mean frequency)

Group	Sub-category			
	activate	construct	use socially	innovate
A	6	14	1	4
B	2	11	1	5
C	2	22	1	3
D	2	13	0	2

(vii) '<u>Elicit' sub-categories</u>

As can be seen from Table 3.10, elicit equilibrium was more frequent among groups A and D, in the first instance by enticing the infant to knock down tower, while in the second instance it was by encouraging him to build it up. No age trends were shown in relation to eliciting the use of containers or eliciting search for hidden objects. Furthermore, these tendencies were not statistically significant.

Table 3.10 '<u>Elicit' sub-categories</u> (mean frequency)

Group	Sub-category		
	equilibrium	container	search
A	5	2	1
B	0	2	3
C	1	1	2
D	6	0	1

(viii) '<u>Game' sub-categories</u>

Table 3.11 shows that mothers in group A initiated games most, followed by mothers in group B. Most reciprocating games was performed by group C. On the whole, there were more instances of 'initiate games' than 'reciprocate'. None of these differences were significant.

Table 3.11 '<u>Game' sub-categories</u> (mean frequency)

Group	Sub-category	
	initiate	reciprocate
A	13	2
B	5	3
C	9	7
D	0	0

3.4 <u>Conclusions</u>

In summary, three conclusions can be drawn from the examination of age trends in mothers' activities.

Firstly, overall, mothers do not change the frequency of their activities within short periods of time significantly.

Secondly, over longer periods, when mothers change the rate of a major function of support, they also change the rate of the predominant form by which they achieve that function. On the other hand, when a function is achieved by more than one form, neither form nor function tend to change with changes in infants' age.

Thirdly, the majority of mothers' activities tend to increase, rather than decrease, with infants' age.

These findings seem to imply that mothers are sensitive to changes in their infants' behaviour and they pace such changes by varying the rates of their own activities. Some of these activities are more affected by change than others; for example, 'enhancing' the infant's play is more affected by the level of the infant's cognitive functioning than 'modifying' it. However, more important than age trends were the predominance of one or two types of support over others, which seems to indicate that parents are selective in the way they structure the infants' play. Contrary to expectations, mothers engage in very little directive interaction when participating in their infants' play.

Finally, by describing maternal behaviour in terms of its hierarchical structuring, I have highlighted the relationships between the various types of activities exhibited by mothers, and I have shown that major functions can be achieved by diverse forms. Some of these forms were very infrequent that under a different system of categorisation they would have been missed out. However, the present system conserved these activities by combining them with others and by examining their developmental significance in terms of the higher functions which they achieve. The hierarchy also showed which aspects of support constitute more common infants' experiences, and for which developmental stages. Furthermore, through the hierarchy we can assess the extent to which these experiences were beneficial or compatible with the infants' levels of cognitive functioning, by balancing the hierarchical level of the mothers' activities with the infants' behaviours on an equivalent level of interpretation. Thus another system of categorisation of infants' behaviour was constructed in order to complement the mothers' hierarchy. This system is described in the next chapter.

CHAPTER IV

CLASSIFICATION OF INFANTS' ACTIVITIES WITH OBJECTS

CHAPTER IV

Table of contents: page

4.0 Introduction

This chapter is concerned with the categorisation of infants' play activities with objects when an adult (parent) is participating in that play. My aim here is not to trace the developmental progression of infants' manipulation of objects, but to use the infants' actions as measures of underlying cognitive and social abilities, and to relate these abilities to other variables such as parental behaviour that could influence them, or that may be influenced by them. In order to achieve this aim it was necessary to devise a classification system that would result in the following:

1. The provision of a comprehensive description of the infants' repertoire of actions relating to objects from age 6 months to age 18 months.

2. The description of that repertoire in terms of the cognitive abilities which the specific actions denote.

3. The description of the same repertoire in terms of the social style through which it is expressed, such as whether the infant pursues his activities with objects independently of others, or whether he incorporates others in his play, or responds to their attempts to regulate his activities.

On these bases the classification system that was constructed consisted of four major categories. Each category is described in 3 to 4 levels which constitute categories subordinate to the major ones (Figures 4.1 to 4.4), and represent alternative forms for achieving the behaviours at level 1. Three of the superior categories describe the infants' mode of interaction with objects (and mother). These are solitary acts, object-contact acts and sequential acts. The fourth superior category, negative acts, describes the lack of - or cessation of - the infants' interaction with objects. Categories at intermediate levels specify more about the cognitive and communicative functions of the four categories, while the ones at the lowest levels (levels 4 or 5) describe the repertoire of the infants' actions with objects. These aspects will be discussed further in the next section dealing with the general characteristics of the system. This will be followed by the description of the actual categories used, and their relationship to the mother's categories, to be concluded by the presentation and discussion of the results of infants' object-play in an interpersonal context.

4.1 General Characteristics of the System

4.1.1 Ethological Characteristics of Infants' Categories

Like the mothers' Hierarchy (Chapter III), the present classification is an attempt to describe infants' behaviours on more than one level of perception without losing the objectivity of the descriptions. Thus, starting with the initial categories which were used to code all observed infants' activities, I set out two criteria whereby the descriptions were made in accordance with the ethological approach. Firstly, I decided on a level of perception that is readily recognisable to others through its reliance on non-subjective and non-motivational descriptions. Therefore, the categories of levels 4 and 5 denote forms of behaviour that were observed with repeated regularity in the course of the present data collection, as well as by other workers; for example, many of these behaviours were described by Piaget as contents of sensorimotor schemes (Piaget, 1936). They are all self-explanatory, their definition being derived from observed consequences.

The second criterion was to specify any details of a behaviour which are of theoretical relevance and to ignore all other details that would not cause any loss of important information for assigning a category to a particular level of competence, or for recognising it; for example, the category 'mouth object' (Figure 4.1, level 4), could have been split up into at least three other categories, each describing a different form of mouthing:

(i) hold object steady and suck it rhythmically,

(ii) rotate object constantly while sucking it,

(iii) alternate sucking with visual inspection of the object.

Such details were ignored because, without their being specified, an observer can still recognise the behaviour referred to by 'mouth object'. Furthermore, all three sub-categories denote a similar level of cognitive functioning, i.e. they do not represent significant differentiation of the scheme of mouthing (Piaget, 1936). Finally, since the study does not focus on the examination of sensorimotor schemes per se, but rather on the frequency of any action relative to other actions (e.g. 'mouth object' versus 'name object') such details are of little relevance. On the other hand, details were included if they made the behaviour more readily recognisable, or if they denoted significant differentiation of cognitive competence. An example of this is the category 'hit object' which was sub-categorised into 'pat object', 'hit one object with another' and 'hit two objects together'. As with the mother's behaviour, in order to retain the ethological descriptions, it was necessary to employ a system that operates along several levels, with the lowest levels referring to simple patterns of behaviour, and the upper levels denoting complex concepts. This was achieved by grouping categories into clusters, and using labels with cognitive and interactive functions to define the clusters. These functions are described in the next two sections.

4.1.2 Cognitive Aspects of the Infants' Behaviour with Objects

Infants' play with objects has been used as a measure of underlying cognitive structures (Piaget, 1936). Thus, in infancy (as in childhood), every play activity embodies an expression of the infant's ability to utilise that object at a cognitive level. Such an activity may be characterised by a developmentally simple or complex level of cognitive functioning, for example, mouthing an object requires a more rudimentary cognitive skill than naming it. The former activity constitutes an exercising of a scheme that involves little or no accommodation to the properties of the object, while the latter action requires the representation of objects in a symbolic system (Piaget, 1936), as well as the acquisition of the concept of naming and the mastery of the cultural conventions for expressing a name (McShane, 1980).

In the present classification the cognitive aspects of the infants' play refer to sensorimotor schemes and cognitive processes identified by Piaget and others (Piaget, 1936; Bower, 1974; Nelson, 1973; Bruner, 1974 and McCall, 1974). The schemes or processes are indicated by labels that describe their identity (e.g. 'undifferentiated schemes', 'grouping', 'imitation' etc.). In each case instances of that scheme are specified by a cluster of categories at levels 4 and 5, while the cognitive aspects are represented at levels 3 and 2, except for 'sequential acts' where they occupy only level 3. In this case the cognitive aspects are inseparable from the interactive ones. (This will be dealt with in the next section). 'Negative acts' have no cognitive components in so far as they express emotional states and affects. However, such states and affects could reflect the level of cognitive competence when a less competent infant may react negatively to the play situation, as a way of avoiding a task beyond his capacities.

4.1.3 Interactive Aspects of Infants' Behaviour with Objects

As mentioned in the introduction to this chapter, infants' activities with objects were observed in the context of interaction with their mothers. Consequently, we would expect some of these activities to constitute responses to what the mother is doing, others may be designed to affect her, while some activities may be pursued relatively independently of what she is doing. The occurrence of all three types were observed and it is important to distinguish between them, if we were to understand how the infant relates to the mother as a partner in his play. These functions could, in turn, allow us to infer the level of competence of the infant's interaction with object and mother.

The interactive aspects of infants' play are indicated by two sets of categories. The first set refers to the type of play with objects, and one that does not involve others. In this case the infant's play may be characterised by the performance of manipulative activities on the objects ('solitary acts'), or by mere contact of them ('object-contact acts'), or by breaking contact with them or refraining from initiating manipulation of them ('negative acts'). The second set denotes a 'triangular' form of interaction involving mother, infant and objects ('sequential acts'), where the infant is either an initiator of a sequence, incorporating the mother in his activities ('self/others'), or he may reciprocate the mother's initiations ('others/self').

Categories specifying the nature of interaction occupy level 1, except in 'sequential acts' where they occupy levels 1 and 2.

4.2 Description of the Categories

4.2.1 Solitary Acts and their Sub-categories (Figure 4.1)

1. Solitary Acts. As mentioned in the previous section, solitary acts are those acts which do not constitute a direct response to another act by the mother, nor are they intended to elicit a complementary behaviour from her. However, such acts may be influenced indirectly by the mother. As Ainsworth and Wittig's study showed (1969), infants are more likely to explore their environments and manipulate objects in the presence of their mothers (or an equivalent attachment figure), than if they were alone. Thus, mouthing a toy, banging it, or building a tower with it are all activities which the infant is potentially capable of performing on his own, but his

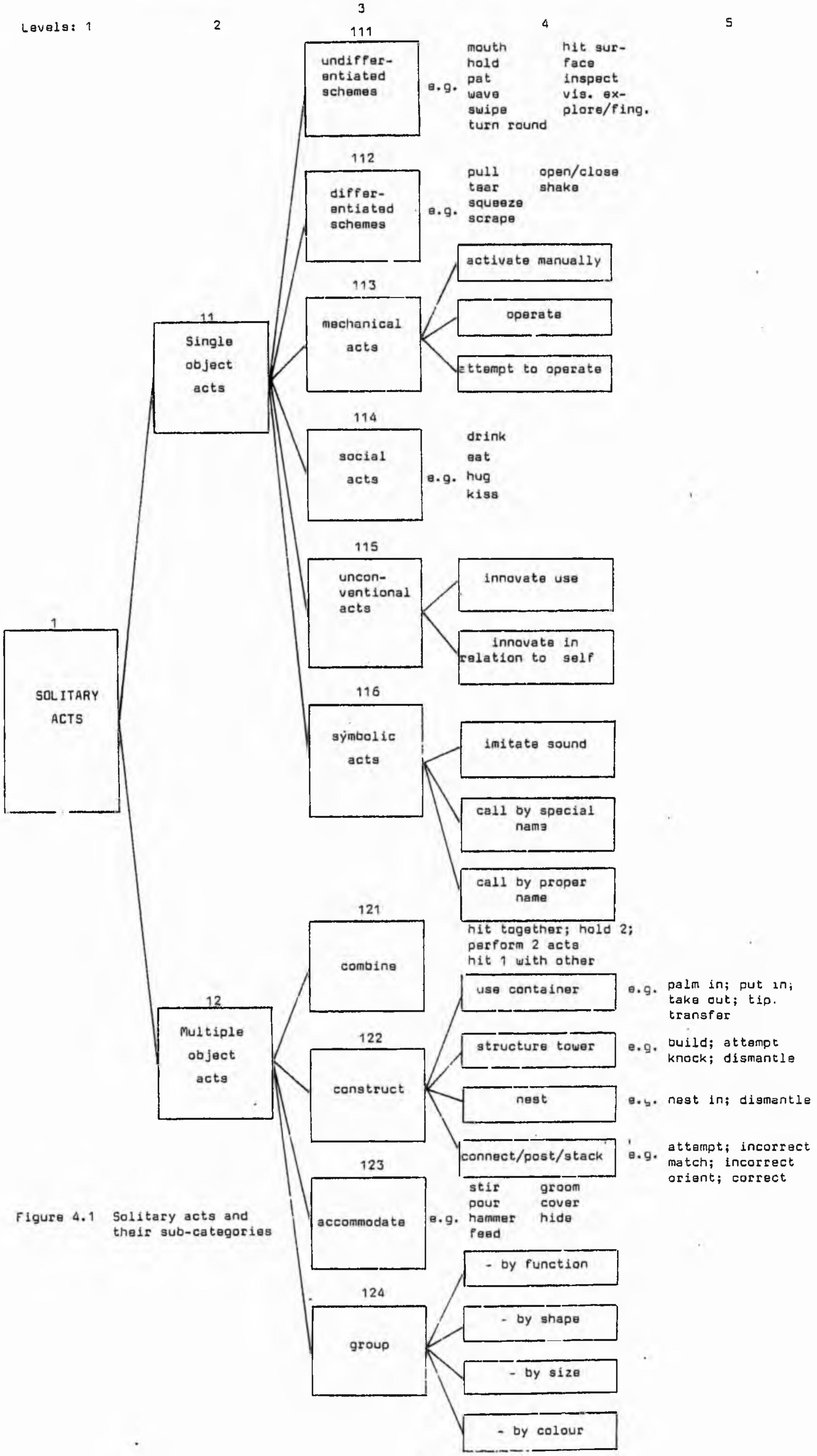

Figure 4.1 Solitary acts and their sub-categories

performance of them may be enhanced by his mother's proximity, or by her watching and/or commenting on his activities. In White's study, solitary acts were found to be characteristic of all infants' play especially during the age of 12 to 24 months (White et al., 1971), although it was found that at 24 months there was a slight decline of solitary acts (or self-initiated acts) and an increase in play activities in response to behaviours initiated by other social agents such as mothers and siblings.

11. '<u>Single Objects'/12. 'Multiple Objects</u>'. Solitary acts can be manifested either in relation to one object at a time (e.g. banging a toy on a surface), in which case they are referred to as 'single object acts', or they may involve several objects (e.g. building a tower with bricks) giving rise to 'multiple objects acts'. With a few exceptions, using two or more objects simultaneously reflects a more advanced cognitive level than using only one object (Piaget, 1936; McCall, 1974; Fenson et al., 1976). Activities with multiple objects are indicative of the development of the cognitive functions characteristic of Sensorimotor Stage 4, such as Means and Ends and Causality.

In order to evaluate the cognitive complexity of single object acts as well as multiple objects acts, we need to describe the various schemes or processes that compose them. These range from the very simple in cognitive structures ('Undifferentiated Schemes'), to the complex ones, ('Symbolic Reference').

111. '<u>Undifferentiated Schemes</u>'. These involve the exercising of one or more simple schemes (e.g. 'mouthing') to any available object regardless of its properties. Such schemes are typical of Sensorimotor Stage 2, and are engaged in by infants of age 6 to 8 months (Piaget, 1936).

112. '<u>Differentiated Schemes</u>'. These involve the selective application of schemes that take into account the properties of objects (e.g. rolling a ball or pulling a string). McCall (1974) calls them 'appropriate be-

haviours'. They were described by Piaget as marking a progression in Sensorimotor Intelligence from Stage 2 to Stage 3, and they were observed to emerge round the age of 7 months (Uzgiris and Hunt, 1975).

113. Mechanical Acts. These are actions that are applied specifically to mechanical objects such as toys with winding mechanisms. In Uzgiris and Hunt's classification, (1975), they would be intermediate between 'differentiated schemes' and 'socially instigated behaviours', since they not only require from the infant knowledge of the specific property of the object, but also the recognition of 'direct ways for activating objects' and the sensorimotor coordinations necessary for operating mechanical devices.

114. Social Acts. These refer to actions that apply to objects with social meaning. In this category fall all objects involved in feeding, grooming, or other care-taking activities; also dolls and stuffed animals. Such usage of objects marks the infant's acquisition of social skills that entails his appreciation of the cultural meanings of specific objects.

115. Unconventional use of Objects. This refers to activities that are applied to objects in an unconventional way. They can be regarded as a simple form of fantasy play in which the infant uses an object as something other than it really is, but maintaining an association between his original use and the conventional use; for example, wearing a beaker as a hat is unconventional but the properties of the beaker bear resemblance to the properties of the hat.

116. Symbolic Reference to Objects. It involves reference to objects verbally. Symbolic reference marks the ability to build central representations of objects and to acquire the conventional labels used by other members of the infant's community. Its onset was observed by Uzgiris and Hunt (1976) around age 18 months, although others have observed it at an earlier age (White et al., 1973; Bates et al., 1975).

121. Combine. This is an example of 'multiple-objects acts', which

refers to the scheme of manipulating two objects together but without much differentiation of their properties, and without associating them in a meaningful manner; for example, an infant may hit a box with a beaker, but not put the beaker in the box. In McCall's study (1974) this form of play was called 'parallel play' and it was observed by others to occur around the age of 9 to 11½ months (Fenson et al., 1974).

122. Construct. This is a more advanced form of combining, characterised by the fitting together of two or more objects in an appropriate manner so that they result in a recognisable structure such as a tower. McCall (1974) called them 'integrated play' and they were hardly observed in his sample of infants with an age range of 8 to 11½ months.

123. Accommodate. This is also an extension of 'combine' and it involves the association of two or more objects in a conventional relationship such as stirring a spoon in a cup. They correspond to social acts except that here more than one object is used. Fenson and co-workers (1976) labelled them 'accommodative relational acts' and they were mostly frequent in the play of infants of age 13 and 20 months.

124. Group. As in Fenson's et al. study (1976), it refers to the placing together of objects that share some kind of similarity. Grouping was observed by these writers to appear around the age of 13 months.

'Constructing', 'accommodating' and 'grouping' are all indicies of a complex level of cognitive functioning (Sensorimotor Stages 4 and 5), since they depend on the ability to attend to discrepancies between two stimuli and the ability to relate schemes in functionally appropriate manners, (Piaget, 1936).

4.2.2 Object-Contact Acts and their Sub-categories (Figure 4.2)

2. Object-Contact Acts. This major category refers to all forms of an infant's behaviour that bring him into contact with objects. Such acts involve minimal interaction with objects in the sense that they do not

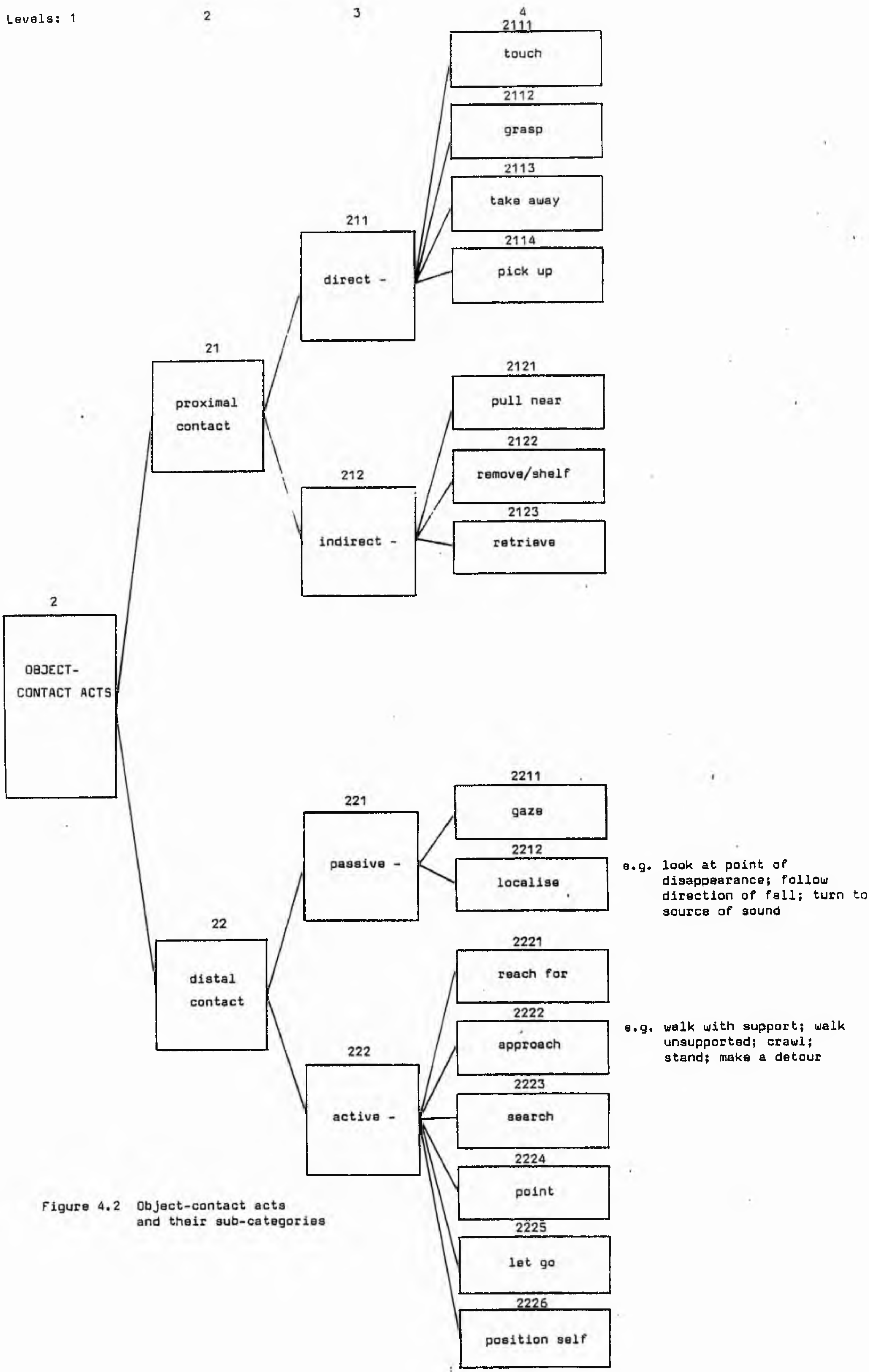

Figure 4.2 Object-contact acts and their sub-categories

constitute a sustained bout of specific manipulation as in 'solitary' and 'sequential' acts. However, in some instances making an initial contact with an object is instrumental to performing subsequent activities with it. Thus, we can distinguish between two forms of object-contact acts: instrumental and non-instrumental. In the present study only the non-instrumental acts qualify as object-contact acts. In some instances, even when they were followed by other acts, they were still regarded as non-instrumental if they were judged to be directed to the object per se, that is, the infant's main objective was to procure the object. This judgement was made on the basis of whether the act was preceded by gazing steadily at the object, and if the infant did not initiate a task immediately after obtaining it. White et al. (1971) used the same criterion whereby a rapidly procured object (in less than 15 seconds) was regarded as instrumental to other tasks.

'Contact acts' are considered important in this study since they provide us with an index of the infant's attitude to play, as well as to his cognitive level of functioning. In the first case, 'contact acts' stem from an interest in the objects, either spontaneously or as a result of the mother's influence.[1] Contacting an object which the mother is highlighting or manipulating has the consequences of increasing the opportunity for

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1. A mother's act is influential in eliciting an 'object-contact' act if its function was to interest the infant in the object and not to elicit subsequent activities with it, in the latter case the act is considered 'sequential'.

developing communicative skills between the infant and his mother where the object functions as a focus of mutual attention (Bruner, 1975). Furthermore, some infants' play may consist of a succession of 'object-contact' acts with no other activities in between; the infant may spend a considerable time picking up a toy, dropping it, picking it up again, and so on. Such a style of play may reflect a lack of interest in the various qualities of a toy, or it may be the result of an infant's inability to pursue goal-directed activities. 'Object-contact' acts are also a measure of underlying cognitive abilities such as perceptual and spatial representation of objects, the development of the concept of means and ends and coordination of vision and other sensory and motor systems (Piaget, 1936; Bower, 1973).

21. Proximal/22. Distal Contact. An object can be contacted by the infant on two levels: directly (proximal) or indirectly (distal). A proximal level leads to the achievement of immediate tactile contact between infant and object. On a cognitive level, 'proximal contact' requires the perceptual representation of objects and the coordination of the visual and motor systems. 'Distal contact' acts, on the other hand, enable the infant to achieve contact with the object while he and the object are separated spatially. 'Distal contact' acts are also characteristic of attempts to procure objects that are less easily and readily obtainable. The infant may eventually achieve tactile contact, but only after locomotion towards an object (e.g. as in approaching a distant object).

211. Direct/212. Indirect Contact.

This refers to two forms of achieving proximal contact with an object. In direct contact the infant simply grasps or reaches an object while in the second case the infant has to perform more involved acts such as pulling an object nearer to him, or he may have to remove obstacles in order to retrieve an object. Thus, 'indirect contact' requires more skill than 'direct contact'.

221. Passive/222. Active Contact. These are two ways of achieving distal contact with an object. In 'passive contact' only the visual system is involved; the infant makes no attempt to decrease the distance between him and the toys, nor does he indicate a desire to achieve tactile contact with them. It is the least cognitively complex of all 'object-contact' acts. Such visual contact was observed by White et al. (1971) to constitute a large percentage of infants' playing activities. It is regarded as pre-requisite to all kinds of learning and coordinations of skills (Appleton et al. 1975). Thus it is more characteristic of younger infants' repertoire. 'Active contact', on the other hand, involves the direction of behaviour towards the ultimate proximal contact with a distant object. It requires the integration of vision with other sensory abilities, as well as the development of the concept of means and ends, and of locomotion.

4.2.3 Sequential Acts and their Sub-categories (Figure 4.3)

3. Sequential Acts (SQ) These represent acts which the infant performs as part of a sequence of actions shared by the mother, thereby combining social abilities with technical ones. Two aspects of the relationship between social and technical competence are expressed by 'sequential acts'. In the first instance objects become means for pursuing social goals, either by being used as a topic of joint reference and conversation, which may enhance the development of pre-verbal communication (Bruner, 1975; Bates et al., 1975), or by mediating affects and, consequently, strengthening the bond between mother and infant (Ainsworth and Bell, 1974). I propose to call this aspect 'secondary-object-interaction' since the emphasis here is on the regulation of the partners' social exchanges rather than on exploring the properties of an object.

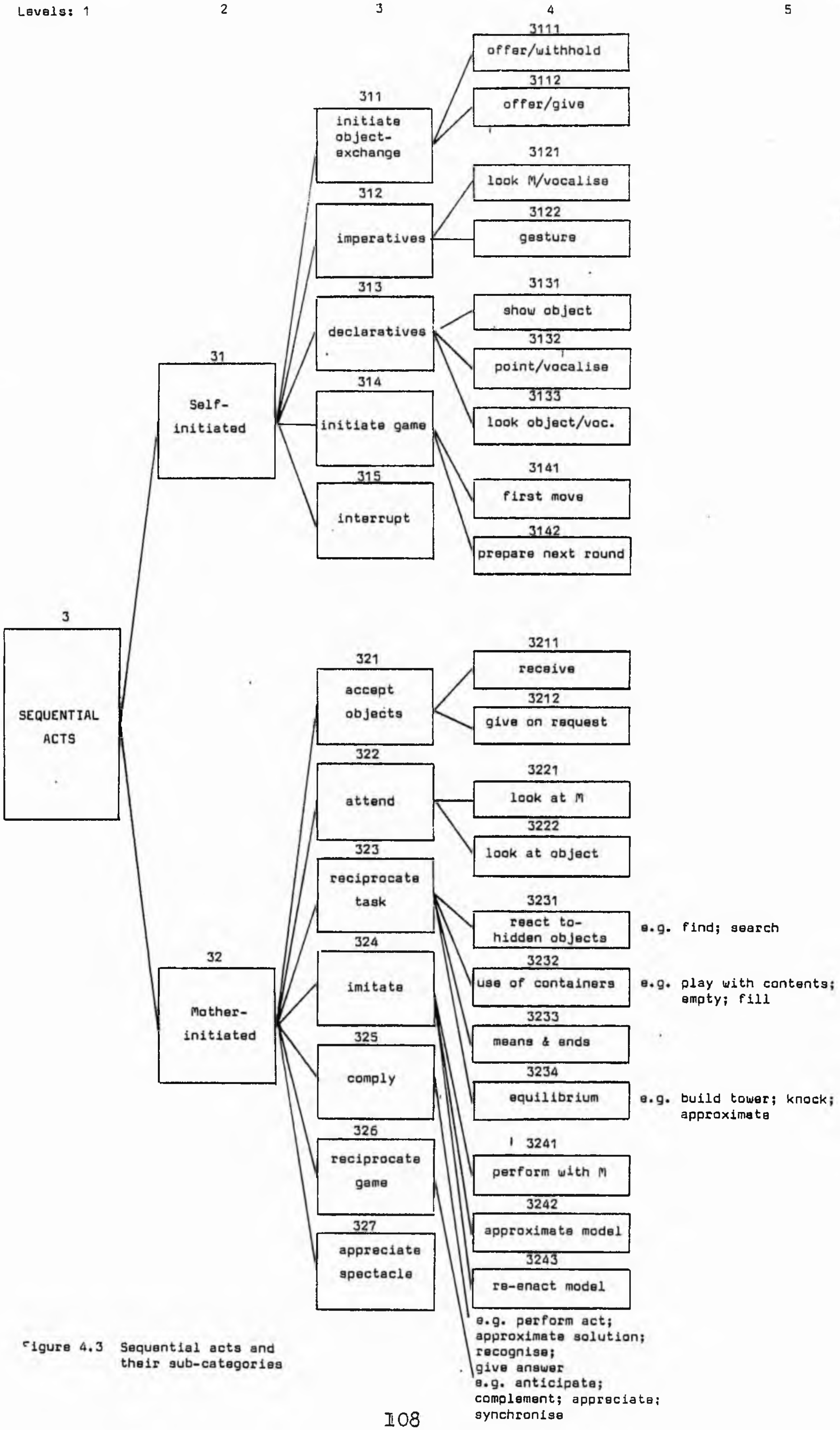

Figure 4.3 Sequential acts and their sub-categories

The second aspect specifies how social abilities are brought into function in order that technical skills may be performed. In this respect interaction with the mother requires the infant's comprehension of - and compliance to - his mother's instructions (Ainsworth and Bell, 1974; Murphy and Messer, 1977). Conversely, the infant must know how to signal his needs effectively (McShane, 1980), if he is to be helped by his mother to fulfil a technical task. I am referring to this aspect as 'primary-object-interaction' being characterised by the regulation of social interchanges so as to change or manipulate the properties of objects. It is specified by the categories 'imperatives', 'initiate' and 'reciprocate' technical games, 'attend', 'reciprocate task' and 'imitate'. Apart from White's et al. study (1973, 1979), this type of object-play has not been explored in the literature and even White and his colleagues did not examine it in terms of streams of interactions, but only as a global measure of the nature and degree of infants' competence.

31. Self-initiated/32. Mother-initiated Acts. These two categories refer to whether the infant performs an act in order that his mother may reciprocate it ('self-initiated') or whether he complements an act already started by her ('mother-initiated'). Self-initiated acts require from the infant the appropriate communicative skills needed to make his demands known to others and to influence their responses. It also requires the ability to decentre leading to the infant's awareness of others as persons with whom he can share his activities (Piaget, 1955). For complementing 'mother-initiated' acts the infant must possess the ability to comprehend instructions and obey them. Such ability was observed to increase with age (White, et al., 1973).

Both types of acts may highlight developmental trends whereby one form of sequential acts may be more typical of a developmental period. They also tell us about the nature of the play relationship: whether the infants' play is spontaneous and directive, or whether it is responsive to the mother's.

4.2.4 Negative Acts and their Sub-categories (Figure 4.4)

4. Negative Acts They refer to an infant's actions or states that prevent or interfere with his interaction with objects or that cause its termination. Examination of these acts is informative for our evaluation of the infant's cognitive functioning and his attitudes to the task of joint play. As mentioned in section 2 (page 96), cognitive competence can be indirectly assessed through the presence or absence of 'negative acts', since a less competent infant may be disconcerted by difficult or prolonged technical play, or he may seek to avoid it by engaging in other activities. Birns and Golden (1972) found that positive affects during intelligence testing predicted later intelligence scores. By the same token, negative affects could predict poor intelligence. From 'negative acts' we could also infer whether the mother-infant relationship was harmonious or not, fostering the growth of competence (Ainsworth, et al., 1974), and how cooperative the infant is. A further use of 'negative acts' was made in this study, namely, to use it as a way of measuring the experimenter's effect and the effect of introducing filming equipment in the home. Since it is difficult to eliminate such effects, the best way of dealing with them is to measure how different infants react to them, and what strategies mothers use to gain their babies' attention back to the play task. It has been the practice of others to stop recording whenever the infant cried, left the field of observation, or initiated contact with the observer. As a rule, this practice could not be followed here because for some infants 'negative acts' characterised the pattern of their interaction with toys on every visit, and, therefore, interrupting the recording every time a 'negative act' occurred would not solve the problem. However, if such acts persisted for longer than three minutes the recording was then stopped and resumed after the infant

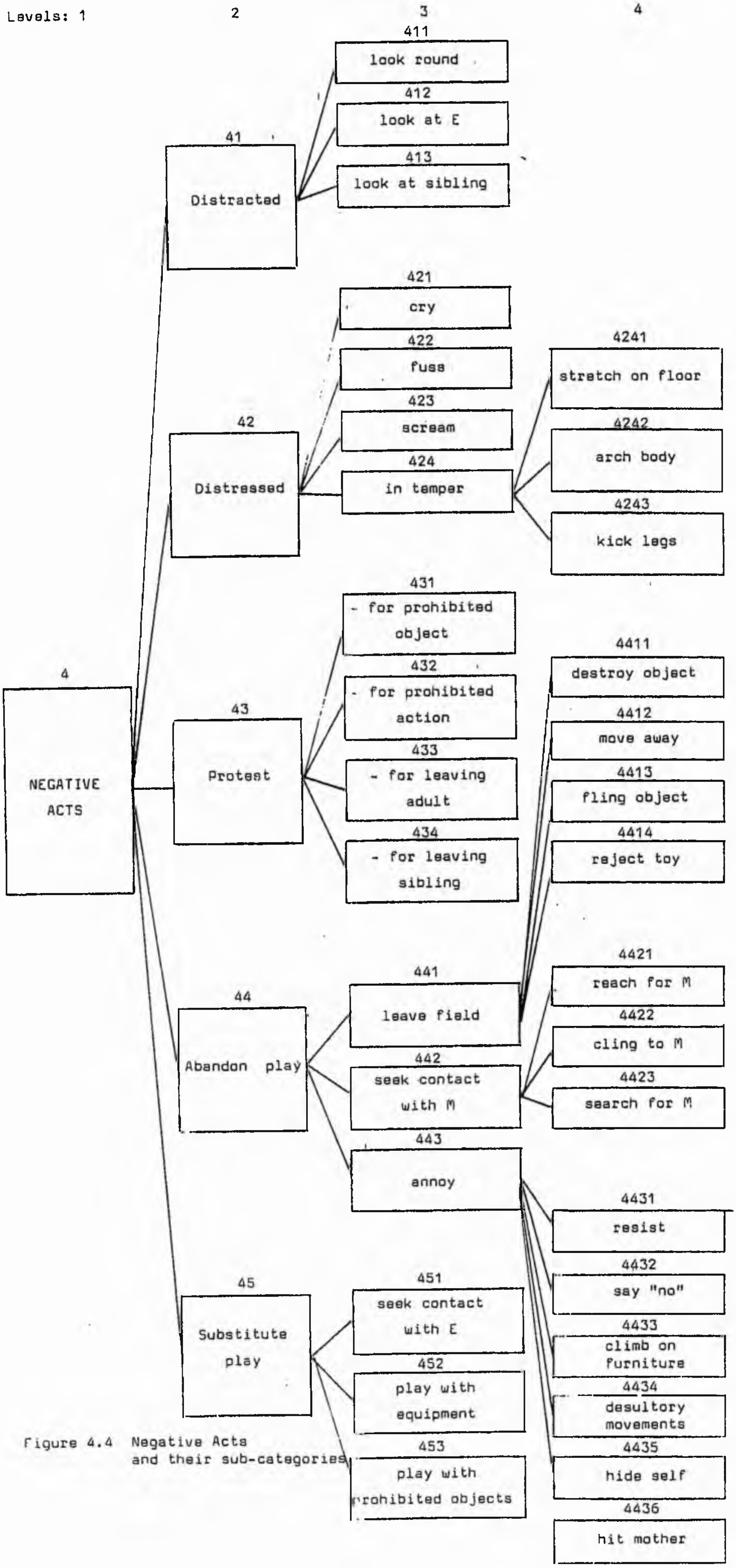

Figure 4.4 Negative Acts and their sub-categories

had settled down to play.

Another feature of 'negative acts' that makes them an interesting subject of study is their developmental pattern of distribution: 'negative acts' may be more frequent during a specific period of development than during other periods, or some forms may be more predominant than others within a certain stage of development; for example, White et al. (1973) found that some forms of negative behaviour which he indentified as 'non-task behaviour' were a common experience of the one and two-year olds whom they observed. These authors also observed that other forms ('annoy') emerge at a later stage of development (age three years), while others ('resist') seem to favour specific environments.

4.3 Relationship to the Mother's Hierarchy

In order that the infant may benefit from the mother's participation in his play with objects, the activities of each partner must be complementary to those of the other partner in terms of their communicative functions as well as level of cognitive complexity.

With regard to the structure of the mother-infant dialogue, the two partners must regulate the patterns of their communication so that their activities are in synchrony and are appropriate to their role of actor and recipient of action (Kendon, 1967). The importance of interpersonal synchrony for development and the integration of the child into a social world have already been emphasised by the studies which examined the processes of - and the developmental progression of - dyadic behaviour (Richards, 1974; Trevarthen, 1977; Schaffer et al., 1977). Likewise, in the context of play with objects, making the socially appropriate response to his mother, eliciting a response from her and waiting and attending to her own activities, provide the infant with opportunities to learn from what she does or says, as well as enable him to affect her behaviour to his own benefit. In the case of the mother, if her participation is to be constructive for her infant's cognitive development, she must 'prime' her activities and keep them in pace with those of her infant's. In other words, besides timing her responses in synchrony with her infant's, she must adopt forms of support that are neither too hard, nor too easy for the infant to reciprocate, thereby allowing him to perform 'at the margins of his ability', (Bruner, 1973).

According to the present classification systems, the infants' categories are designed to complement the mother's categories in terms of interactive synchrony as well as cognitive compatibility. To illustrate with an example, if the mother 'reveals an object's property' and the infant 'watches' her perform the activity, then the two behaviours are in synchrony since the infant is adopting a role that complements his mother's. Furthermore, by watching her, the infant may learn about the properties of objects, and which may lead to modifying his subsequent activities with the same object. Thus, 'watching' and 'revealing' are cognitively compatible.

Another example may illustrate how the mother's responses can be appropriate to her infant's. If the mother 'watches' her baby as he builds a tower, then the dialogue is characterised by interpersonal synchrony and cognitive compatibility since the mother is allowing the infant to fulfil his role, while at the same time encouraging an activity that fosters the development and practice of fine motor-spatial skills.

Table 4.1 shows the association between maternal and infants' categories that bear the direct burden of detecting the structural balance within the mother-infant dyad.

Table 4.1 Summary of interactional association between the mother's categories and the infant's categories. The arrows indicate the direction of interaction ⟶ infant's behaviour is responsive to the mother's; ⟵ mother's behaviour is responsive to the infant's; ⟷ infant's behaviour occurrs simultaneously with the mother's.

Mother's Categories	Direction of Interaction	Infant's Categories
Participate from back-ground	⟷	Solitary acts; multiple-objects acts; mechanical, social and unconventional acts.
Eliminate	⟵	Negative acts.
Receive	⟵	Initiate toy-exchange.
Support manipulation	⟶	Proximal/active contact.
Support contact	⟶	Proximal contact.
Support approach	⟶	Distal contact.
Reveal object's properties	⟶	
Create discovery	⟶	Mother-initiated sequential acts.
Demonstrate	⟶	
Teach	⟶	
Trigger; defer	⟶	Accept toy exchange; comply.
Elicit response	⟶	Reciprocate task.
Reciprocate game	⟵	Initiate game.
Initiate game	⟶	Reciprocate game.
Demonstrate/teach	⟶	Imitate

The pairing of a category with another one which does not conform to the one specified in the Table leads to an imbalance, and in some cases, to an overlap between the mother's behaviour and the infant's, which leads to a disruption of the flow of communication, for example, Reveal object's property $\longrightarrow$ Attend (SQ); constitutes a balance since the appropriate reciprocal act to 'reveal object's property' is to attend to what the mother is doing.

Reveal object's property $\longrightarrow$ take away object, leads to imbalance since the function of 'reveal object's property' is not being fulfilled because the infant is more concerned with procurring the object than with attending to its properties.

Reveal object's property $\longleftrightarrow$ solitary act or self-initiated sequential act, marks an imbalance and an overlap since the infant's behaviour and the mother's run in parallel to each other, and neither constitutes an appropriate or inappropriate response to the other. In terms of dyadic interaction, the two activities are mutually exclusive (Argyle, 1972).

The Use of the Infant's Categories in Data Analysis

By using the infant's classification system in isolation, we shall examine the patterns of infant's object-manipulation in an interpersonal context, and determine whether there are any age changes in these behaviours from month to month, as well as across a period of three months. In a later chapter (Chapter VI) the infants' categories will be considered in conjunction with the mothers' categories in order to examine the significance of parental participation in play to the infant's cognitive growth.

The data on the types, frequencies and age changes of manipulative behaviour manifested by infants between 6 and 18 months of age, will now be presented.[2]

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2. The methodology of data collection and frequency analysis is identical to that which was used with respect to the mothers' activities, and which has been described in Chapter III, Section 3.

4.4 Results and Discussion

In presenting the data on infants' activities with toys and mother, we shall consider each of the main categories - as well as the sub-categories that denote cognitive and/or interactive functions - and examine the frequency of their occurrence and whether they undergo any age changes.

4.4.1 The Four Major Categories

Figure 4.5 shows that for groups A, C and D 'solitary' play was the most common activity, while in the case of group B 'negative' behaviour was more common than 'solitary', 'object-contact' or 'sequential' acts. Two-way anova showed a significant category effect $F(3,45) = 3.45$; $p < 0.05$, where 'solitary' and 'object-contact' acts were much higher in rate than 'sequential' and 'negative' behaviours. Four separate within group analyses showed that only groups B and C manifested significant differences in the frequencies of the four activities ($p < 0.05$). For group B the most frequent activity was 'negative' behaviour ($\bar{X} = 70.8$), and the least frequent one was 'sequential' play ($\bar{X} = 42.0$), while 'solitary' and 'object-contact' acts were similar in the frequency of their occurrence ($\bar{X} = 63.6$ and 56.4, respectively). The majority of group C activities consisted of 'solitary' play ($\bar{X} = 81.4$), followed by 'object-contact' ($\bar{X} = 65.6$); the least frequent were 'sequential' and 'negative' acts which had similar rates ($\bar{X} = 63.5$ and 62.2, respectively).

These findings indicate that infants of age 6 to 9 months and those of age 15 to 18 months spent their play time in the four types of activities in a more or less even manner. Infants at intermediate age tended to perform some behaviours more than others. Thus, rejecting play with mother and toys is characteristic of infants at age 9 to 12 months. This is accompanied by a decline in sequential activities with the mother. It appears, therefore, that the period of 9 to 12 months is one of negativism and a lack of cooperation with the mother, although other workers have

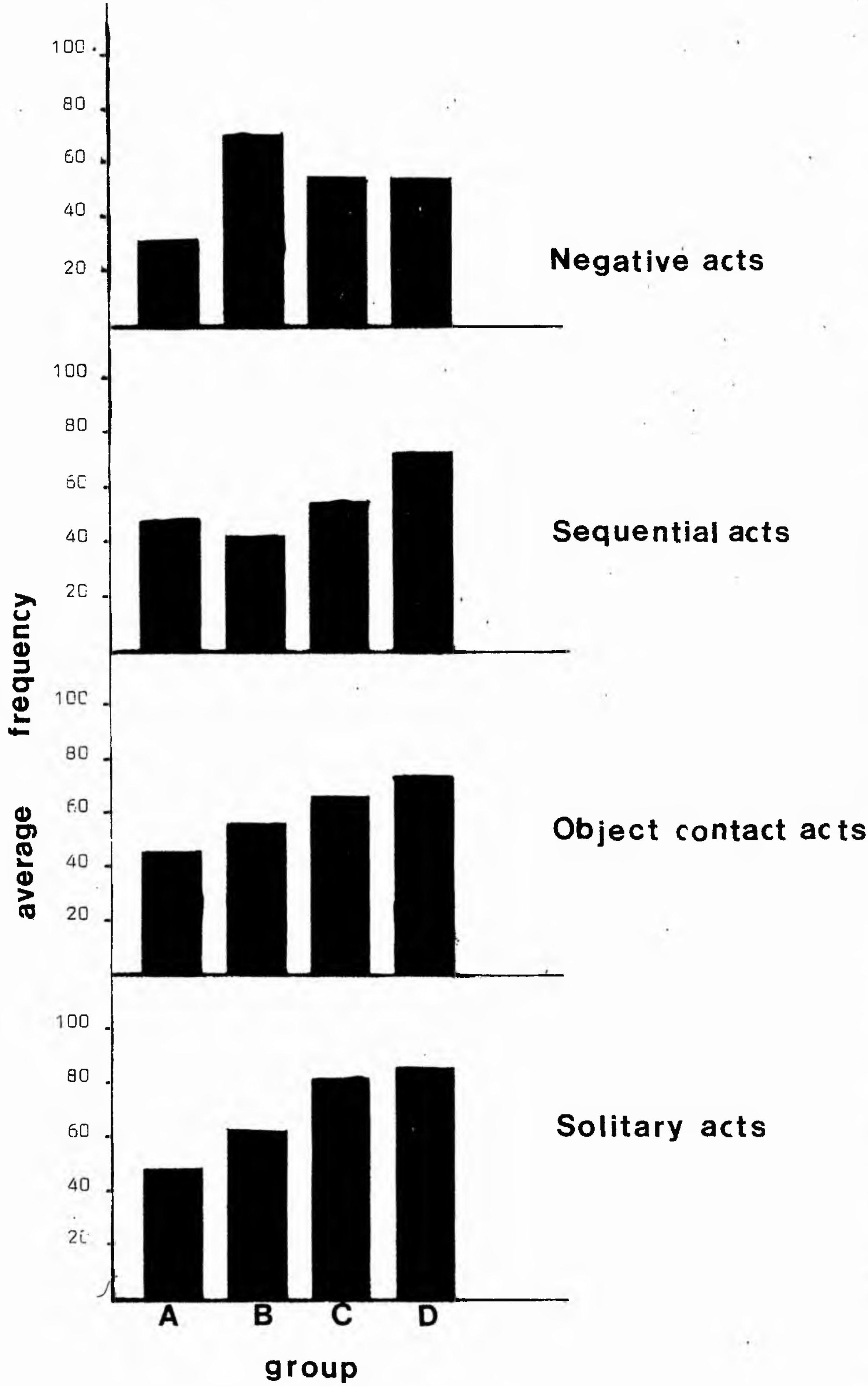


Figure 4.5 Average frequency of the major activities of four groups of infants

reported the prevalence of similar trends at the later age of 14-21 months (White et al., 1979). One can attribute this difference to the context in which 'negative' behaviour was observed. In White's et al. study, for example, the observations were unstructured and, accordingly, 'negative' activities characterised the day-to-day social behaviour of the infants they studied. In the present study the observations were structured, and in such a case 'negative' behaviour was manifested in relation to a specific type of mother-infant interaction. Thus, it could be that in White's et al. study by being negative, the infant was expressing developing traits such as self-assertion and hostility, while in our case the same behaviour was reflecting a lack of interest, willingness or, may be, inability to participate in object play with the mother. In evidence to this interpretation, Stayton, Hogan and Ainsworth (1971) reported that obedience to others emerges only after the first year. If so, we can assume that the 9-12 months old infant lacks the social competence that is required for cooperative activities. This, in turn, is reflected in the drop of 'sequential' acts and the prevalence of 'negative' behaviour. Since the infant at this age is also less advanced in cognitive abilities, 'solitary' play is not so frequent as at a later age.

At age 12 to 15 months, infants' play is characterised by a predominance of 'solitary' activities, less joint play with others and less rejection of toys. This indicates that the period in question is one of independence and one which marks a peak in curiosity, exploration and the emergence of new cognitive skills that lead to the infant being more interested in object-play and more capable of pursuing it on his own. Furthermore, during this period 'sequential' acts still lag behind 'solitary' acts (21% versus 31%) which implies that the one-year old infant is relatively incapable of combining technical abilities with social ones, since his efforts may be focused on performing activities with objects.

Overall, activities which the infants pursued independently of their mothers ('solitary' and 'object-contact' acts) were more common than the ones which were performed jointly with her. This finding is in line with White's et al. that solo activities constituted a large proportion of infants' play from age 12 to 24 months.

4.4.2 Solitary Acts and their Sub-categories

Beside their predominance over other acts, as Figure 4.5 reveals, 'solitary' acts tended to increase steadily with age. One-way anova showed that this increase was significant - $F(3,15) = 4.67$, $p < 0.05$, while the Scheffe Method revealed that the increase was linear beyond 0.05 level. However, when considering the longitudinal data, from Figure 4.6 we can see that 'solitary' acts change from month to month only slightly. Furthermore, analyses showed that these monthly changes were not significant. It follows, therefore, that there are no rapid developmental changes in solo activities, but over longer periods infants show an increased capacity to pursue longer bouts of independent play.

When considering the sub-categories of 'solitary' acts, we find that the majority of the younger infants' activities (age 6 to 12 months) involved single objects, and very few activities were performed with multiple objects (Table 4.2). The older infants' play, on the other hand, consisted of a greater incidence of use of multiple objects, and its frequency exceeded that of play with only one object.

Figure 4.6 Longitudinal distribution of solitary acts of 19 infants

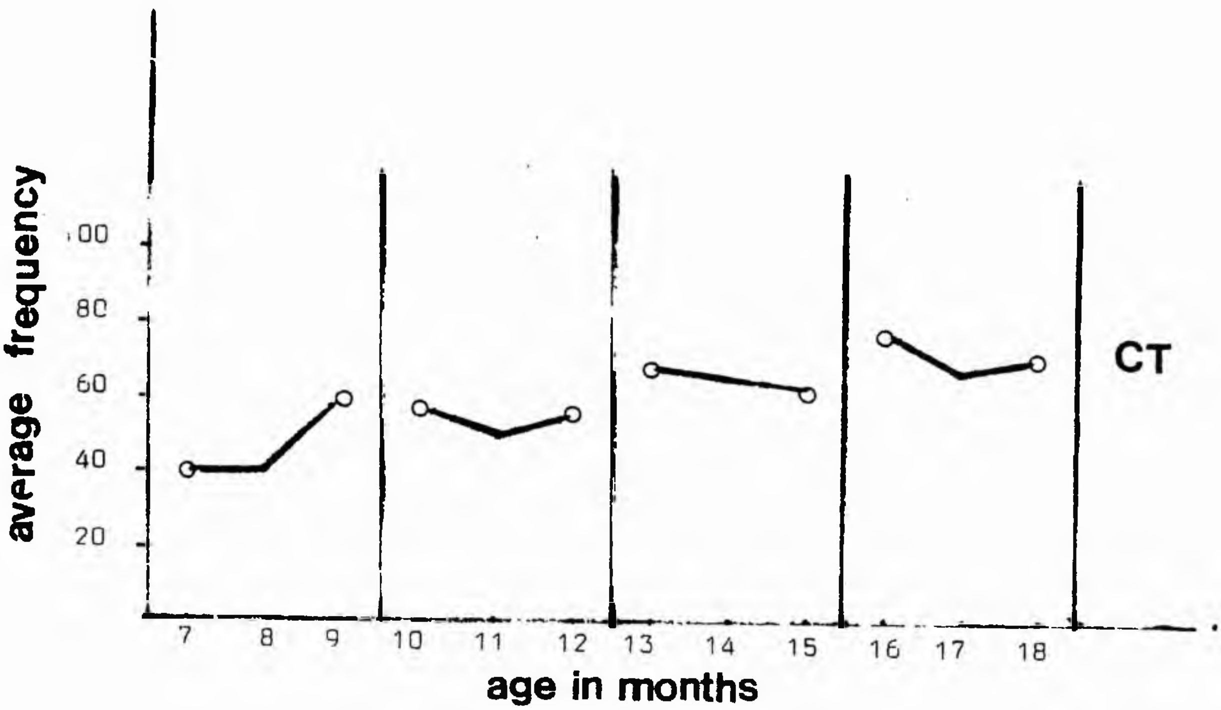


Figure 4.11 Longitudinal distribution of 'object-contact' acts of 19 infants

Table 4.2 <u>Distribution of solitary play between one object and several objects.</u>

Group	Sub-category	
	Single objects	Multiple objects
A	43	5
B	45	16
C	35	42
D	39	44

However, from Figure 4.7 we can see that for infants of all ages, the majority of 'single object' play consisted of 'undifferentiated' acts. 'Differentiated' acts were more frequent among groups C and D. The other activities ('social', 'unconventional', 'mechanical', and 'symbolic') were least frequent of all, although the older infants performed more of these activities than the younger ones.

Two-way anova, comparing the frequency of 'differentiated', showed a very significant category effect, with 'undifferentiated' acts having a mean of 29, while the mean for 'differentiated' acts was only 6.5 ($F(1,15) = 78.7$; $p < 0.001$). The analysis showed no age effect, although an age/category interaction was found ($F(3,15) = 7.6$; $p < 0.005$). From Figure 4.8 we can see that this effect was brought about by the fact that all groups performed differentiated acts at a similar rate, but since groups A and B performed more 'undifferentiated' acts than the other groups, the discrepancy between the two

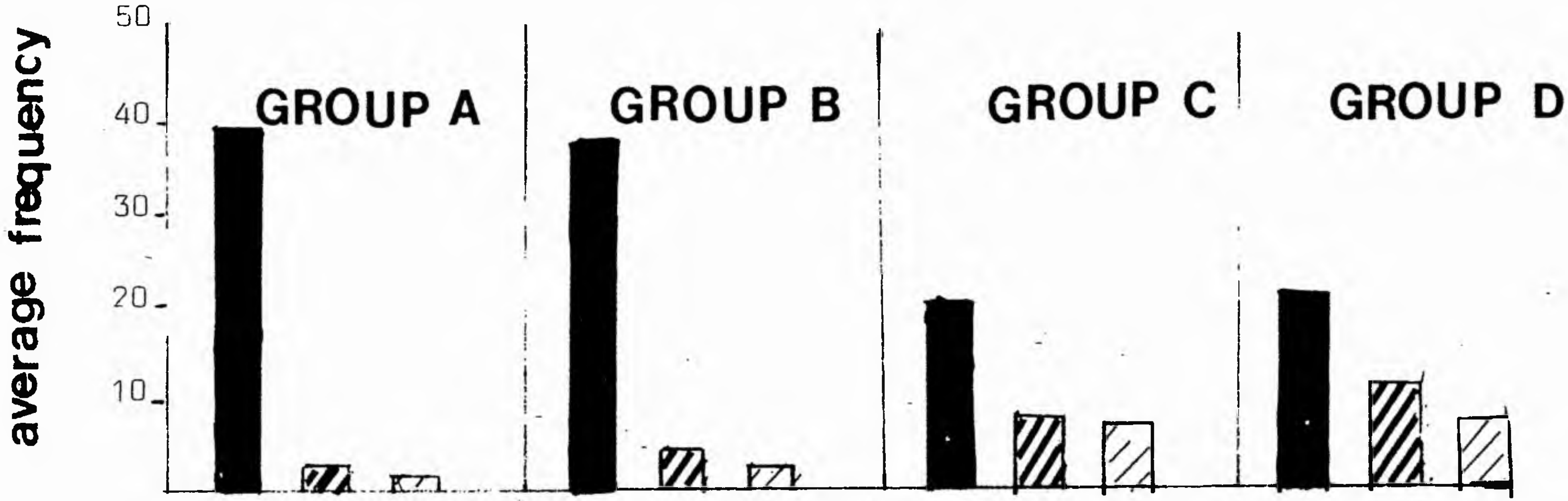
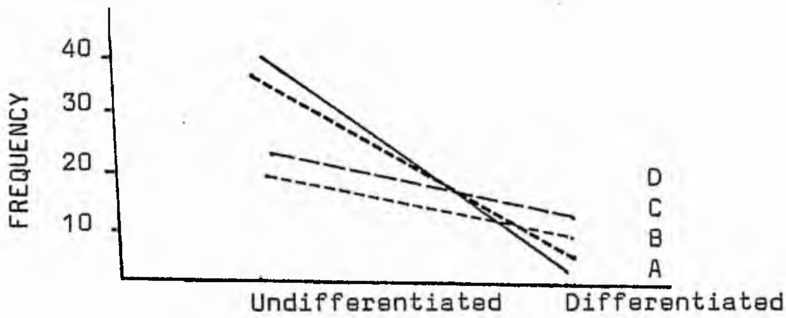


Figure 4.7 Cross-sectional distribution of the different activities with a single object

categories was greater for A and B than for C and D.

Figure 4.8 Age/category effect on 'undifferentiated' and 'differentiated' acts.



These findings highlight the similarities between the performance of infants 6-9 months old and that of the 9-12 months old. Infants of age 12 to 15 months, on the other hand, were similar in their single object play to the 15-18 months group. Between 12-18 months 'undifferentiated' acts dropped to the level of 'differentiated' ones.

By specifying the other group of activities in Table 4.3, we can see that 'symbolic' acts were the least frequent, while 'social', 'unconventional' and 'mechanical' acts had a similar frequency of occurrence. Two-way anova showed that the differences in these rates were not significant, although changes in frequency with age were found to be significant $F(3,15) = 15.27$; $p < 0.001$. The older infants engaged in these activities while the younger ones did not, or did so very infrequently.

Table 4.3 Distribution of the second class of the sub-categories of 'single object' acts.

Group	Sub-category			
	Social	Unconventional	Mechanical	Symbolic
A	0	0	1	0
B	0	1	1	0
C	3	2	1	0
D	2	1	2	2

Solitary activities with 'multiple-objects' showed a definite developmental trend. As Figure 4.9 shows, during the period of 6 - 12 months, there was very little 'multiple-objects' play, whether by combining objects together or by making constructions with them. This is in contrast with the period of 12 - 18 months which is characterised by the increase of 'multiple-object' acts and the predominance of 'construct' over 'combine'. Two-way anova confirms this tendency since a highly significant age/category interaction was found ($F(3,15) = 33.70$; $p < 0.0001$). As Figure 4.10 reveals, the interaction was due to the greater discrepancy between 'combine' and 'construct' for Groups C and D, while for Groups A and B the level of the two activities was uniform. Once more, these results highlight the developmental similarities betwwen the infants in Groups A and B, on the one

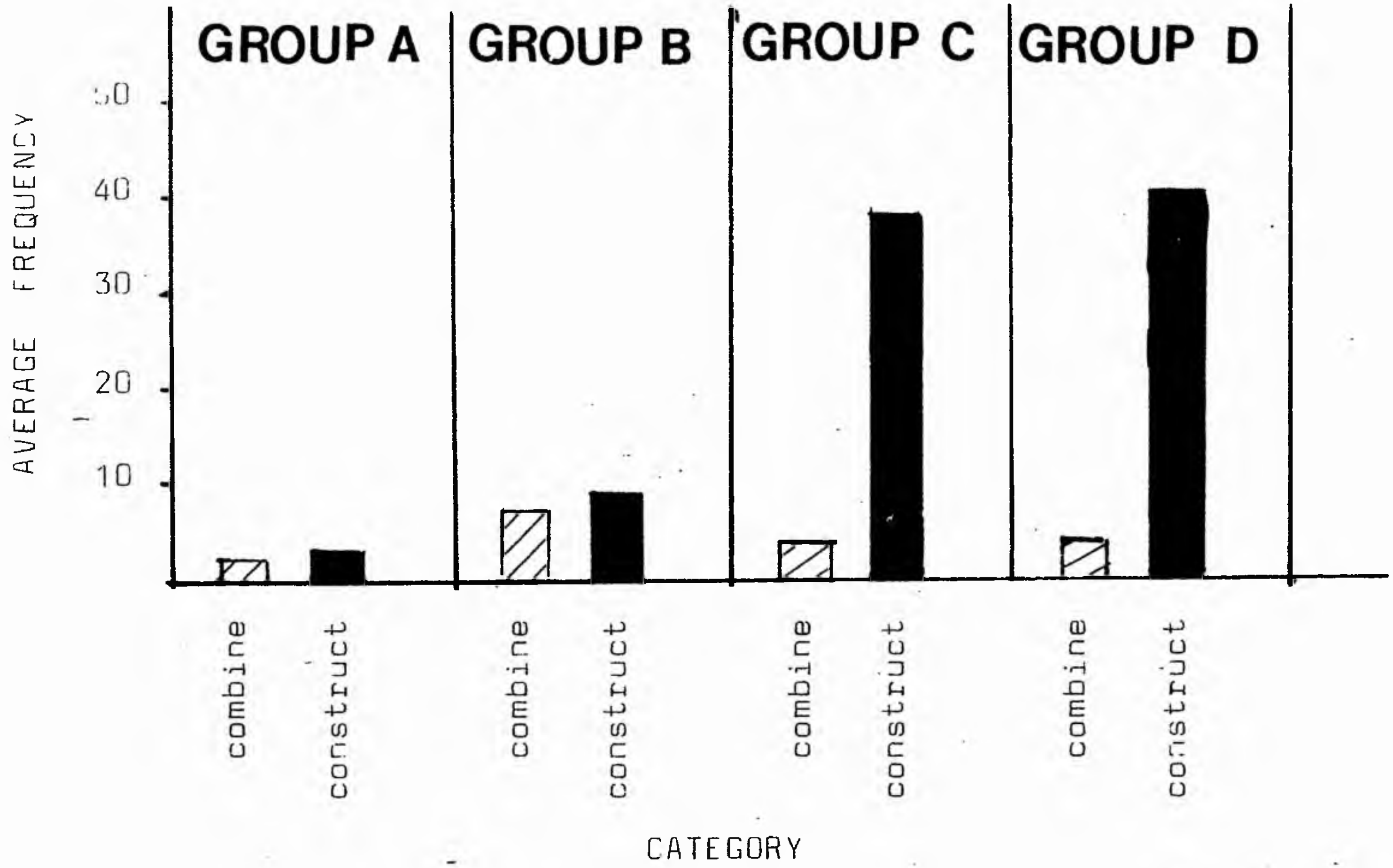
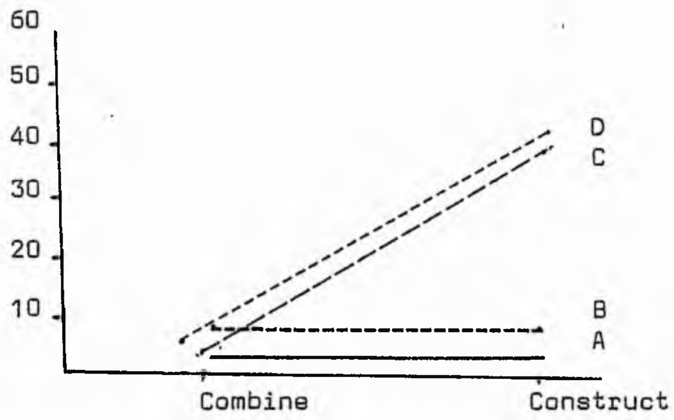


Figure 4.9 Cross-sectional distribution of the sub-categories of 'multiple-objects' acts

hand, and between the infants in groups C and D on the other hand.

Figure 4.10 Age/category effect on 'combine' and 'construct'



To sum up, the data on 'solitary' acts and their sub-categories showed that solitary play is common during the period of 6 to 18 months, and its amount is affected by age: the older the infant, the more 'solitary' acts he engages in. 'Solitary' acts also follow a developmental order in terms of quality and quantity. At age 6-12 months solitary play is characterised by the predominance of 'undifferentiated' schemes, while play with more than one object is very rare, (although it tended to increase after 9 months). By 12-13 months the infants' play begins to be more specific, and activities involving the appreciation of the socio-cultural use of objects and symbolic reference to them become more frequent. Infants at this age also give evidence of their knowledge of relations between their own actions and the effects of such actions on the environment, as manifested in play with mechanical toys and the unconventional manipulations of various objects. Furthermore, these infants begin to make appropriate associations between two or more objects since building towers, slotting shapes and other similar activities rank very high in the play of the 12 - to18-month olds. Although 'undifferentiated' play with objects, such as mouthing and inspecting them, declines after 12 months, it is still predominant over the other activities with single objects. This fact implies that although the older infants show evidence of their entry into the final stages of Sensorimotor Intelligence (Stages 5 and 6), they are still exercising the schemes which they had acquired during earlier stages. This is probably because 'undifferentiated' acts consist of exploratory responses that enable the infant to identify an object and its properties prior to performing other more complex actions with it. Finally, examination of solitary play revealed that the period of 9-12 months is more similar to the period of 6-9 months than to that of 12-15 months. During the latter period, 'solitary' acts were more similar to the ones engaged in by infants of age 15-18 months.

4.4.3 Object-contact Acts and their Sub-categories

Figure 4.5 shows that 'object-contact' acts increase with age, while Figure 4.11 shows that there is an increase from the 8th to the 9th month; throughout the remaining period the changes from one month to the next are very slight. One-way anova showed that the increase in rate across the three months period was significant. $F(3,15) = 4.05$; $p < 0.05$, while anova and t-tests showed that within and between groups monthly changes were not statistically significant. Thus, like 'solitary acts', 'object-contact' acts are affected by age only over periods longer than one month. Also the older the infant the more contacts he made with objects.

Concerning the sub-categories of 'object-contact' acts, a comparison of 'proximal acts' (Figure 4.2, level 2) with 'passive distal' and 'active distal' acts (Figure 4.2, level 3) gives us a better perspective for examining the developmental level of the infants' contacts with objects since, as mentioned in section 4.2.2, the cognitive and motor abilities required for these types range from simple to complex.

Figure 4.12 shows that all infants made contacts with objects more on a distal level than on a proximal one. However, if we exclude 'looking' from the other 'distal-contact' activities, we find that the picture changes:

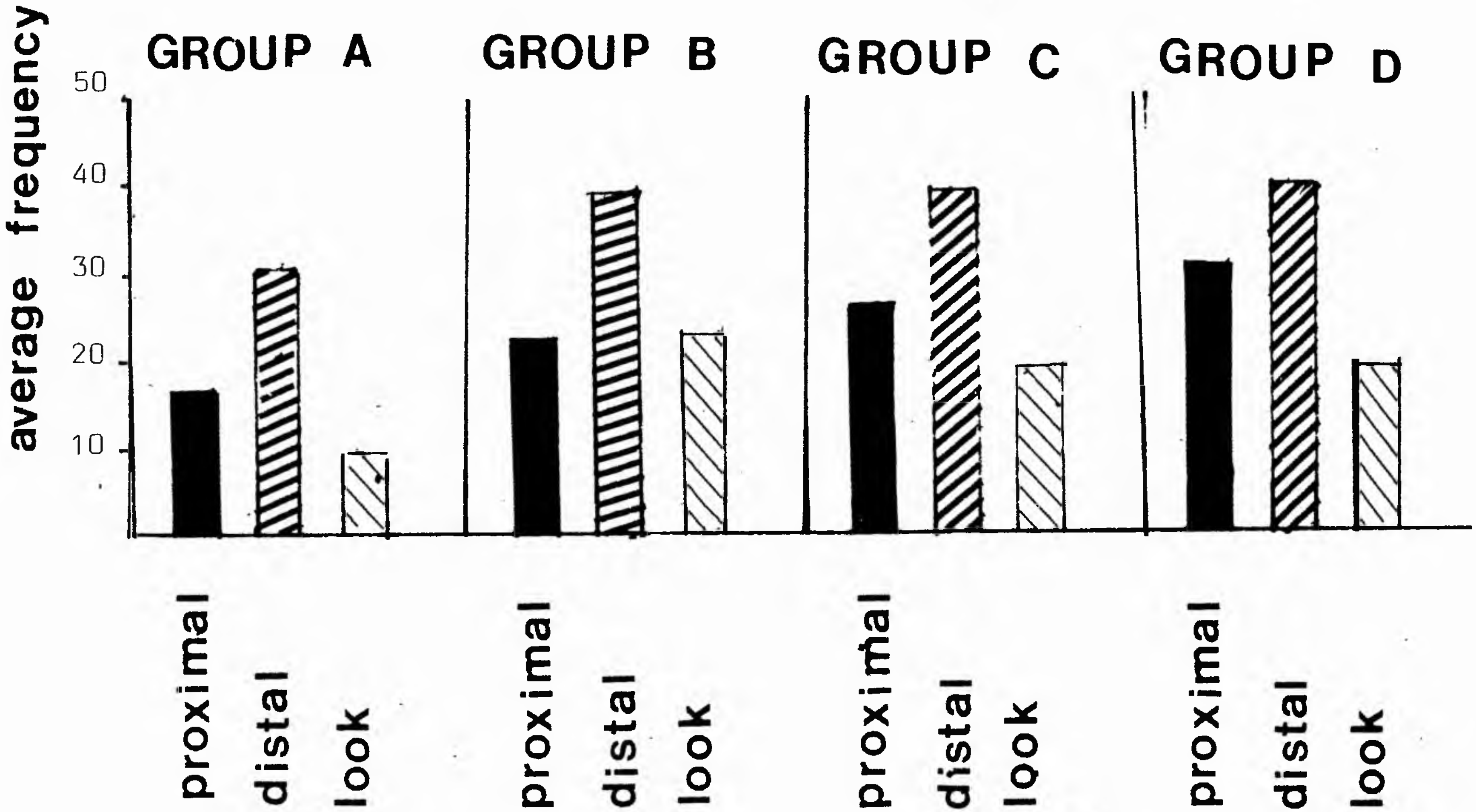


Figure 4.12 Cross-sectional distribution of the sub-categories of 'object-contact' acts

infants of age 12 to 18 months made more 'proximal' contacts than either 'looking' or 'active distal' contact. The youngest infants in the sample (6-9 months) looked more at toys than they made direct tactile contact or approach to them. The infants in the intermediate age of 9-12 months showed a similar frequency of tactile contact and approach. To determine whether the differences in the rates of object-contact activities were significant, two-way anova was carried out, and it showed that there was no category effect, although 'proximal' acts had the highest frequency ($\bar{X}$ = 25), followed by 'looking' ($\bar{X}$ = 20). 'Active distal' acts were the least frequent ($\bar{X}$ = 18). However, four separate within group analyses showed that there was a significant category effect for group D infants, who performed 'proximal' acts at a mean frequency of 31, 'looking' at 21 and 'active distal' contact at 18. Thus, the older infant engaged in more 'proximal' contact than the younger ones. However, no significant age effect was found in relation to the sub-categories of 'object-contact' acts.

The predominance of 'proximal contact' over 'looking' and 'active distal' contact during the period of 15-18 months can be used as an index of the infants' increasing interest in toys. For these infants 'proximal contact' constituted a less passive way of investigating a toy than mere 'looking' at it; the latter was predominant among the 6-9 month olds. 'Active distal' contact was least frequent among all the infants probably because, as mentioned in Chapter III, it was an unnecessary activity, since the structure of the observations allowed for toys to be readily available to the infants and within close reach. However, group B had the highest rate of 'active distal' contact, and which is congruent with the development of walking. Thus, it seems that for these infants practice of their newly developing motor skills competed with manipulative responses to toys, and active approach was more pleasurable than performing tasks with objects.

4.4.4 Sequential acts and their Sub-categories

Figure 4.5 shows that 'sequential' acts change with age in an irregular manner. They are more frequent during the period of 6-9 months, than during 9-12 months. Beyond 12 months they follow a regular increase. Figure 4.13 shows that there is an increase of 'sequential' acts from the 7th to the 8th month, and another similar increase from the 17th to the 18th month. One-way anova showed that the cross-sectional age changes were significant. $F(3,15) = 3.25$, $p < 0.05$, while the longitudinal analysis showed that only the monthly changes during the period of 17 to 18 months were significant, $F(2,8) = 4.96$; $p < 0.05$.

These results indicate that the older infants engage in 'sequential' acts significantly more than the younger ones, and except for the period of 9-12 months, such acts increase with age. Since the period of 17-18 months is one which marks a sudden increase in 'sequential' behaviour, we can infer that the ability to integrate social skills with technical ones is consolidated during this time.

With regard to the sub-categories of 'sequential' acts, Figure 4.14 shows that reciprocating a behaviour that was performed by the mother is more common than initiating a behaviour for her to complement. The discrepancy between the two types of responses is greater for the youngest group of infants. Two-way anova showed a very significant category effect. $F(1,15) = 83.4$; $p < 0.0001$ and within group analyses showed that for all groups the rate of 'mother-initiated' acts was significantly greater than the rate of 'self-initiated' ones ($\bar{X} = 45.2$ versus $\bar{X} = 8.94$).

Concerning the age changes, of these behaviours Figure 4.14 also shows that 'self-initiated' acts increase steadily with age, while 'mother-initiated' acts do not. The only noticeable change in the latter can be observed during the period 9-12 months when they decrease. Two-way anova showed a significant age effect, $F(3,15) = 3.26$, $p < 0.05$, but no age/category

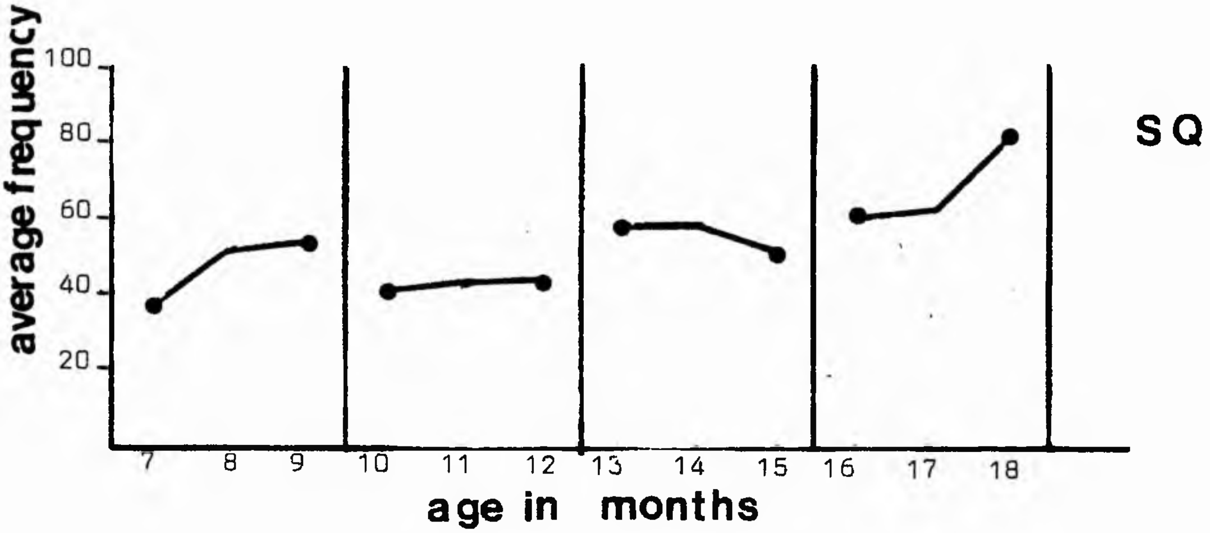


Figure 4.13 Longitudinal distribution of 'sequential' acts for 19 infants

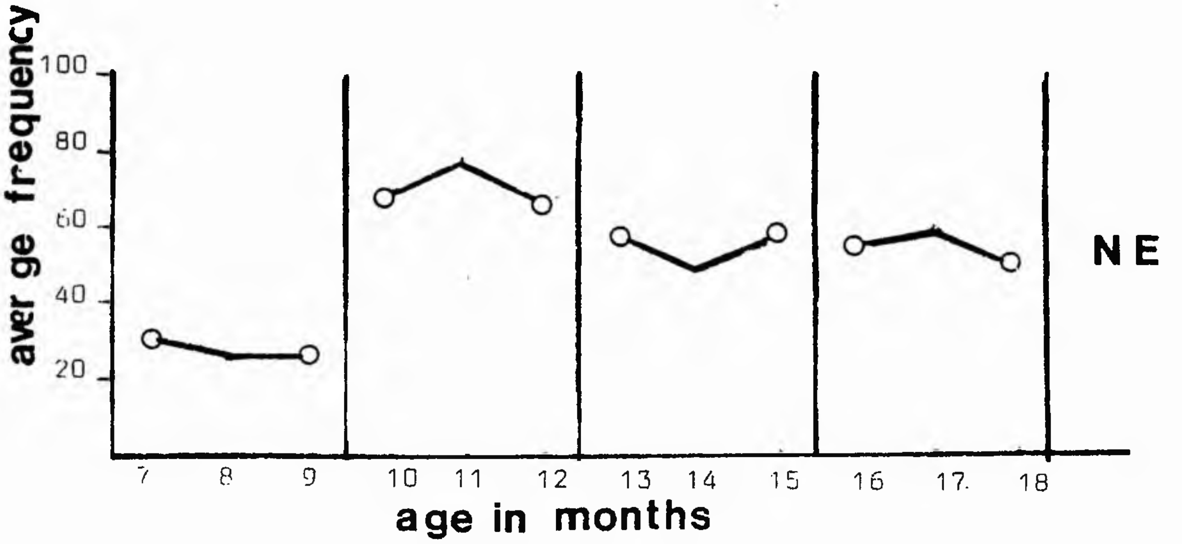


Figure 4.15 Longitudinal distribution of 'negative' acts for the 19 infants

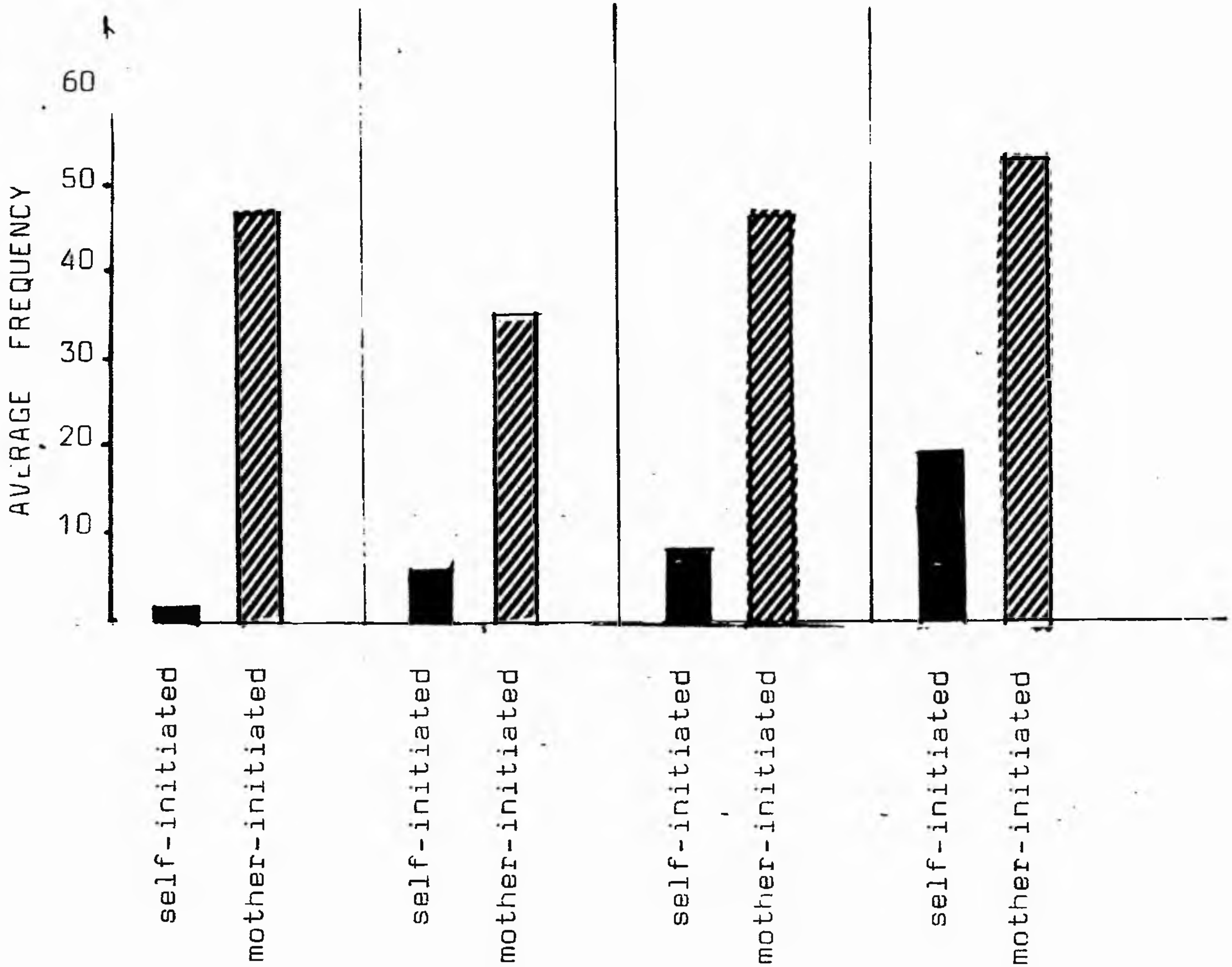


Figure 4.14 Cross-sectional distribution of the sub-categories of 'sequential acts'

interaction was found.

These findings indicate that when sharing their activities with their mothers, the infants in this study were mostly reactive, and only the older ones showed spontaneity in directing their mothers' attention to their own activities and inviting her to join in their manipulative play. Furthermore, the period 9-12 months emerges as one when shared activities are minimal. In this case the infants followed the trend of increasing the rate of their own initiations of interactive sequences but decreased the rate of responding to the mother. It is worth noting here that the data from group B mothers which was presented in the preceding chapter, revealed a decline in modifying activities in general and 'create discovery environment' in particular. Thus, there seems to be an association between the mothers' behaviour and the lowered frequency of infants' responsive play. One can hypothesise that the mothers may have refrained from modifying because they probably sensed that it was ineffectual, either due to the infants' lack of social ability to respond to the mother simultaneously with involvement in performing tasks with toys, or the infants showed little readiness and willingness to engage in interpersonal interaction that focused round technical tasks. The predominance of 'negative acts' may have provided the mothers with an index of the state of their infants' receptivity. Alternatively, due to the small sample size, these results could be attributed to pecularities in the mothers who represented this group.

Within 'self-initiated' acts, Table 4.4. reveals that only groups C and D showed a predominance of some activities over the others. In both cases 'declaring' to the mother something about the object and offering it to her were more frequent than the other initiative activities. Infants of all ages initiated very few games or none at all. Two-way anova showed a significant category effect. $F(4,60) = 6.99$, $p < 0.001$, with the highest mean on 'declare' and 'exchange'. However, within group analyses showed that the difference in the rate of each category were significant only for groups C and D.

Table 4.4 Sub-categories of 'infant-initiated' acts

Group	Sub-category				
	interrupt	declare	game	exchange	imperatives
A	1	1	1	0	0
B	0	2	1	3	1
C	1	3	1	4	1
D	2	12	0	9	3

The analysis also showed a significant effect, $F(3,15) = 12.93$, $p < 0.005$ and an age/category interaction, $F(12,60) = 2.46$, $p < 0.01$. This was brought about by the fact that 'declaring', exchanging objects and issuing 'imperatives' were elicited at certain periods of development (12-18 months), but not during other periods (6-12 months).

The fact that infants' initiative behaviours consisted mainly of 'declaring' and 'offering' seems to point out that infants' incorporation of others involves focusing on the object as a topic of conversation, and interpersonal sharing of an event or object. Thus, in this study initiative sequential acts were concerned with 'secondary object manipulation'. Only the infants who were 15 to 18 months old used the mother as a social agent who could facilitate their technical play, since they were the ones who manifested a greater incidence of 'imperatives'.

On the whole, there were very few incidents of interrupting the mother which implies that the interaction was harmonious and well synchronised.

When we turn to the sub-categories of 'responsive' acts we find from

Table 4.6 that for all groups, the majority of responses consisted of 'attending' to mother and reciprocating her games. 'Attention' to mother increases with age while 'games' decrease. Two-way anova confirmed the first tendency in that a highly significant category effect was found, $F(6,90) = 59.18$; $p < 0.000$. There was also an age/category interaction, $F(18,90) = 3.34$; $p < 0.001$, but there was no age effect. Furthermore, each separate group showed a significant category difference.

Table 4.6 Sub-categories of 'mother-initiated' acts

Group	Sub-category						
	Accept	attend	discover	game	appreciate	imitate	reciprocate task
A	1	16	2	20	1	0	0
B	1	12	2	10	1	1	1
C	4	22	3	8	1	2	2
D	4	24	4	7	1	1	1

These results lead to the conclusion that most reciprocating is directed towards attention to the mother's modifying activities and the exercising of technical skills in a game-like manner. The age progression on these behaviours point to the fact that as the infants get older they become more attentive to their mothers' activities which increases the likelihood of their benefiting from her modifying behaviour. Similar results on the increase of attention and compliance to mother with age increase have also been reported by others (Rosenblatt, 1977; Hubely and Trevarthen, 1979; Schaffer and Crook, 1980).

4.4.5 Negative Acts and their Sub-categories

Figure 4.5 shows that 'negative' acts follow an irregular pattern of change with age. They are least frequent during the period of 6-9 months, and most frequent during the period of 9-12 months, after which they decrease but their level remains still higher than that at age 6 to 9 months. With regard to the monthly changes, Figure 4.15 shows that only slight changes take place within each group. Two-way anova on the cross-sectional data revealed that the age changes were significant, $F(3,15) = 4.69$; $p < 0.05$. Four sets of one-way anova with reference to the longitudinal data showed that none of the groups changed the rate of 'negative' acts from one month to the next significantly. T-tests, on the other hand, showed that the transition from the 9th to the 10th month is marked by a significant increase in 'negative' activities, $t(7) = 2.85$, $p < 0.05$.

These results indicate that as the infants get older they become more autonomous, and more likely to respond to competetive stimulation. Such characteristics seem to emerge at $9\frac{1}{2}$ months, and continue at a high but steady rate for the following three months, after which they decline.

Concerning the sub-categories of 'negative' acts, as can be seen from Figure 4.16, all four groups of infants showed more 'distraction' than physically leaving play or 'substituting' it with other activities, or being distressed. By 10 months infants abandoned and substituted play more. According to two-way anova these differences were highly significant, $F(3,45) = 34.54$; $p < 0.0001$ with 'distracted' rating highest ($\bar{X} = 26$) and 'distress' rating lowest ($\bar{X} = 4$). Both 'substitute' and 'abandon' had similar rates ($\bar{X} = 12$ and 13 respectively). Within group analyses showed that this category effect was characteristic of each group.

Although being distracted was predominant its rate changed only slightly with age (Figure 4.16), except for a sudden increase during the period 9-12 months. 'Distress' declined after 9 months, while both 'abandon' and 'substitute' showed a sharp increase after 9 months, but their frequency remained steady afterwards. Two-way anova showed that these age changes were significant at 0.05 level.

Overall, 'negative acts' changed their rate with age but the trend of

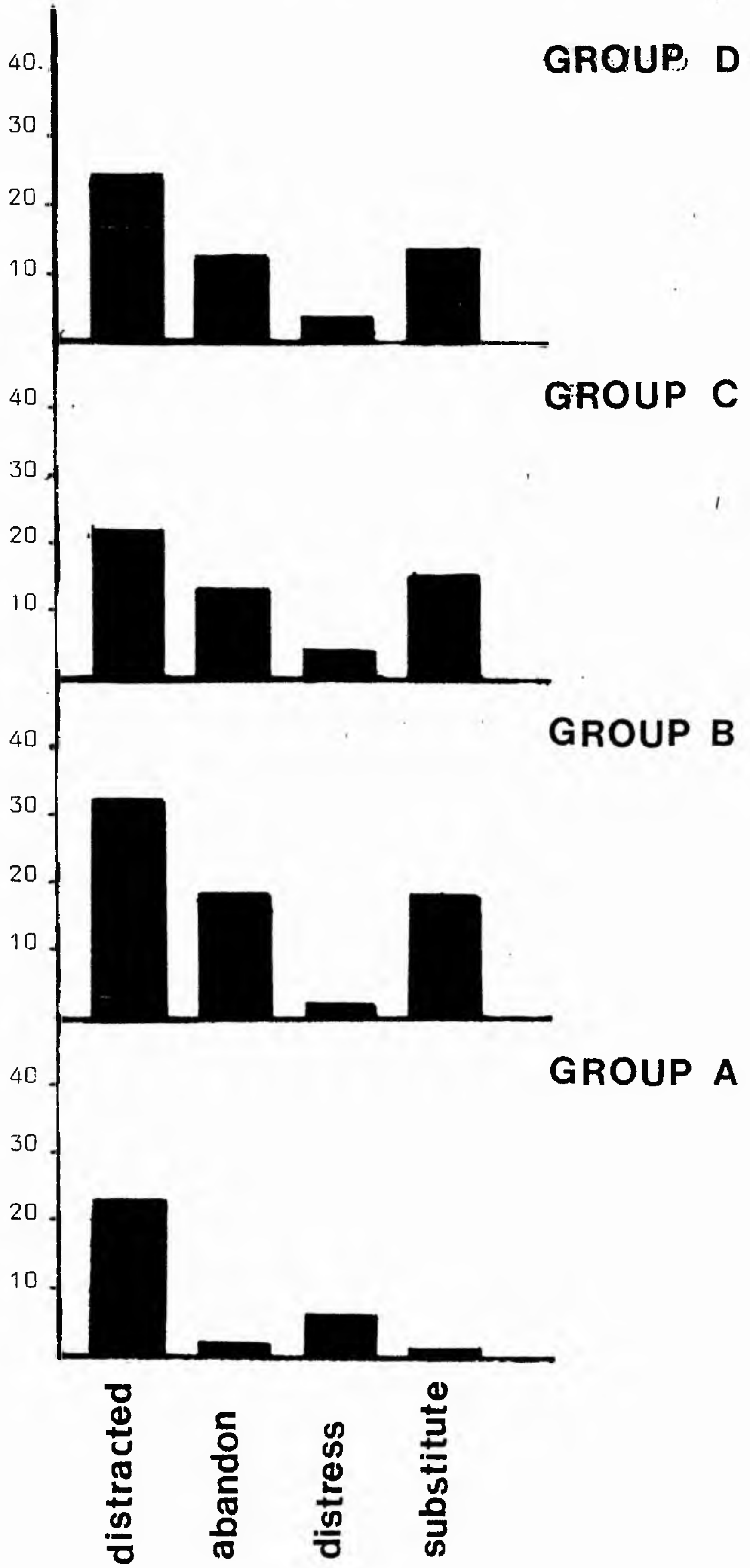


Figure 4.16 Cross-sectional distribution of the sub-categories of 'negative' acts

change was different for different categories. 'Negative' behaviour that results from the discovery of new means for achieving independent contact with salient features of the environment, such as locomotion, together with behaviours that express the development of new social abilities and detachment from the mother (e.g. 'substitute' play) tended to increase with age. 'Distress' was more common during an earlier developmental period, and it declined as the infants got older. During the period 9-12 months, the infants' span of attention is at its worst for they tended to be easily distracted by external events; this slightly improved after 12 months.

4.4.6 Observer's Effect

With regard to the observer's effect, Table 4.7 shows that visual contact with her was more frequent than physical contact. Infants showed more interest in manipulating the video equipment than in playing with the observer. However, the infants aged 6-9 months tended to be least concerned with either observer or equipment. During the period 9-12 months, 'looking' at the observer was most frequent, while playing with the equipment reaches a peak between 9 to 15 months after which it declines to a level which is still higher than the initial one at 6-9 months. Two-way anova revealed a significant category effect, $F(2,30) = 13.5$; $p < 0.001$, with a predominance of 'looking at observer' ($\bar{X} = 15$) over 'seek contact with observer' ($\bar{X} = 6$) and 'manipulate equipment' ($\bar{X} = 8$). A significant age effect was also found, $F(3,15) = 4.02$; $p < 0.05$.

Table 4.7 Sub-categories of the 'observer's effect' on infants

Group	Sub-category		
	look at observer	contact observer	manipulate equipment
A	9	1	1
B	21	10	11
C	13	5	11
D	16	7	7

Thus, the degree by which the infants were affected by the presence of an observer, as well as the types of responses directed towards her, change with age. The youngest infants showed least interest and involvement, while the older group, B, showed that they were affected most. Group C showed a decline in the activities directed towards the observer probably because at this age they were closely attached to their mothers and wary of strangers (Ainsworth and Bell, 1974). Group D infants were less interested in the filming equipment than in playing with the observer and watching her thereby indicating an interest in socialising with others. However, overall, the activities that were directed towards the observer and the equipment constituted only a small proportion of the overall infants' repertoire. Therefore, we can conclude that the observational set-up did not interfere greatly with the interpersonal object-play.

4.5 Conclusion

Examination of the infants' repertoire of social and technical schemes revealed definite developmental trends which are congruent with Piaget's descriptions of the Sensorimotor Period (Piaget, 1936; 1955). At an earlier stage (Stage 3) the infants possess a limited repertoire of schemes in relation to objects, and they are capable of attending to only one stimulus at a time. This is reflected in the contents of their 'solitary' play which was characterised by the predominance of 'undifferentiated' acts on single objects, as well as by their dependence on the mother to direct and structure their play. Thus the 6-9 months old infant engaged in 'sequential' behaviour quite frequently, which was mainly responsive in nature; the responses consisted of watching the mother perform actions on objects and taking turns in the games she started. As the infants got older, the rate of their activities increased and became more diverse. New 'solitary' activities such as imaginative use of objects and symbolic reference to them emerged, while constructive play involving the association between various technical objects in appropriate structures, became prominant, thereby marking an advancement in knowledge of Means and Ends and Spatial Relations. Furthermore, the older infants showed a steady increase in their capacity to combine social abilities with technical ones and in understanding the role of others as agents who can affect their own behaviour and be affected by it,

which are all landmarks of the development of the concept of Causality. Thus, the spontaneous play of these infants discriminated certain levels in their developing cognitive competence. In the next chapter we shall see how these infants fared in a formal testing situation, utilising Piagetian scales of Sensorimotor development. In a later chapter we shall examine the relationship between free activities and test scores on the one hand, and the mothers' behaviour on the other hand, in an attempt to evaluate the effects of the mother on the infants' performance in cognitive tasks during interpersonal play.

CHAPTER V

ASSESSMENT OF INFANTS' COGNITIVE COMPETENCE

CHAPTER V

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5.0 Introduction

Besides looking at the infants' performance during inter-personal interaction, we need a formal measure of the infants' level of cognitive competence with respect to which the quality of parental influence can be evaluated since such measures are indicative of underlying cognitive structures. Such measures are made available in the form of the various developmental scales such as Kuhlman's IQ scales (Kuhlman, 1922) and, more recently, the Uzgiris and Hunt's Ordinal Scales of Psychological Development - IPDS (Uzgiris and Hunt, 1975). In this study selecting a scale was determined by the nature of the theoretical framework on which the tests were based. This theory, therefore, will be discussed for the purpose of pointing out the main features related to the issues raised in this research. This will be followed by a description of the measuring instrument that was used, and the procedure of its application, to be concluded by presenting and discussing the results of the infants' performance in the tests.

Since the issue of what constitutes cognitive competence is a contraversial one, it is expedient to begin the chapter by defining the use of the term in this study.

5.1 What is Cognitive Competence?

Cognitive competence (or intelligence) will be defined as "the utilisation of sensory and motor capacities that lead to the individual's effective dealings with his animate and inanimate environment, and his constant adaptation to these environments for the purpose of his social survival."

This definition is derived from the currently held views concerning the characteristics and function of cognitive development and which the present thesis advocates. There are at least three principles related to this definition which need to be discussed.

Firstly, competent performance and physical maturation are non-identical, in the sense that sensory and motor capacities may function independently of cognitive competence, although competent behaviour is always expressed through these capacities. For example, locomotion is an ability that becomes available to all normally developing individuals. A competent infant might utilise a form of locomotion such as walking to obtain a lure out of immediate reach, <u>or</u> to escape from an aversive stimulus. It follows, then, that cognitive competence involves the understanding of external options and the ability to respond to them appropriately. In this lies the important distinction between physical abilities and purposeful and adaptive behaviour that characterises intelligence.

Secondly, cognitive competence is dynamic and is affected by environment; it involves the adaptation of cognitive structures to new situations while changes in cognitive structures lead to changes in responding to the environment. Environments, whether they consist of objects or of people, are never entirely constant: an object which an infant has handled on one occasion may be heavier or more distant on another occasion; a person who once smiled in response to the infant's smile may respond another time with a coo. Similarly, an infant's physical and cognitive capacities increase with his age. Thus, if at one point he was content with mouthing a box with its lid on, on another occasion he would want to open the lid of the same box and to examine its contents. Socially, he may no longer be satisfied with his mother's 'baby-talk', but he would want her to read him a story. Similar examples have been cited by Lewis (1973) to illustrate the effects of environment on the infant's cognitive structures, and how different environmental experiences could lead to different cognitive contents.

Thirdly, the function of the infant's intelligence is social in the sense that intelligent behaviour allows the individual to cope with his social environment and at the same time to be incorporated in it. In this respect the structure and function of intelligence become closely interrelated, since the process of development brings the child into more social encounters. During such encounters, as Lieven and McShane (1977) point out, the more skilful infants become (in language or in other domains of cognitive functioning), the more "mastery is demanded from them as participants in social interaction" (page 923).

Fourthly, cognitive competence and emotions and motivation are closely connected. It is a recognised fact that there are motivational differences among infants (Yarrow et al., 1976), some of which are inherited, others are attributed to the differing experiences. On the one hand, parents and other socialising agents may not only provide the infant with favourable experiences in the form of availability of materials, opportunities, and direction of activities that enhance his cognitive development, but also by providing warmth, security, encouragement and appreciation of the infant's achievements may motivate the infant to accelerate or increase his cognitive abilities. On the other hand, as a social being, the infant is motivated to participate in society, and this motivation can be regarded as a force that acts on the infant's cognition to develop new schemes or to adapt already existing ones to novel situation. Examples of these are provided by Yarrow and his co-workers (1976) who identified three clusters of abilities that had underlying motivational component. These were visually-directed reaching and grasping, secondary-circular reactions, and goal-directedness. They regarded them as 'cognitive-motivational' since they represent the infants' "attempts to master and to obtain feedback from the environment" (page 385). Having stated the nature and function of cognitive competence, I shall now examine the major theoretical framework, namely Piaget's, that generated the Infant's Psychological Scales of Development, a technique for measuring cognitive functioning and one of very few that was based on a theory of development. This technique was used in the present study in preference to the traditional tests. When appropriate, comparisons between the two approaches will be made in order to point out the merits of Piagetian Scales.

5.2 Piaget's Theory of Sensorimotor Intelligence

In discussing the Piagetian approach to intelligence, Piaget's own definitions provide a good start:

> "Intelligence is a particular instance of biological adaptation."
>
> Piaget (1950) pages 3-4
>
> "Intelligence is a form of equilibrium toward which all the (cognitive) structures tend."
>
> (Ibid) page 6

These definitions emphasise the biological nature of intelligence, namely, that it is an outcome of biological or evolutionary adaptation of man to the unique requirements of his environment. One assumes that this process of adaptation is continuous throughout the life span of human individuals, and, therefore, to Piaget the essence of intelligence is the continuous development of means that enable the individual to interact successfully with his biological environment at a psychological level (Ginsburg and Opper, 1969).

In this process of cognitive adaptation an active role is attributed to the individual: according to Piaget it is the individual who is responsible for bringing his own mental activities into a state of balance. In this respect Piaget's view differs from the traditional one that sees the individual's role as consisting of expressing the intelligent behaviour with which he is endowed through hereditary and possibly environmental circumstances.

Environmental factors play a central role in Piaget's theory, through the principle of adaptation that resides in an interaction between environmental variables and cognitive schemes. As Furth (1973) has said, the conditions for the appearance of cognitive stages "is not, or is not merely, the maturation of physiological organs but primarily human behaviour in a human environment" (page 62). This is because the emergence of any stage and the cognitive structures that characterise it are the result of a series of exposures to various stimuli (actions or objects) which are necessary for cognitive schemes. According to the principle of adaptation, once a scheme is formed, moderately familiar stimuli are assimilated into - and accommodated to - it, while very discrepant stimuli are rejected. However, if the environment is constantly presenting new information to the individual, the state of equilibrium that had characterised a scheme will be disrupted and the need to restore it will result in the individual's accommodation to the new experiences. Thus the existing scheme becomes differentiated into a more complex one that could handle the new information (Piaget, 1936). From this, one can infer that the more frequent and complex the stimulation is (provided that it is within the margins of the infant's current abilities), the greater the adaptation and, consequently, the more cognitively sophisticated the individual becomes.

A third feature of Piaget's theory is its emphasis on the diversity of cognitive contents and the qualitative differences that characterise their underlying structures. This is in contrast to the assumption made by the traditional tests which postulates a single factor of intelligence. Two aspects of Piaget's theory make a strong case against the likelihood of a unitary factor:

1. The principle of reciprocal assimilation whereby schemes are co-ordinated together, leading to a new achievement. Thus, in the case of two co-existing skills, such as vision and grasping, at some stage they co-ordinate giving rise to a new achievement such as visually directed grasping. From this example one can see that visual ability, grasping and visually-directed grasping do not all constitute the same general ability.

2. Within-Stage and between-stages achievements. Here although Piaget perceives of a super-structure that subsumes under it all mental activities characteristic of a stage, each of these activities belongs to a different domain of cognition. To illustrate, in stage 5 of the Sensorimotor period, Piaget observes the emergence of the ability to appreciate the force of gravity on objects, as in the example of Laurent dropping breadcrumbs on the floor (Piaget, 1936, page 299). Concurrently, Laurent discovered new means to obtain goals (e.g. pulling a cushion to obtain a watch that was placed on it; Piaget, 1936, page 300). These abilities are qualitatively different but they are related through manifesting one cognitive structure, the tertiary circular reactions (i.e. "systematic variations of an earlier behaviour sequence to observe its new outcomes", Brainerd, 1978, page 52).

Similarly, with the transitions from one stage or one period[1] to another, Piaget emphasises the qualitative changes in structures. Thus, within the sensorimotor period, the reflexes of the first stage are qualitatively different from the primary circular reactions of the second stage, and the latter are also different from the secondary circular reactions that follow from them. For this reason sensorimotor intelligence - as well as the intelligence of the other periods - does not denote various specific abilities, each of which is identical to the others; rather it denotes a whole constellation of abilities with very different identities.

Further evidence for the absence of a g-factor is provided by experimental studies such as Uzgiris' (1973) which found no intercorrelations

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1.Throughout this Chapter, the term 'period' will be confined to the major periods of cognitive development described by Piaget (e.g. Sensorimotor, Concrete, etc), whereas the term 'stage' will refer to the developmental landmarks that occur within the Sensorimotor period.

between performance on the six scales of the IPDS. Therefore, one can conclude that the cognitive abilities underlying, for example, object permanence, are of a different nature from those underlying, say, imitation. It follows that rather than using tests such as the traditional IQ tests that give a cumulative and single score representing the total number of items in a test performed correctly, one should use tests that measure the different cognitive abilities, separately.

Credit is attributed by educational and clinical authorities in the Western World to traditional intelligence tests for their predictive value, whether in the field of education, social and medical welfare, or research. When psychologists talk about the predictive validity of IQ tests they are using the term 'prediction' in two different senses:

1. Prediction of future competence. Here the quality of intellectual performance at infancy or early childhood is seen as constant throughout the individual's life span. In this sense IQ scores are used either for educational placements, or for diagnosis of current and future mental deficiency. In this thesis I am not concerned with the practical implications of this practice - important as it is - nor am I concerned with assessing the infants' current competence in order to make predictions about their future intellectual levels.

2. Prediction of current levels of competence. In this context IQ scores are used as a basis for making conjectures regarding the individual's potential competence in other domains of cognitive functioning (Lewis, 1976). This is the approach adopted by researchers studying the interaction between environment and intelligence, and the one which is of direct relevance to the present study. This form of prediction can be achieved through two methods. The first method involves the correlation of current environmental conditions with current levels of intellectual functioning. The procedure which is followed is to test the infants' intelligence and correlate their

scores with selected environmental variables such as SES (Willerman et al., 1970; Rubin and Balow, 1979), child-rearing conditions such as an 'enriched' home environment versus an 'impoverished' institution (Dennis and Najarian, 1957; Bayley et al., 1971; Kagan and Klein, 1973 and Wachs, 1976), and maternal variables such as responsivity and closeness of the mother-infant bond (Ainsworth and Bell, 1970; Honzik, 1972). The second method is to provide special developmental programmes to children and infants who score low on intelligence tests, and who come from under-privileged homes. This is what has come to be known as the 'intervention studies'.

Now let us consider Piaget's position in relation to the issue of prediction. Piaget's theory has been termed a 'discontinuity theory' (Brainerd, 1978), since it emphasises the changes that take place at every stage and period of development. Consequently, it is not possible to make predictions about future competence on the basis of current performance. In this respect environmental variables could provide a better index of future achievements. A good example would be cultural differences: certain cultures may contribute to the total lack of achievements of certain periods such as the period of Formal Operations (Bovet, 1976; Hunt et al., 1975).

As for making concurrent correlations, there is no incompatibility between Piaget's approach and making correlations concerning the relationship of specified, external variables and the nature or rate of development of Sensorimotor schemes. Furthermore, by using environmental experiences as a variable, we could understand the nature of coordination between various cognitive domains since certain experiences may foster one aspect of sensorimotor intelligence at the expense of others. If, for example, one can imagine an environment with very few opportunities for interaction with objects, but extensive encounters with people, one could predict that an infant living in that environment will perform poorly on scales related to objects (e.g. 'object permanence', or 'schemes' for relating to objects) but will show an enhancement in scales measuring social or linguistic competences. As Uzgiris (1976) has pointed out, "the rate of progress on any cognitive achievement is to be regarded as a joint function of the individual and the circumstances being encountered by the individual" (page 7). One illustrative study for this statement was carried out by Wachs, Uzgiris and Hunt (1973). Using Caldwell's Inventory of Home Stimulation - HSS (Caldwell et al., 1964), these researchers correlated scores on the HSS with scores on the IPDS obtained by five groups of infants (ages 7, 11, 15, 18 and 22 months). Negative correlations were found between high intensity stimulation (e.g. noise and overcrowding) and various cognitive skills such as object permanence. The pattern was characteristic for all age groups. On the other hand, they also found that parental vocal and verbal stimulation correlated positively with performance on the scales for 'Means', 'Schemes' and 'Imitation'. This study offers an advantage over that of Rubin and Balow (1979), for instance, since it investigated effects of aspects of the environment - identified by the HSS - which were more specific than the global variable of SES. Consequently, it was possible to make direct links between an infant's behaviours on certain tasks and the ennumerated features of his surroundings.

Traditionally, intelligence scores are closely associated with chronological age (CA), since the interpretation of performance in a test depended on showing how each individual's performance compares with the norm, that is, a sample of other infants on whom the test was standardised. Thus the Stanford-Binet and the Kuhlman tests were concerned with assigning age norms to the various activities of infants, which were considered 'mental'. Gesell's test (1925) is strictly speaking not an intelligence test but a behavioural developmental schedule. This linkage of intelligence to age led to a shift of interest to examining variations from the norms.

Hence the origin of studies on individual differences among infants.

Underlying Piaget's theory are certain implications regarding the problem of individual differences and the linkage of intelligence with CA. Concerning the latter, it is sufficient to say that Piaget has used the age ranges in which he observed the emergence of specific skills merely as a guide line, without giving it much significance. This is because he believed that age is of little use as a developmental issue; what was more crucial was the ordering of cognitive achievements and their differential qualities. This is evident in the way he grouped these achievements according to basic sequences, and not according to their co-occurrence in time (Uzgiris and Hunt, 1975). Besides, variations in the age of achievements of certain skills were often observed by Piaget, for example, visual-directed grasping was achieved at a different age by each of his three children: 3 months, 4 months and 6 months. Piaget accounts for the differences in terms of environmental circumstances, namely, the seasons during which the children were born.

With regard to the issue of individual differences, one would expect variations (within a Piagetian paradigm) to arise due to the variations in experiences impinging upon each individual's physical capacities (as in the previous example). Furth (1973) mentions three types of experiences that could account for differences between individuals:

particular physical experiences

particular environments

and particular skills (such as talents).

One could compare infants along these variables in terms of the differential rates of achievements (Kagan and Klein, 1973), or in terms of relationships between similarities of achievements and similarities in experiences (Rubin and Balow, 1979), or the correlations between different levels and types of achievements and environmental variables (Wachs, 1976).

Although Piaget's approach attributes a central role to environment, it does not take into account the fact that the infant's cognitive functioning takes place largely in an inter-personal context, during which information is exchanged between him and others, and joint tasks are executed. In such a context the infant's actions are not solely determined by the processes of assimilation and accommodation, but may also be regulated by what others bring into the interaction, and how the infant interprets their intentions and communicates to them his own.
Thus, when adopting a Piagetian framework, one should take into account this shortcoming. Nonetheless, in the absence of better alternatives, the Uzgiris and Hunt's Scales of Sensorimotor development were chosen since they measure specific aspects of cognitive competence and which can be directly related to the relevant infants' social experiences which are specified by the mothers' Hierarchy, while avoiding the pitfalls of the traditional IQ tests. These scales will now be described.

5.3 Scales of Assessment of Cognitive Competence

The Infants' Psychological Development Scales (IPDS) were designed, by Uzgiris and Hunt, and were made available for use in 1974. The aim behind these scales was

> "To develop a tool of assessment grounded in the theory that development is an epigenetic process of evolving new, more complex, hierarchical levels of organisation in intellect and motivation."
>
> Uzgiris and Hunt (1975) page 47

The tests were considered highly reliable. Inter-observer reliability ranged from 93% for the younger infants to 97% for the older ones. Intertest reliability had an average of 80%.

The scales have been described by Brainerd (1978) as a "macro-stage sequence study" that examined all the sub-stages of the sensorimotor period, with reference to five cognitive contents. They consist of six parts. Five of them correspond to Piaget's cognitive contents related to the construction of reality (Piaget, 1954). These are:

I. Visual Pursuit and Permanence of Objects

II. Means for Obtaining Goals

III. Vocal and Gestural Imitation

IV. Concept of Causality

V. Concept of Space

VI. Schemes for Relating to Objects

For the purpose of this study, only part 2 of Scale I was used, together with Scales IV, V and VI, for reasons which will be explained later. The description of the contents of the test will be confined only to those scales which were administered to the present sample of infants.

I. Object Permanence According to Piaget's theory, for an infant of the early stages in sensorimotor period, objects exist only in so far as he can perform actions on them (e.g. sucking, picking and hitting). When objects disappear from the infant's visual field, then, as far as the infant is concerned, they cease to exist. Sensorimotor development involves the gradual transitions made by the infant regarding the existence of objects outside his own self. Full attainment of the object concept comes towards the end of the sensorimotor period, and its landmark is the search and retrieval for a hidden object under complex cues.

To test this gradual progression Uzgiris and Hunt devised a scale of twelve steps; each step presents the infant with a situation that would elicit a number of responses that reflect the infant's level of attainment of the object concept. Responses may indicate no comprehension of object permanence (e.g. 'loses interest') or primitive signs of attainment of the concept (e.g. 'reacts to loss'), to active behaviours to reinstate the object.

The importance of object permanence to all other activities involving cognitive competence has been emphasised by Uzgiris (1973) when citing various studies that found correlations between high performance on object permanence tasks and skilful manipulation of objects. Similarly, Bell (1970) showed that infants who initiate contact with objects tend to show enhancement on object concept.

Most research on the contents of the Sensorimotor period has focused on Object Permanence, and it has been concerned with examining whether the failure to solve object permanence tasks is due to the infant's conceptual incompetence or performance incompetence. Most of these studies give further support to Piaget's explanations of the development of the concept of the object's permanence (e.g. Gratch and Landers, 1971; Ramsay and Campos, 1978).

Scale IV: Development of Operational Causality

Operational causality, in Piaget's terms, refers to how the child achieves the knowledge that events have causes, and conversely that certain causes lead to certain consequences. The full realisation of this extends beyond the Sensorimotor period. Ability to perceive cause and effect relationships is mediated by the circular reactions which allow the infant, first to observe events objectively, and then to associate the event with objective causes, and, later on, to reinstate the event by manipulating its source (e.g. an object, another person, or self).

Progressive development on Operational Causality is measured by a seven-steps scale, construced along the same principles as the previous scale.

One of the main features of this scale is its motivational component, since it is the infant's initiatives that cause events to take place. Thus, the scale could tell us to what extent the infant is motivated to explore and exploit his environment. The second feature of the scale is its combining of social skills with technological ones. During interpersonal play with objects, the infant develops the necessary social skills that enable him to appreciate other social beings as centres of causality. This is partly achieved by the infant's own abilities and partly by the cooperation of others who participate in his object-play. Thus we would expect an association between the infants' performance in tasks involving causal relationships and his free play which is characterised by goal-directed activities or interactive activities with others.

In examining the significance of environmental experiences for development of causality, a positive correlation has been found between performance on tasks on causality and the infant's manipulation of audio-visual toys (Wachs, 1976).

<u>Scale V: Construction of Object Relations in Space</u>

According to Piaget, a newborn cannot differentiate himself from the objects and people of his environment. This is reflected in his inability to coordinate objects with one another, nor can two actions be coordinated to one object. The full ability to construct spatial relations is attained at early adolescence. Until then, through circular reactions, the infant progresses gradually towards objectifying self from objects, and object from object, to an understanding of the spatial relations between objects.

The scale measuring the infant's concept of space consists of eleven steps, designed along the same principles as in the previous two scales.

This scale taps the development of technological skills that involve spatial relationships between objects. When related to interpersonal play, it enables the researcher to examine to what extent the understanding of spatial relationships is enhanced by maternal behaviours that provide the child with opportunities to discover spatial attributes for himself, or that directly point out such attributes.

Scale VI: Schemes for Relating to Objects

The purpose of this scale is to measure what schemes for interacting with objects the infant possesses. The scale enables us to measure the levels of organisation which may not be accessible to the other five scales (e.g. social schemes), or which may be masked by the testing procedure through subject and/or task variables (Uzgiris, 1976). Unlike the other scales, it does not involve set tasks for the infants but relies on presenting him with a specific object and observing his spontaneous actions with it. Four levels can be indicated from these actions:

1. Level of simple undifferentiated actions. These correspond to Sensorimotor Stages 2 and 3. Initially they take the form of exercising an already existing scheme without reference to the particular qualities of the object (e.g. mouthing a toy). This is followed by focusing attention on the properties of the objects (e.g. visual inspection) leading to the development of a new scheme and the exercising of that scheme. Another characteristic of this level is the prolonged exercising of one scheme on a single object.

2. Level of differentiated actions (Stage 4). This level is characterised by actions achieved through coordinations of single schemes, and through studying the properties of objects; also the schemes are selectively applied to the objects' particular properties (e.g. tearing of 'tearable' objects). There is also the tendency to apply successive schemes to a single object, as well as alternating objects for the same scheme.

3. Level of regulation by differential feedback (Stage 5). Here schemes are modifed in order to attain certain goals. Such goals usually involve other people and the expectation of their responsiveness (e.g. showing objects). Awareness of social outcomes also entails the 'conventionalisation' of schemes (e.g. hugging a doll). Furthermore, the number of schemes applied to an object is greatly reduced in contrast to the previous levels since the particular qualities of objects limit the number of actions appropriate to them, and since earlier simple schemes tend to diminish due to their incorporation into higher, complex ones.

4. Level of anticipatory regulation. This marks the decontexualisation of schemes: the infant anticipates the outcomes of his schemes, and, therefore, is able to make inferences about them (e.g. naming), and to use them in a context that does not directly correspond with present reality, such as in fantasy play. Thus the application of schemes, though it is still governed by the properties of objects, makes reference to their abstract qualities.

This scale was found to be most affected by environmental experiences such as living conditions and qualities of personal interactions (Uzgiris, 1973 and Wachs, 1976). In Wachs' study, for example, children and infants who were restricted in their exploration were found to use fewer schemes or lower level ones than children who were given freedom to explore.

In conclusion to this section, since the present research adopts an interpersonal approach to the study of cognitive growth, using the IPDS can help to determine the relationship between specific abilities and specific environmental variables. The scales are used to answer four questions:

1. Do the infants in this sample show a similar level of competence along each of the domains of cognitive abilities tested by the scales?

This question was put forward in order to examine whether variations among infants are associated with age differences or other environmental differences.

2. Is the pattern of infants' performance consistent along all scales' that is, if an infant scores high on one test, does he also score high on the other tests? This question is asked for the purpose of finding out whether the rate of development of the various sensorimotor abilities is constant, or whether the predominance of specific environmental experiences is associated with the acceleration or deceleration of certain abilities more than others.

3. How does the infants' performance in a test situation compare with his performance during interpersonal interaction? Here, a discrepancy in favour of interpersonal performance may be an index of the beneficial effects of maternal support.

4. Is there any association between the mothers' modes of participation, and the infants cognitive abilities as measured by the Scales? The answer to this question can help us to assess the degree of compatibility between the infants' level of performance and the mother's level of intervention (Chapter IV).

The answers to the first two questions will be presented in this chapter, while the answers to the third and fourth questions will be dealt with in the next chapter that examines the infants' behaviour jointly with the mother's. Before presenting the results on infants' performance I shall now describe the methodology used in the administration of the scales.

5.4 Methodology of the Administration of the IPDS

5.4.1. Rationale for excluding some of the scales

In using the IPDS only those scales which are relevant to the research aims were administered. Thus, part 1 of Scale I (Visual Pursuit) which consists of two tasks was omitted. This is because my study is not concerned with visual behaviour, and also the two tasks elicit behaviours typical of infants much younger than the ones in this sample (1-3 months versus 6 months).

Means and Ends (Scale II) constitute an important issue in this study because they tell us how the infant can use his resources to obtain specific goals. The infant can work out the connections between two aspects of a situation (e.g. tip a narrow container to obtain its contents), or he can perceive others as potentials for supplying him with means. However, Scale II was not included firstly due to the limits of time, and, secondly, because it was felt that information concerning the development of means and ends abilities could be obtained from different sources; for one reason, developing this ability is closely linked with understanding the causal relationships between the means (causes) and the ends (consequences), without the two being exactly identical. It is interesting to note that Piaget did not consider 'means and ends' as a separate issue with regard to the child's construction of reality (Piaget, 1954). In the Origin of Intelligence' he states that development of means is one of the characteristics of stage 3, and a herald to causality:

> "As soon as the schemes become..........capable of intentional decompositions and recombinations - that is to say, of really intelligent activity - the consciousness of the relations thus implicated by distinguishing means and ends will necessarily bring with it the

elaboration of a world independent of the self."

Piaget (1936), page 178

The Scale was also excluded because some of the information provided by it is redundant: for example, items 1 and 2 overlap with items 2 and 3, respectively, in Scale IV; items 3 and 10 overlap with items 4 and 10, respectively, in Scale V.

Scale III on imitation was also excluded because it deals primarily with language development and vocal and gestural imitations. These issues were not examined here. Imitation was studied only with reference to re-enacting a model's activities with an object.

5.4.2. Modification of the Scales

Scale I

Situation 6: finding an object completely covered in two places alternately, was substituted by another situation of my own design:

> finding an object completely covered under one screen, after the place of the screen has been alternated with the place of the other screen.

There were two reasons for this substitution: firstly, the Uzgiris and Hunt's situation did not seem to differ greatly from the previous one. The same place errors encountered in situation 5 (finding an object which is completely covered with a single screen in 2 places), are likely to persist here; thus success or failure implies the same interpretation as before. Secondly, it has been observed that when performing the task of finding an object hidden first under one screen (A) and then under another (B) infants develop a 'place habit'(Willats, 1980), that is, the infant knows that the object is under B but out of habit he first removes screen A and then he removes screen B. The infant's knowledge of the place of hiding became apparent to me when, in the course of administering the task, it was observed that several infants reached for the wrong screen while focusing their gaze on the correct one. By alternating the place of the screen one can control for this 'place habit' since the infants' responses are then guided not by the place of the screen but by its identity.

The sequential placement of this item, to some extent, can be regarded to logically follow from situation 5 and leads to situation 7 since both 5 and 6 involve the presence of two screens, and visible hiding; situation 7 introduces 3 screens and visible hiding.

Scale IV

Situation 4: behaviour in a familiar game.

This situation was omitted since it slightly overlaps with situation 3 (cessation of a spectacle with an object evokes a procedure), and situation 5 (behaviour to a spectacle created by an agent). Furthermore, the situation does not involve a game with toys; it also requires more familiarity between the experimenter and the infant to make the infant accept being tickled or bounced in the air.

Although situation 5 does not involve objects, it was included for the following reasons:

(i) to act as a buffer to dispel boredom or to satisfy the infants' wish to interact socially with the experimenter without involving too much physical contact.

(ii) to examine the level of achievement of causality in the absence of objects and where the source of action as well as its consequences reside within a social agent.

(iii) to measure imitation in the absence of observable consequences, that is, the infant has to imitate the experimenter by moving parts of his body that are not visible to him.

Scale V

(i) Situation 4: follow the trajectory of a moving object.

This was omitted because visual regard is not a typical response of infants within the age range of the present sample, but is characteristic of infants below 6 months.

(ii) Situation 5: recognise the reverse side of objects.

This was excluded after administering it to half the sample, since in most cases it failed to elicit a response and even when a response was made it was difficult to interpret or score it.

For full information on the contents of the scales the reader is referred to Appendix E.

5.4.3 Procedure of Application

Each of the 19 infants received all scales (or the ones suitable for his/her age) once. The age of infants varied at the time of testing: Table 5.1 gives the details of this.

Table 5.1 Age of each infant at the time of administration of the IPDS

Group	Mean
A	7 months
B	10 months
C	13 months
D	16 months

Each infant received the three parts of scale VI first. This is in order to familiarise the infant with the toys of this scale and which were also used in subsequent scales. This initial presentation of the toys was found to make the infants more willing to cooperate later with the experimenter in carrying out the set tasks, and not just manipulate the toys in an exploratory manner. The remaining scales were administered in an unsystematic order, depending on the infants' moods and inclinations.

Score sheets designed along Uzgiris and Hunt's techniques were used. After the infant had performed each item, a mark was placed on the sheet against the appropriate response (see illustration).

Illustration

Item 2 (Scale I) Finding an object which is totally hidden.

a) Loses interest ....

b) Reacts to loss but does not attempt to retrieve toy ...✓....

c) Pulls screen and obtains toy ....

d) Any other response ....

Inter-observer reliability was generally very high. The two observers agreed 96% of the time on Scale I, 84% on Scale IV, 82% on Scale V and 100% on Scale VI.

5.4.4. Scoring Procedure

The scoring procedure has been changed from that of Uzgiris and Hunt where success on a task was determined by one response only, namely, whether or not the infant has performed the 'critical action' (i.e. one from which specific cognitive structures could be inferred). In the present approach, attention was given not only to success versus failure in a task, but also to the degree of efficiency in performing the task and the ways the infant's response approximates the critical action. For this reason a 5-point scale was employed in the following manner:

Score 5: for critical actions attained 100% of the time (i.e. immediate and perfect success).

Score 4: where the critical action was attained less than 100% of the time.

Score 3: when the dominant response is one step below the critical action.

Score 2: when the dominant response is two steps below the critical action.

Score 1: assigned to a response that indicates a capacity not mentioned in the scale.

Three advantages are gained from scoring the infants' performance along a 5-point scale:

Firstly, the extended range of scores gives us a more accurate measure of the infant's level of competence. For example, if an infant achieves steps 5 and 8 on Object Permanence but only approximates the solution to task 6, according to Uzgiris and Hunt's scoring procedure, this infant's performance would appear to be quite erratic since his scores would show complete failure on step 6 but success on step 8. On the other hand, the present system smoothes out the sharp differences between 6 and 8 since the infant's score on step 6 would be lower than his score on step 8, but not nil.

Secondly, the present procedure highlights differences between subjects that may otherwise go unnoticed; for example, two infants may pass the same number of steps with perfect success, but only one of them may partially achieve further steps. In Uzgiris and Hunt's procedure the two infants would be similar on their level of cognitive functioning but according to the present system the one who attempted other tasks would be more advanced than the one who did not.

Thirdly, by assigning a score to the category of 'other responses', the system takes into account those actions that are not listed in the scale but are, nonetheless, indicative of competence.

In any of the scales, if an item was not administered to the infant, it was then given a score which was one point above the one that follows from it; for example, if an infant has missed the task of partial hiding (Scale I) but performed the critical action on the following task of complete hiding 50% of the time, then his score on 'partial hiding' is 5.

For scoring each of the three parts of Scale VI the same range of scores was used. However, since here different toys rather than different situations make up the scale, responses may be the same or different with each toy. In this case the score is determined by the predominant response on all toys. The detailed procedure is described in Appendix E(V).

5.5. Results and Discussion

5.5.1. Age Differences

From figures 5.1 and 5.2 we can see that performance on all the scales increased with age, although after 15 months performance on 'spatial relations' and 'single-object schemes' showed a decrement, while performance on the other four scales underwent little change. Two-way anova (age X scale) revealed a highly significant age effect $F\ (3,15) = 24.7$; $p < 0.0001$. Separate one-way analyses showed an age effect on each scale, while subsequent Newman Kuels comparisons revealed that group A infants had significantly lower scores on all the six scales. Groups A and B did not differ on the scales on 'spatial relations' and 'schemes relating to multiple objects.'

It follows then that with increase in age, infants improve their performance in cognitive tasks. Advancements in tasks pertaining to spatial

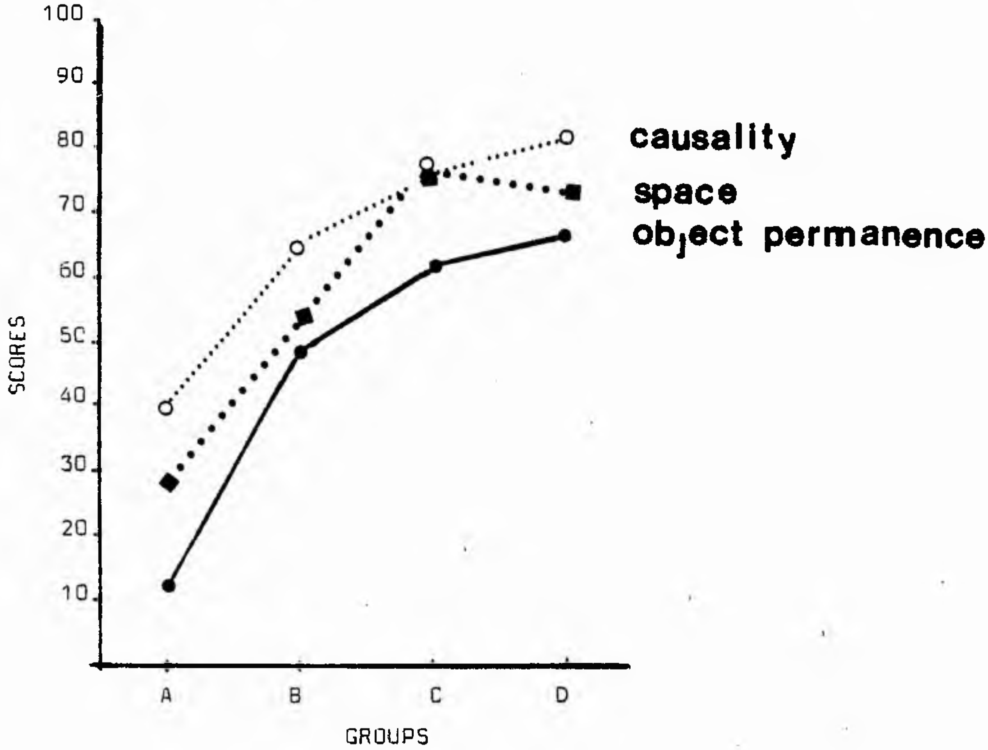

Figure 5.1 Age differences on scales I, IV and V

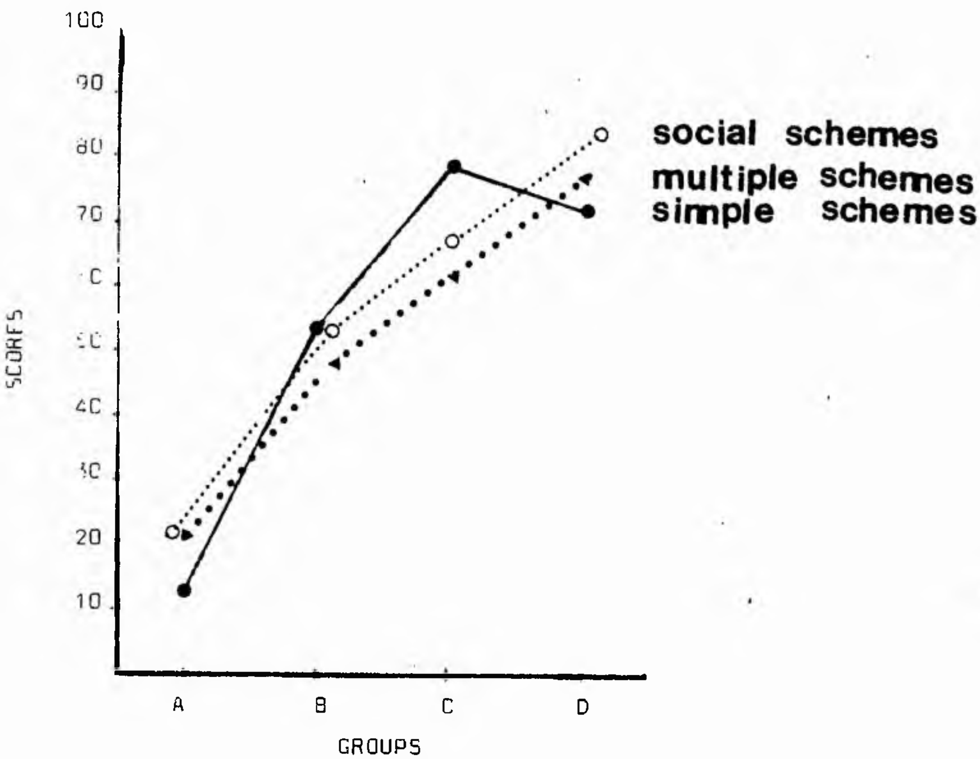

Figure 5.2 Age differences on scales VIA, B and C

relations between objects and the development of schemes relating to multiple objects come later than the other abilities. This finding is in line with Piaget's description of the development of the concept of space as a lengthy process, and his belief that the younger infants' concept of spatial relations is dependent upon an egocentric frame of reference, characterised by reliance on past accommodations to an object, rather than consideration of the object's spatial locations with reference to self and other objects (Piaget, 1936). Supportive evidence for this view, and which is congruent with the present findings, comes from a study by Acredolo (1978) who tested the spatial orientation of three groups of infants, 6-month-olds, 11-month-olds and 16-month-olds. Significant differences were found between the responses of the 6-month-olds and the 16-month-olds; no differences were found between the 6-month-olds and the 11-month-olds. The responses of the 6- and 11-month-olds were described as 'egocentric', while those of the 16-month-olds consisted of correct spatial orientations.

The present finding that groups A and B did not differ on the schemes relating to multiple object is compatible with the lack of difference between the two on the scale measuring spatial relations since both scales involve the spatial coordinations between two or more objects.

5.5.2. Between Scales Comparisons

Figures 5.1 and 5.2 show that for groups A, C and D the worst performance was on object permanence scales, while the highest scores were obtained from the scales on 'causality' and 'single-object schemes'. The figures also reveal that group A infants showed more score-variability across the six scales than the other groups. This was confirmed by two-way anova that showed a significant scale effect, $F(5,75) = 4.74$; $p < 0.001$, while separate within group analyses revealed that the differences in scales were significant only for group A, $F(5,15) = 6.7$; p 0.001.

From these results we can conclude that the infants of this sample tended to be more advanced in some cognitive tasks than others, with the youngest group manifesting this tendency in a significant manner. However, this is largely due to the contents of the different scales where some had more items than others (e.g. permanence) with fewer items clustered around an earlier developmental period (6-9 months). In scale IV (Causality), there were only five items and almost all of these were relevant to an earlier age; hence the high scores on Causality for group A, compared to the low scores on Permanence. Accordingly, there is no comparable basis in these scales which would allow us to say whether or not the infants were advanced on some branches of cognitive functioning more than on others. However, it is possible that for an individual infant, poor performance in one scale may be a reflection of poor performance in others; for example, poor performance in object permanence may be associated with poor performance on the scales measuring spatial, motor abilities (Space and Schemes), since both types depend on the infant's central representation of objects. To determine whether this was the case, for each group multiple correlations were carried out on the six scales (using the Pearson R formula). The results are presented in Table 5.2.

As can be seen from the table, for the youngest group of infants the only significant correlations were found between

'spatial relations' and 'multiple - objects' schemes. On the whole, there was no significant correlation between 'object-permanence' and 'space', nor between 'object-permanence' and 'schemes'. It follows then that development of the concept of space and of schemes proceed independently of the concept of object. However, a positive correlation between object-permanence and schemes with social objects was found during the period of 15-18 months, which implies that increased mastery of object-concept is accompanied by similar increases in schemes relating to social objects. It is worth noting here that this group had the highest scores on both scales ($\bar{X}$ = 67 on permanence and $\bar{X}$ = 82 on schemes with social objects), so it could be that once full attainment of

Table 5.2 Table of intercorrelations between the scores on the six scales, with age included.

Comparisons	r value for each group			
	A	B	C	D
Permanence & Causality	0.33	-0.28	-0.06	-0.14
Permanence & Space	0.77	0.22	0.03	0.76
Permanence & Schemes (A)	0.61	0.30	0.47	0.77
Permanence & Schemes (B)	0.81	-0.23	0.18	0.31
Permanence & Schemes (C)	0.25	0.25	0.59	0.80
Causality & Space	0.80	0.20	-0.48	0.40
Causality & Schemes (A)	0.91	0.46	-0.81	-0.54
Causality & Schemes (B)	0.78	0.80	-0.38	-0.07
Causality & Schemes (C)	0.79	0.54	-0.82	-0.17
Space & Schemes (A)	0.81	0.50	0.60	0.55
Space & Schemes (B)	0.99 *	0.54	-0.07	0.43
Space & Schemes (C)	0.43	0.81	0.46	0.80
Schemes (A) & Schemes (B)	0.88	0.80	0.60	0.42
Schemes (A) & Schemes (C)	0.85	0.32	0.86	0.92 †
Schemes (B) & Schemes (C)	0.50	0.52	0.24	0.38

* r 0.99 at 0.05 for 2 degrees of freedom (2-tailed)

† r 0.91 at 0.05 for 3 degrees of freedom (2-tailed)

the object-concept is reached, its association with relevant branches of cognitive functioning become noticeable.

The scales on causality and schemes are expected to correlate since the ability to realise the connection between cause and effect and the sources of causes, are pre-requisite to performing appropriate actions with objects such as setting an object into motion or fulfilling its technical or social function. Furthermore, as already mentioned in the previous section, the scale on causality has a motivational component which may also be characteristic of the scale measuring schemes since in both cases the infant's agency and spontaneity are emphasised. The relationship between these two scales was revealed with reference to groups A, B and C. In the case of groups A and B, as table 5.2 shows, a positive correlation was found between the scores on 'causality' and the scores on 'schemes with single objects' (group A) and 'schemes with multiple objects' (group B). In both instances the scores on 'schemes' were lower than the scores on causality. (Group A's average scores on schemes was 13.5 versus 40 on causality; group B's average scores on schemes was 54 versus 66 on causality). This implies that at age 6 to 12 months 'causality' is developing at a faster rate than 'schemes', but advances in the former are proportional to gains in the latter. This result confirms the expectation that as the infants' knowledge of cause and effect increases, their repertoire of schemes which is initially poor, becomes more complex and diverse since the infants are progressively more able to perform effective behaviour on objects. However, with such small groups, and with a large matrix of correlations, any such interpretations must be regarded as tentative and especially since the pattern

of correlation

between 'causality' and 'schemes with single objects' was not consistent for the remaining groups. Thus, for group C a negative correlation was found between the two scales.

Concerning the scale on spatial relations, a positive correlation was found between it and the schemes on multiple objects (group A) and social objects (groups B and D). In the case of group A, scores on spatial relations were higher than the scores on schemes with multiple objects but subjects increased their scores on schemes by the same proportion they increased their scores on spatial relations. For groups B and D scores on spatial relations mirrored the ones on schemes, that is, if subjects scored high on spatial relations they also tended to score high on schemes and vise-versa. The findings with regard to group A indicate that 'schemes' are lagging behind 'spatial relations'. Similarly, the pattern of correlations manifested by groups B and D may be indicative of an underlying pattern of the cognitive development of spatial abilities and the acquisition of schemes. Thus, at the period 9-12 months social-object schemes could be developing at a faster rate than during the previous period, while spatial abilities may be developing at a slower rate. This accounts for the similarities between the scores of the two tests. The slow rate of development of spatial abilities is inferred from the finding that groups A and B did not differ significantly on their scores on 'space'. In the case of group D, the rate of development of spatial relations has probably accelerated to match the rate of development of social schemes.

With regard to the intercorrelations between the three sub-scales of the 'schemes' test, positive correlations were found between single-object-schemes and social-objects-schemes for groups C and D. The infants in group C tended to score higher on single-object schemes than on social-object schemes, with subjects who scored high or low on one scale, scoring lower or similar scores on the other scale. The general pattern indicates that single-object schemes are acquired earlier than social-objects schemes. Group-D-infants showed an opposite trend; they were more advanced on social-object schemes than on single-object schemes, or they tended to score similarly on either scale. This contradictory finding could be attributed to the type of toys that were presented with each scale. In part A (single-object schemes) the infants were presented with a crumpled paper, a beaker, a rattle and a box attached to a string. In part C (social-objects schemes) the infants were presented with a spoon, a balloon, a doll wearing a hat, a winding toy, a book, a ball and a friction car. The latter set may have been more exciting to the older infants since they possessed the appropriate schemes for manipulating these objects such as those involved in symbolic and co-operative play. The first set, on the other hand, may have the potential of evoking only primitive schemes such as mouthing, visual inspection and hitting. From Piaget's accounts we know that such schemes gradually disappear from the older infants' repertoire to be replaced by more sophisticated ones such as accommodating two objects in a meaningful manner, fulfilling the social function of an object or using it in an imaginative manner, as well as showing or naming it to others. Such responses constituted the high level scores while the more rudimentary ones constituted the low-level scores. The older infants' responses to part A were characterised by low-level schemes while their responses to part C were characterised by high-level schemes.

5.5.3. Conclusion

Analysis of the infants' performance in IPDS showed that cognitive capacities increase quantitatively from one developmental period to the next, with least development taking place between 6-9 months. Furthermore, the analysis showed that construction of object relations in space and the development of schemes for relating to objects develop at a slower rate than the other branches since the younger infants (6 to 12 months) performed worse on those scales than the older ones (12 to 18 months).

The findings that the worst performance occurred in relation to the scale measuring object-permanence, and the fact that no intercorrelations were found between it and the other scales (except for social schemes at 15-18 months), are contradictory to Uzgiris' results (1973) which indicated that advances on spatial relations, means and ends and causality are strongly dependent upon the attainment of object concept. The infants in the present study were found to perform better on scales with motivational components and ones that involved the manipulation of objects rather than the procuring of vanishing ones.

Intercorrelations between the different scales were generally low, and only few of them were significant. They seemed to indicate that causality and space are dependent on schemes. In Uzgiris' data the correlations were much lower, although they tended to form more definite clusters that were indicative of specific underlying factors that pertain to distinctive abilities.

The use of Piagetian scales in the present study was helpful since the scales revealed which aspects of intelligence developed independently of the others, and which ones were associated together. The scales also highlighted individual differences among the infants which could be attributed partly to age differences but they could also point out the possibility of environmental factors accounting for the differences. Since this study is concerned with examining the association between environmental conditions and cognitive development, the IPDS, as will be shown in Chapter VII, can be used as a starting point for determining whether the differences among the infants are associated with differences in their experiences.

CHAPTER VI

DESCRIBING THE MOTHER-INFANT PLAY-RELATIONSHIP

CHAPTER VI

CONTENTS: Page

6.0 Introduction

For Hinde (1979), a relationship involves a series of interactions that are extended over a period of time. He also suggests that understanding a relationship requires the examination of what goes on between the participants during each interaction, and the quality of such interaction, as well as the pattern of continuity between their past, present and future interchanges. To understand the relationship between a mother and her infant we need to examine a series of interactions between them with reference to the following:

1. Specifying the dimensions of the relationship. Here we specify whether we are focusing our attention on all aspects of a relationship or whether we are selecting one or few dimensions and studying them separately. Hinde describes the mother-infant relationship as 'multiplex' since it involves responses from several domains such as care-taking, playing, protecting and loving. This is in contrast with a 'uniplex' relationship, one that is concerned with only a limited dimension of interchanges, such as those involving maternal-filial responses. Thus, when viewed as a whole, the mother-infant relationship is multiplex, although we can examine separate 'uniplex' interactions evolving round a single theme. If, for example, the mother is bathing her baby she may concentrate on that task only, or she may integrate it with cooing to-, smiling at-, and kissing her baby. Therefore, one can look at certain aspects of the relationship in isolation from others. In doing so, we may consider the unitary aspects as a prototype of others; for example, the feeding situation is regarded as a prototype of all mother-infant dyadic exchanges (Schaffer and Crook, 1978). In this research, the main objective for selecting and isolating playing with objects as a topic for study is not to determine the extent to which this type of interaction is prototypic of the mother-infant relationship, rather object-

play was selected for the belief that it may have important developmental outcomes. Nonetheless, in isolating it from the overall relationship we must bear in mind that interpersonal play may be affected by other types of interchanges between mother and infant, such as affiliative ones. For example, a warm and loving mother may play more frequently with her infant than a rejecting mother, and, moreover, the significance of the same play behaviour may be different for an infant who has a warm mother-infant relationship compared to one who does not. Thus the relationship between affiliative and cognitive aspects of the mother-infant interchanges become intricate, and to fully understand the one we must have access to the other. While in theory this is what we should be doing, in practice it is not economical to perform. For the present, therefore, we shall content ourselves with focusing on only one dimension of the relationship.

2. Identifying and quantifying the activities by which the participants of a relationship fulfil their roles, and the stability or changes in such activities. It is important to describe and quantify the contents of a relationship because, as Hinde (1979) points out, "........whilst we may manage our relationships with moderate success, we are not always adept at pin-pointing their special characteristics, describing them to others, or generalising about them" (page 40). Description of the content of a relationship facilitates an understanding of the roles each partner adopts; for example, in the present study a mother who 'enhances' the infant's interaction with objects more frequently than she 'modifies' it (Chapter III) could be regarded as adopting a relatively passive role towards her infant's play. Specifying the content of interaction also provides us with an index of its diversity, that is, whether the mother's and/or infant's object-play activities are of one predominant type, being directed towards one particular theme, or whether the activities are varied,

evolving round several themes. Finally, quantifying the content of interaction enables us to detect differences between relationships as well as within a single relationship at different points in time. Thus, in Chapter III of this thesis I have examined the content of the mothers' interaction and the temporal stability or changes of her activities across a period of three months. I have also examined the differences in content between four groups of mothers, each group representing a different developmental period in relation to their infants' age. Similarly, in Chapter IV the activities of the infant, the other partner in the relationship, were also quantified and their changes over time were examined.

3. Evaluating the qualities of a relationship. Value judgements regarding the quality of a relationship are often made, first, on the basis of whether or not the partners' responses are well integrated, so that the interaction between them proceeds in a smooth and balanced fashion with respect to turn-taking and floor apportionments (Argyle and Kendon, 1967; Duncan, 1972). For reasons which will be discussed later interpersonal synchrony is an important evaluative criterion of mother-infant interaction. A second criterion involves the complementarity between the partners' responses. For Hinde (1979) a complementary interaction is one in which "the behaviour of each participant differs from, but complements, that of the other" (page 79). In studying parental support of cognitive development in infancy, we already assume that what the parent brings into the interaction is quantitatively and qualitatively different from what the infant brings. If the behaviour of the parent is to be 'supportive' to the infant's cognitive development, then it must complement that of the infant, and the infant's activities must also complement the mother's. Thus, in this chapter the cognitive compatibility between the mother's behaviour and the infant's will be considered.

Compatibility may also become evident from the outcomes of interactions, that is, whether or not the partners achieved any goals they may have tried to pursue in the course of their interchanges. In the case of the mother and infant, the mother may try to teach the baby a particular skill. If the infant masters that skill then we regard that episode of their interaction as successful since it achieved the desired outcome.

These two criteria will be discussed in more detail in the next section, to be followed by a description of the procedure that was employed in applying the criteria to the mother/infant data. Finally, the results obtained from such procedures will be presented and discussed.

6.1 Evaluating the mother-infant interaction with objects

6.1.1 Interpersonal Synchrony

A number of studies in mother-infant interactions have been concerned with analysing streams of the behaviour of the mother and the infant during feeding (Kaye, 1977), vocal interchanges (Schaffer et al, 1977), social games (Bruner and Sherwood, 1975) and interchanges evolving round objects (Collis, 1977). The outcome of these studies was a new perspective of the mother-infant relationship, namely, its consideration as a 'dyadic system' in which each partner adjusts his or her own behaviour to the ongoing behaviour of the other partner. During feeding, for example, mother and infant alternate roles with the mother being passive during the infant's bursts of sucking, and active (jiggling, stroking and talking) when the infant ceases to suck (Kaye, 1977). From these studies it also emerged that the mother is the primary source of the regulation of interchanges since she "allows herself to be paced by the infant's spontaneous behaviour" (Schaffer and Crook, 1978). Although initially the infant is pre-adapted to respond to his mother's stimulation and to evoke responses from her, he is incapable of taking the initiative and regulating turn-taking during social exchanges. However, as he gets older he becomes progressively more able to initiate and reciprocate interchanges. Considerable mastery of such a skill is attained towards the end of the first year when the infant acquires a reciprocal mode of exchange which is defined by Bruner (1977) as one that is "organised around a task that possesses exteriority, constraint and division of labour" (page 282). This is manifested in the example of "Give and Take" which progresses gradually from being a one-sided activity in which the mother is the initiator and giver, to a ritualised game in which both partners play reciprocal as well as complementary roles.

The developmental significance of interpersonal synchrony is emphasised by Shaffer and Crook (1978) who see dyadic interactions as essential for the child's social development and gradual integration into the culture to which he belongs. Furthermore, during such interchanges the child's conception of himself, others and the inanimate world undergoes rapid changes. Several authors have shown that the adult-infant dialogue provides a context for language learning (Bruner, 1977; McShane, 1980) and for learning rules and social conventions (Bruner and Sherwood, 1975). Of more relevance to the present issue is Collis and Schaffer's studies which showed that interpersonal synchrony, manifested through vocal interchanges and visual co-orientations, provides the mother and infant with opportunities to pursue topics of conversation that focus around objects (Collis, 1977; Collis and Schaffer, 1975). In the more recent study by Schaffer and Crook (cited above) it was shown how behavioural synchrony increases the likelihood of the effectiveness of the mother's control techniques when attempting to change the course of her infant's behaviour. Thus, the mother 'selects' the type of control and 'times' it with reference to the infant's ongoing activity, and by doing so she maximises the chances of the infant's compliance to her, and reciprocation of her actions. For example, action control techniques (those requiring the infant to perform a specific task with a specific object) tended to occur when the infant was already in contact with the relevant object (Schaffer and Crook, 1979). It follows, then, that the more synchronised the mother-infant dialogue is, the more likely that parental support would achieve a beneficial effect. When we consider this in relation to the maternal Hierarchy that describes parental support in a structured interpersonal play situation we expect that the types of 'create possibilities' to be congruent with the types of infant's activities with objects that fulfil similar communicative functions. Thus, if the infant is engaged in solitary play 50% of the time, we expect the mother to 'provide a stable base' also for 50% of the time. Therefore, examinations of the correlations between the mother's categories that describe her mode of exchanges and the corresponding infants' activities could enable us to assess the degree of interpersonal synchrony between them. An alternative method is to employ 'microanalytic' techniques for examining the temporal patterning between the behaviour of the mother and that of the infant and their sequential arrangements. By doing so, we do not only look, for example, at the amount of 'provide stable base' and 'solitary play' and the relationship between them, but we also examine each episode of 'solitary play' and whether or not it was accompanied by 'provide stable base'. This technique elucidates the direction of interaction, which may help in unravelling the links between cause and effect; for example, if the mother shifts her behaviour from 'provide stable base' to 'assist' we examine the conditions that may have led to such a shift by referring to the infant's activity that preceded the shift in maternal behaviour. However, employing such detailed techniques comprehensively is time consuming especially when large amounts of data, as in the present case, are involved. Therefore, sequential analysis was applied selectively to data constituting the case-studies to be presented here and in the next chapter.

6.1.2 Cognitive Compatibility

As already mentioned, since the gap in cognitive abilities between parent and infant is great, then mother-infant interactions are complementary rather than reciprocal (Hinde, 1979). In Chapter IV of the thesis it was also mentioned that adopting forms of support that are within the margins of the infant's ability increases the likelihood of the infant's appropriate and successful responding to the parent's behaviour, and in the long run, the parent's behaviour would be more effective in enhancing the infant's sensorimotor development. In this chapter we shall, therefore, look at the forms of 'create possibilities' in relation to the infants' activities and examine to what extent the two are complementary to one another, on a cognitive level. Underlying this approach is the assumption that parental support is significant for the infant's cognitive functioning in four ways; that is to say, there are four sorts of consequences to be examined:

Firstly, the mother's behaviour provides the infant with information that is of immediate and direct relevance to their current interactions, such as in its being instrumental to the achievement of goals. Thus, if the mother teaches the infant to build a tower, then the infant is likely to acquire that skill through imitation of the mother.

Secondly, the mother's style of support may affect the infant's current and future performance in an indirect manner through providing him with general strategies for approaching problems and acquiring skills (Chapter III). In this case the content of the mother's support need not correspond directly to the content of the infant's play. In the previous example, 'teaching' is complemented by 'imitation'. In this instance, however, the link between what the mother does and what the infant does is less obvious; for example, 'provide stable base' may facilitate cognitively high- or low-level 'solitary' acts.

Thirdly, certain experiences during interactions may be associated with some aspects of sensorimotor intelligence; for example, if the mother frequently hides objects in boxes, under covers and behind screens and invites the infant to find them, her activities may contribute to the infant's advancement in object permanence.

Fourthly, activities which the infant performs during the presence of his mother may differ in terms of their cognitive complexity from his performance in a test measuring his cognitive abilities. As was mentioned in Chapter V, during joint play with mother an infant may be highly motivated and consequently he would perform better than in a test situation. The reverse is, of course, possible.

To determine how the infant's play relates to the mother's activities on the one hand, and to his own performance in cognitive tasks, on the other hand, the infant's activities were correlated with the mother's activities and with the infants' scores on the IPDS.

6.2 Methodology

Analysis of the data was carried out in two parts. In the first part frequency data representing the infants' average scores on each of the four major categories, as well as some of their sub-categories were matched with the figures representing the mothers' average scores on categories belonging to various levels of the Hierarchy. A series of multiple correlations were then applied to the data in order to determine the extent of correlation between the mothers' behaviours and the infants' corresponding activities for each of the four age groups. In the second part each infant's score on each of the six scales of the Uzgiris and Hunt's test (IPDS) were correlated with selected maternal categories and then the scale on schemes with multiple objects was correlated with the four major categories that describe the infants' forms of interpersonal play.

Correlating the infants' activities with the mothers', as well as the infants' and mothers' behaviours with the IPDS was based on two main themes. The first theme examines the interpersonal synchrony between the mother and infant during joint interactions with objects. Here infants' activities that fulfil communicative functions with or without reference to the cognitive level of the behaviour were selected for comparisons with the maternal activities that fulfil similar functions. Beginning with the mothers' categories at level 2 of the Hierarchy and which describe the two main roles which mothers may adopt in relation to their infants' play, the two categories were correlated with each of the four major infants' activities. The passive role of 'enhance' was expected to correlate positively with the infants' activities that are pursued relatively independently of other participants such as 'solitary', 'contact' and 'negative' acts, whereas with 'sequential' acts there would be no correlation or a negative one with 'enhance', but a positive one with 'modify' since the latter involves mutual exchanges between mother and infant (Table 6.1).

Table 6.1 Expected correlations between the two maternal roles and the infants' activities

Maternal Category	Infant Category	Expected direction of correlation
Enhance	Solitary/Contact acts	Positive
Enhance	Sequential acts	Negative
Enhance	Negative acts	?
Modify	Solitary acts	Negative
Modify	Contact/Negative	?
Modify	Sequential acts	Positive

On a lower level of the Hierarchy, particular maternal categories were correlated with infants' activities that were communicatively complementary to the mothers'. Thus since 'eliminate undesirable behaviour' is responsive to the infants' 'negative' acts, the two would be expected to correlate positively. 'Participate from background' is directly compatible with 'solitary' acts, less so with 'contact' and 'negative' acts and incompatible with 'sequential' acts. 'Support manipulation' would be reciprocated by 'contact-acts' while 'reveal objects's property', 'create discovery environment' and 'demonstrate/teach' would be reciprocated by the infant's attention to his mother (Table 6.2). If the two participants' activities that are specified in Table 6.2 showed a positive correlation then we may regard the interactions as synchronous. If, however, the correlations were poor or negative, or positive between two incompatible categories, then we may conclude that synchrony was not achieved or well maintained between the mother and her infant.

However, it is possible for two compatible categories to be positively correlated without necessarily being in synchrony if the correlation was based on performance of these behaviours at different times. Similarly, incompatible categories may correlate together but if they were performed at different times they would not indicate a lack of synchrony. Because of this problem assessment of interpersonal synchrony cannot depend on correlational analysis only, but it needs to be complemented by analysing the temporal patterning of compatible or incompatible categories of behaviour as they occur in mother-infant interactions. This analysis was employed here with reference to eight subjects only who constituted the case studies presented in Chapter VII. Full description of the procedure will be given in the next chapter.

The second theme deals with the cognitive compatibility between the mothers' forms of support and the infants' level of performance . As

Table 6.2 Expected correlations between the sub-categories of 'enhance' and 'modify' and the infants' various activities

Maternal Category	Infant Category	Expected direction of correlation
Eliminate	Negative acts	Positive
Participate	Solitary/Contact acts	Positive
Participate	Sequential acts	Negative
Participate	Negative acts	?
Support manipulation	Contact acts	Positive
Reveal object's property	Attend	Positive
Create discovery environment	Attend	Positive
Teach/Demonstrate	Attend	Positive

mentioned earlier, this theme was examined with reference to the mothers' and infants' behaviour, the mothers' behaviour and the infants' scores on IPDS, and, lastly, the infants' behaviours and their scores on the scale measuring schemes with multiple objects. Concerning the compatibility between the mothers' forms of support and the infants' activities the two maternal roles that constitute level 2 of the Hierarchy, were first correlated with the sub-categories of 'solitary', 'contact' and 'sequential' acts that describe the infants' level of cognitive competence when engaged in solitary or sequential play (Table 6.3). The aim here was to determine whether both maternal roles were associated with advanced cognitive performance to an equal extent. The correlations were then extended to the sub-categories of 'enhance' and 'modify' and the various infants' activities that were judged to correspond to them. These are specified in Table 6.4.

Table 6.3 Correlations of categories that represent cognitive compatability between the mothers' roles and the infants' acts

Maternal Category	Infant Category	Expected direction of correlation
Enhance	High-level solitary acts	+
Enhance	Construct	+
Enhance	Low-level solitary acts	-
Enhance	Contact-acts	+
Enhance	Look at toy	-
Modify	High-level solitary acts	?
Modify	Construct	?
Modify	Low-level solitary acts	+
Modify	Contact-acts/Look	?
Modify	Manipulative sequential acts	+
Modify	Non-manipulative sequential acts	-

The compatibility between the mothers' forms of support and the infants' scores on the IPDS was examined through correlating the scores on each scale with each of the seven maternal categories of level-3 of the Hierarchy since these categories denote the different areas of cognitive development which the mothers are likely to foster (Chapter III). For example, as Table 6.5 specifies, 'provide stable base' may foster abilities that develop from the infants' repeated encounters with objects, but without much intervention from adults; such abilities would be 'object permanence' and simple schemes (with single objects). 'Support manipulation' brings about more encounters between the infant and objects and, therefore, it may also support the development of 'object-permanence' and simple schemes. The

Table 6.4 Correlations of the categories that represent cognitive compatibility between the mothers' behaviour and the infants' activities.

Maternal Category	Infant Category
Provide stable base	Solitary, Contact, Sequential and negative acts
Support manipulation	" " " " " "
Assist	" " " " " "
Reveal object's property	" " " " " "
Reveal object's property }	Manipulative and non-manipulative
Create discovery environment }	sequential acts
Demonstrate/Teach	Solitary, Contact, Sequential and negative acts
Participate	High-level, low-level solitary acts
Participate	Construct
Fulfil	Look, attend, construct, discover
Elicit	" " " "
Demonstrate/Teach	Look, attend, construct, imitate

other categories of the 'modifying' roles would be expected to foster areas of cognitive functioning that are more dependent on manipulating objects when interacting with others. Examples of these cognitive abilities are 'causality', 'space' and complex schemes (with multiple and social objects).

Finally, the infants' scores on the scale measuring schemes with multiple objects were considered jointly with the infants' major activities. The rationale behind this analysis was that advancement in one area of cognitive functioning, as measured by the Piagetian scales, would also be reflected in the infants' daily activities with their mothers. For example,

Table 6.5 Expected correlations between maternal categories and the infants' scores on the IPDS

Maternal Category	Scales					
	I	IV	V	VIA	VIB	VIC
Provide stable base	?	+	+	+	+	+
Support manipulation	+	?	?	?	?	?
Assist	?	+	+	?	?	?
Reveal object's property	?	+	+	+	+	+
Create discovery environment	+	+	+	+	+	+
Demonstrate/Teach	?	+	+	+	+	+

an infant who shows an advancement on this scale would probably engage in 'sequential' acts frequently, characterised by constructing structures such as towers jointly with the mother.*

6.3 Results & Discussion

6.3.1 Interpersonal Synchrony

As can be seen from Figure 6.1 when mothers adopt the passive role of 'enhancing' the infants' play with objects, the correlations between that role and the infants' various activities are generally low.

Contrary to the expectation that 'enhance' would correlate positively with 'solitary' play, there seems to be little relationship between the two. Furthermore, a low, negative correlation was found in the case of group A, and a negative one for group C ($r = -0.81$).

Since for all groups the frequency of 'enhance' exceeded that of 'solitary' acts, we infer that mothers' 'enhancing' was associated with other activities besides 'solitary' ones. Thus, the low and sometimes

*The correlations of the IPDS scores with the mothers' and infants' activities utilised the average frequency of behaviour taken from the total number of visits. The rationale for this is given at the end of appendix E.

negative correlations can probably be attributed to the fact that 'enhance' is relevant to several activities of the infants.

How, then, does 'enhance' relate to the other infants' activities? Figure 6.1b and 6.1d show that the correlations between 'enhance' and 'contact' and 'negative' acts are low, but they are all positive. With reference to 'sequential' acts, as expected, there was a negative correlation between them and 'enhance' except in the case of group A.

These findings show that there is a tendency for the mothers' passive role to be compatible with the infants' different types of activities in that the more the 'enhancing', the more the 'contact' acts performed by the infants, and the less is their 'sequential' play. However, the behaviours are incompatible in terms of 'enhance' and 'negative' acts.

When mothers adopt the directive role of 'modify' as Figure 6.1 shows, the relationship between that role and the infants' behaviours is more definite, as the amount of correlation is greater than that between 'enhance' and infant behaviour. 'Solitary' acts are unrelated or negatively related to 'modify' at 6-12 months, but the relationship between the two behaviours is positive after 12 months and significant during the period 12-15 months ($r = 0.97$; $p < 0.01$).

'Contact' acts and 'negative' acts follow similar patterns in terms of their association with 'modify'. At earlier ages 'modify' is positively related to both 'contact' and 'negative' acts while for older infants the correlations are negative. Among the infants' activities 'sequential' acts showed the best correlation with the mothers' role of 'modify' for the two behaviours correlate positively and significantly for all four groups. Also, 'modifying interaction' is positively and significantly associated with 'responsive-sequential' acts, while the correlation between 'modify' and 'initiative-sequential' acts is either negative as in the case of groups B and C, or low but positive as in the case of groups A

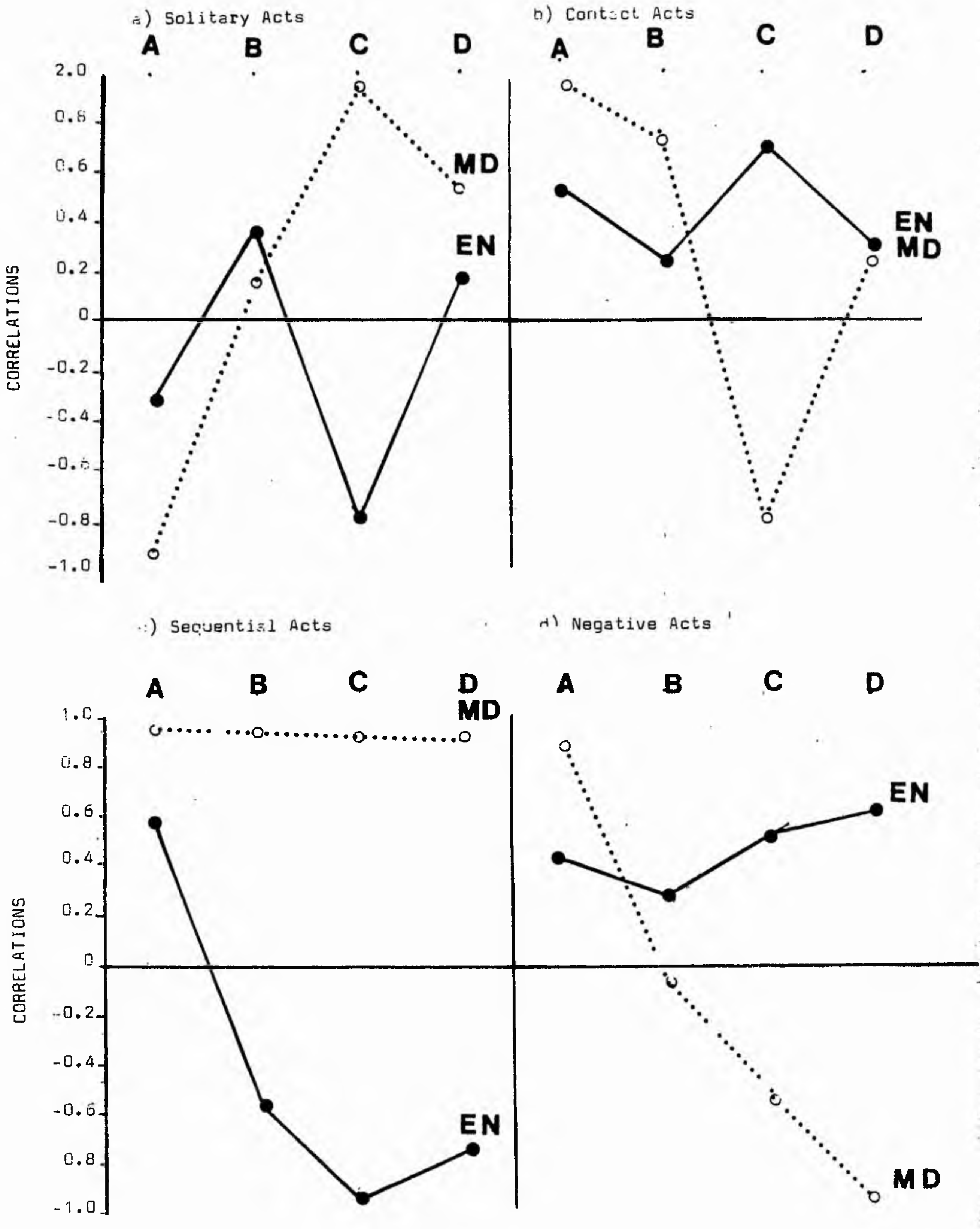

Figure 6.1 Relationship between the mothers' passive role of 'enhance' and directive role of modify, and the infants' activities

and D (Figure 6.3e). These results indicate that the infants were largely reactive to their mothers' 'modifying' behaviour and they well reciprocated her initiatives. 'Modifying interaction' seemed to facilitate cooperative play in general during the periods 6-9 months and 15-18 months. Thus, during these two periods infants responded to their mothers' modifying activities not only by reciprocating them but also by initiating similar sequences with her.

Overall, mother-infant interaction during the period 12-18 months was characterised by more synchrony than interactions during the period 6-12 months. Thus, at 12-18 months, the negative correlation between 'modify' and 'contact' acts indicates neither synchrony nor its lack, while a positive correlation, as in the case of groups A and B, would contribute to synchrony only if the infants were not contacting toys simultaneously with the mothers' 'modifying'. The same can be said with respect to the negative correlation between 'modify' and 'negative' acts at 12-18 months. On the other hand, at 6-12 months the negative correlation between 'modify' and 'solitary' acts could indicate more synchrony than the positive correlation that characterised the period of 12-18 months. This is because the negative association minimises the possibility that both partners were performing an active role simultaneously, or that 'modifying' acts were followed by 'solitary' acts in which case, the infants would not be reciprocating the modifying activities. The positive correlations between 'modify' and 'sequential' acts at all ages is congruent with the expectation that the more 'modifying' the mothers do, the more the infants' reciprocal 'sequential' acts. Thus, the directive role and its complementary counterpart provide the best index of interpersonal synchrony among the mothers and infants of this sample. 'Modifying' at the earlier age of 6-12 months was also associated with 'object-contacts' and 'negative' behaviour. The association of 'modify' with 'negative' acts could be interpreted as indicative of lack of harmony between mother and infant at that period. However, only sequential analysis of the data could determine whether this was the case for if 'modify' activities invariably followed from infants' 'negative' acts, then we may conclude that the mothers' role was reactive to the infants' type of play. If the opposite was found, that is, 'negative' behaviour following 'modifying' behaviour then 'negative' acts could be regarded as reactive to the directive role, and, consequently, 'modify' would be an inappropriate form of support of younger infants' play.

Further assessment of interpersonal synchrony will focus on the sub-categories of the two maternal roles and the corresponding infants' categories:

(i) Sub-categories of 'Enhance'

Within 'Enhance', if the mother is 'providing stable base' we would expect her activities to be associated with the infants' negative behaviour when she is 'eliminating undesirable behaviour' and with his 'solitary acts' when she is 'participating from background'; if the mother is 'supporting manipulation', we would expect her activities to be related to the infant's 'object-contact' acts. Figure 6.2 shows the relationship between these behaviours.

Concerning 'eliminate' and 'negative' acts, as can be seen from Figure 6.2a, the two categories are positively correlated. The amount of their correlation increases with age and reaches a significant level at 15-18 months ($r = 0.95$; $p < 0.01$). This confirms the expectation that infants who engage in a lot of negative behaviour would have mothers who 'eliminate undesirable behaviour' a great deal, and thereby maintain the harmony of their infants' interaction with them and with objects. This tendency was more noticeable among groups C and D than groups A and B. Thus, it seems that mothers of younger infants were less responsive to their

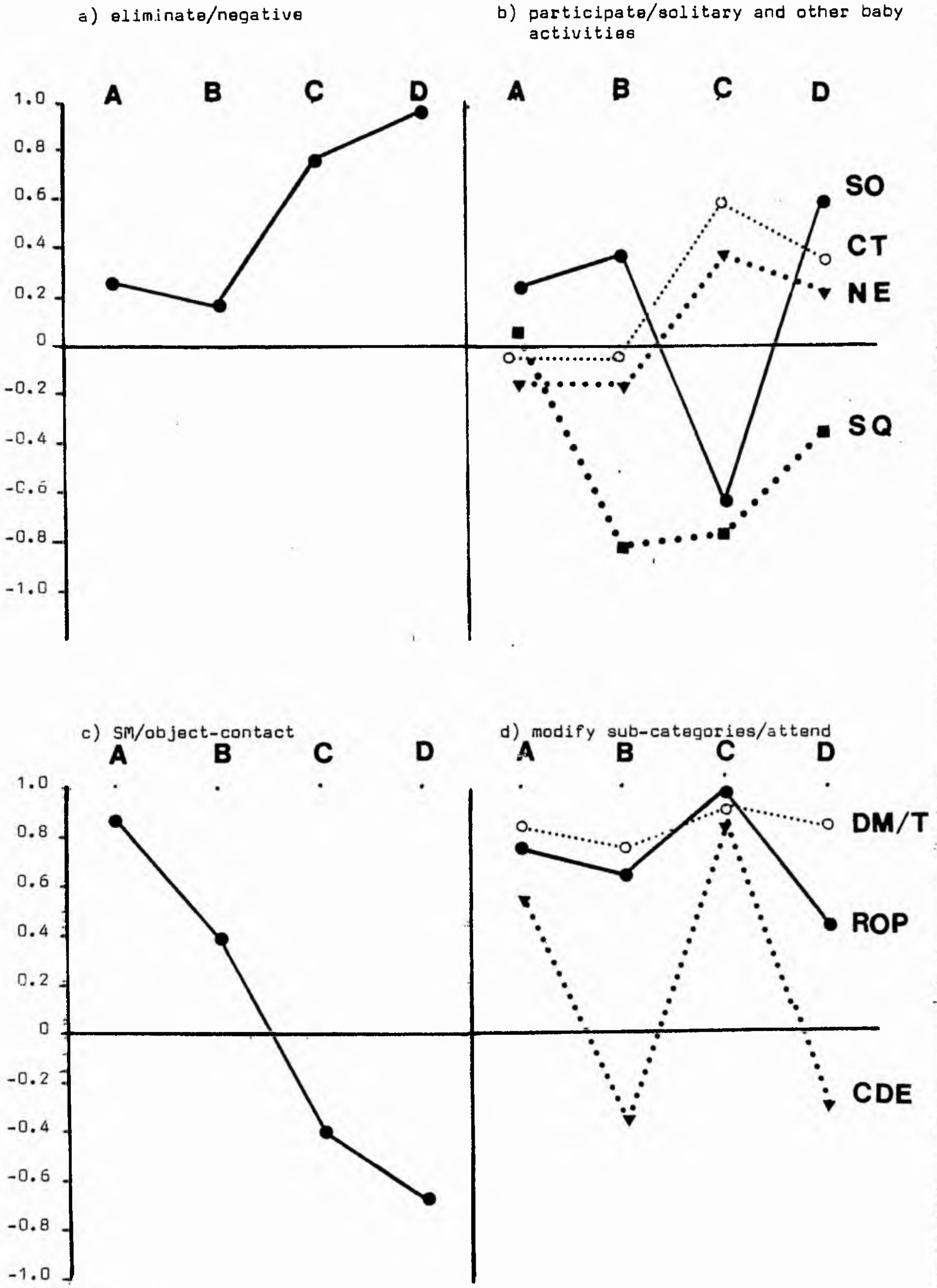

Figure 6.2 Relationship between the sub-categories of 'enhance' and the corresponding infants' categories

infants 'negative' acts (by directly eliminating such acts) than mothers of older infants. This may lead to earlier mother-infant dialogues to be less balanced than later dialogues. However, even in the case of groups C and D not all 'negative' acts were dealt with in terms of 'eliminate' since there were more incidents of 'negative' acts than 'eliminate'. The question remains, how did the mothers respond to 'negative' acts when they did not eliminate them and were the mothers' responses appropriate for maintaining the harmony of the interaction? The correlational analysis on its own cannot answer these questions. This aspect of interaction will, therefore, be examined further through a sequential analysis of the data which will be presented in the next section.

As can be seen from Figure 6.2b, there is no relationship between 'participate from background' and 'solitary' acts. Despite this lack of a relationship between the two complementary behaviours, synchrony may have still been maintained since the frequency of 'participate' was greater than the frequency of 'solitary' acts. This also implies that the mothers 'participated from background' in response to other infants' activities such as 'contact', 'negative' and 'sequential' acts. In the case of 'participate' and 'contact' acts the interaction would still be balanced since the mothers would be responding to spontaneous infants' play, in which the mother is passive and the infant is active. If the mothers were 'participating from background' when their infants were engaged in 'negative' acts, that is, mothers watching or commenting on the infants' distress, distraction, substituting play or abandoning play, then the behaviour of the two partners would not be in synchrony since the interaction with objects is disrupted, although the activities of the mother would still be congruent with the infant's because the infant is playing the active role while the mother is adopting a reactive role. It is only when the mother participates and the infant performs 'sequential' acts that the interaction is not only desynchronised but also incompatible since the mother's passive participation would not be reciprocal to the infant's initiatives towards mutual exchanges. However, as Figure 6.2b shows, 'sequential acts' correlate negatively or not at all with 'participate'. This indicates that there was no incompatibility between the mothers' participation and the infants' responsive activities.

With regard to the relationship between 'participate' and 'contact' and 'negative' acts, Figure 6.2b shows that the infants' activities were negatively correlated with the mothers' at 6-12 months, but at 12-18 months there was a low positive correlation between the two partners' activities. Thus, mothers of older infants showed a slight tendency to 'participate from background' in response to their infants' 'negative' and 'contact' acts.

The second component of the enhancing role is 'support manipulation'. Figure 6.2c shows that this category correlated well with the infants' corresponding category of 'object-contact' acts only for group A, ($r = 0.98$; $p < 0.01$). For group B the amount of correlation decreased but it was still positive. Groups C and D, however, showed a negative correlation between mothers' 'support manipulation' and the infants' 'contact' acts. These results seem to indicate that 'contact' acts were more dependent on 'support manipulation' at an earlier age. As infants got older they performed more 'contact' acts than their mothers' 'support manipulation', and the negative correlation may result in part from this. This may mean that at a later age infants initiated contacts with toys without their mothers' support. Since the frequency of 'contact' acts was greater than the 'support manipulation' it is possible that all instances of 'support manipulation' were responded to by 'object-contacts', so that the behaviour of mother and infant was still balanced.

(ii) <u>Sequential analysis of the sub-categories of 'Enhance'</u>

Tables 6.6 - 6.8 show the sequential relationship between 'participate' and the infants' activities. It can be seen that a large proportion of 'participate' was associated with 'solitary' acts that occurred either simultaneously with it, prior to it, or immediately after it. This confirms the expectation that 'participate' was synchronised with solo play. Besides 'solitary' acts, 'participate' was also associated with 'contact' and 'negative' acts, and, in a few instances, with initiative sequential acts. Of these only the association with 'negative' acts are indicative of a lack of synchrony between mother and infant. A 'participate'- response to initiative sequential acts is still compatible if it is in the form of 'receiving' an object the infant was offering or commenting on information he had exchanged with her. If we combine the activities that indicate compatibility and compare them with the ones that imply a lack of harmony, as in Table 6.9, we find that for groups A and B 76% of 'participate' behaviour was in synchrony with the infants' activities, and only 24% was not. For groups C and D synchrony improves, reaching the percentage of 84 for group C and 88 for group D. However, this increase may be due to the older infants' increasing capacities to perform more 'solitary' and 'contact' acts which led to an increase in 'participate'. Thus it is not the case that mothers of older infants 'participated' less with respect to their infants' 'negative' acts, but rather they increased their behaviour in proportion to increases in solo play. Negative acts may have received the same amount of participate at all ages (Chapter IV). This leads to the conclusion that the earlier dialogues were not less harmonious than the later ones.

Table 6.6 Percentage of mothers' 'participate from background' that occurred simultaneously with the four major infants' activities

Groups	Infant acts			
	Solitary	Contact	Initiative Sequential	Negative
A	39	22	0	20
B	38	24	3	21
C	44	26	2	13
D	44	27	3	10

Table 6.7 Percentage of mothers' 'participate from background' that were followed by the four major infants' activities

Groups	Infant acts			
	Solitary	Contact	Initiative Sequential	Negative
A	0	2	0	2
B	1	1	0	1
C	0	1	0	1
D	0	0	1	1

Table 6.8 Percentages of 'participate from background' that followed from the four major infants' activities

Groups	Infant acts			
	Solitary	Contact	Initiative Sequential	Negative
A	10	2	1	2
B	3	2	4	2
C	6	3	2	2
D	6	3	4	1

Table 6.9 Percentages of 'participate from background' that synchronised or not synchronised with the infants' activities

Groups	Infant acts	
	Synchrony	Lack of Synchrony
A	76	24
B	76	24
C	84	16
D	88	12

Concerning the relationship between the mothers' behaviour and 'negative' acts, the sequential analysis revealed that 'negative' acts were mostly preceded by 'enhance interaction' and only a small proportion of them were preceded by 'modify interaction' (Table 6.10). Furthermore, for the younger group the proportion of 'negative' acts preceded by 'enhance' was similar to that of the other groups. This rules out the possibility, suggested earlier, that the positive correlation between 'modify' and 'negative' acts at 6-9 months was due to their sequential patterning and, consequently, it is not the case that the infants were reacting negatively to their mothers' modifying activities. Rather, the positive association may be partly due to the mothers responding with 'modify' to their infants' negative behaviour. As Table 6.11 shows, 36% of the infants' acts were responded to by 'modify/support manipulation' during the period of 6-9 months as opposed to 14% and 26% during the other periods. This leads to the conclusion that the positive correlation between 'modify' and 'negative' acts does not suggest a lack of synchrony of mother-infant behaviour at 6-9 months.

Table 6.10 <u>Percentage of negative acts that were preceded by various maternal activities and external events happening in the environment</u>

Maternal behaviour	Group			
	A	B	C	D
Non CP	18	17	15	10
Enhance interaction	59	78	60	69
Modify interaction	23	4	21	19
External events	0	1	4	2

The association of 'enhance' and 'negative' acts can be accounted for partly in terms of 'support manipulation' and one of the sub-categories of 'provide stable base', namely, 'eliminate undesirable behaviour'. Thus, a small proportion of 'negative' acts was brought about by 'support manipulation' (Table 6.12), when offering a toy or encouraging the infant to procure it was responded to by the infant's refusal or by abandoning play altogether. Another small proportion of 'negative' acts was brought about by 'eliminate undesirable behaviour' when the mother's initial efforts to cope with negative acts had failed and so she had to repeat her 'eliminating' actions. However, the majority of 'negative' acts were preceded by 'participate from background'. This can be attributed to the fact that 'participate' was the predominant form of maternal involvement in the infants' play and, consequently, it was bound to be associated with 'negative' acts, as well as the other acts, more than 'modify' was. Moreover, prolonged episodes of 'participate' were more likely to result in 'negative' behaviour since the mothers' inactivity and passive participation may lead to the infants' boredom with his 'solitary' themes. In such a case, too long periods of 'enhancing' may have been responsible for the disruption of the harmony of interpersonal play.

With regard to maternal responses to 'negative' acts, Table 6.11 shows that only a very small proportion of these was responded to by 'eliminate undesirable behaviour', with group-A- mothers responding more than the others. Mothers tended to respond to their infants' negative behaviour mostly by background participation and, to a lesser extent, by directly intervening to re-establish the infants' contact with the toys ('support manipulation') or re-channelling the direction of his activities ('modify interaction'). Thus mothers either responded to negative behaviour ('eliminate', 'support manipulation' and 'modify') or, more or less ignored or accepted it ('no response', 'participate'). If we combine the figures for the 'responding' class of categories and the non-responding class, we find that for group A 62% of their negative acts were actively dealt with, while 38% were not. For the other groups, however, a larger proportion of 'negative' acts (58% - 70%) were not dealt with in a direct manner. These findings indicate that at earlier periods mothers were more responsive to their infants negative behaviour, while mothers of older infants spent a large proportion of session time (as the previous findings have indicated) disengaged from the task of getting their infants to manipulate objects. This may be attributed to the younger infants' need to learn new skills for manipulating objects and the mothers' concern to meet these needs. Thus, mothers of younger infants need to regulate their dialogues with the infants so as to maximise the chances of their infants' learning new cognitive skills during interpersonal play. Older infants' negative behaviour, on the other hand, is more tolerated by the mothers probably because it is expressive of newly developing skills such as locomotion that leads to the infants substituting object-manipulation with gross-motor skills such as running about and climbing on furniture. Older infants are also more self-assertive which may have discouraged their mothers from intervening in their negative activities.

The sequential patterning of 'support manipulation' and the infants' activities reveals that this form of maternal behaviour was closely associated with the infants' contacts with objects. Thus from Table 6.13 we find that 45% of support manipulation was followed by object-contacts during the period of 6-9 months. At later periods the proportion decreases slightly but it still remained predominant over the other activities. Thus, one can conclude that a large proportion of 'support manipulation' were reciprocated by the infants. Tables 6.12 to 6.14 also show that 'support

Table 6.11 Percentage of 'negative' acts responded to by various forms of maternal behaviour

Maternal responses	Group A		Group B		Group C		Group D	
Eliminate	26	62	16	30	9	35	16	42
Modify/Support manipulation	36		14		26		26	
Participate	28	38	56	70	48	65	44	58
No response	10		14		17		14	

manipulation' was associated with 'solitary', 'sequential' and 'negative' acts. Of these, 'solitary' acts that were simultaneous with or prior to 'support manipulation' are not compatible with the mothers' behaviour since the mother would be attempting to initiate contact with toys when the infant is already manipulating different toys. This also applies to 'sequential' acts that occur simultaneously with 'support manipulation'. 'Negative' acts that follow from 'support manipulation' would also be non-compatible since the behaviour of the mother would have been unreciprocated. If we combine the figures in the tables that indicate reciprocity and those which do not, we find that group A and B show only slightly more reciprocity than groups C and D. Thus for group A compatibility accounted for 86% of maternal 'support manipulation' and for group B it accounted for 82%. The figures for groups C and D are 77% and 80% respectively. This seems to contradict the correlational analysis that showed a positive relationship between the behaviours only during the period of 6-9 months. However, as maintained then, contact-acts may have been initiated without the mothers' support but on those occasions when the mothers supported manipulation, the infants of all ages responded favourably to that support.

Table 6.12 Percentages of 'support manipulation' that occurred simultaneously with the infants' activities

Groups	Infant acts			
	Solitary	Contact	Sequential	Negative
A	5	12	0	7
B	2	9	0	15
C	12	6	0	4
D	10	4	0	4

Table 6.13 Percentages of 'support manipulation' that were followed by the infants' activities

Groups	Infant acts			
	Solitary	Contact	Sequential	Negative
A	4	45	4	8
B	5	32	6	10
C	8	38	11	7
D	4	44	18	7

Table 6.14 Percentages of 'support manipulation' that followed from the infants' activities

Groups	Infant acts			
	Solitary	Contact	Sequential	Negative
A	1	6	3	5
B	6	6	3	6
C	4	4	2	4
D	2	3	3	2

(iii) Sub-categories of 'modify'

Figure 6.2d shows that the three main sub-categories of 'modify', 'reveal object's property', 'create discovery environment', and 'demonstrate/teach' correlate fairly well with infants' attention, while 'demonstrate/teach' show an almost perfect, positive correlation with 'attend'. The correlation was worst for 'create discovery environment' and, in fact, it was negatively associated with attention during the periods 9-12 months and 15-18 months. From this it follows that when mothers demonstrate or teach, 'reveal object's property', and, to a lesser extent, 'create discovery environment', the infants are attentive to their mothers' activities, thereby synchronising their behaviour with hers. 'Create discovery environment' evoked less attention probably because it usually involves the mother's performance of an incomplete act to be responded to by a manipulative, verbal or gestural act from the infant.

Among the four groups group C showed most synchrony between the mothers' modifying activities and the infants' attention since they had the greatest amounts of correlations which were all significant. In fact, if we look at the graph (Figure 6.2d) we find that the correlations on each pair of activities follow an identical pattern for each group. Thus for group A the amount of correlations are all fairly high but they decrease slightly for group B on 'demonstrate/teach' and 'reveal object's property', with a sharp decrease for 'create discovery environment'. This is followed by an increase in the correlations for group C, again only slightly for 'demonstrate/teach' and 'reveal object's property' but sharply for 'create discovery environment'. For group D the correlations decrease in a manner similar to that from group A to group B. This means that groups A and C were similar to each other but different from groups B and D who were similar. There were more correlations of 'modifying' activities and attention during 6-9 months and 12-15 months than during 9-12 months and 15-18 months.

(iv) Sequential analysis of the sub-categories of 'modify'.

As already mentioned, the three sub-categories of 'modify', 'reveal', 'create' and 'demonstrate/teach' showed a significant, positive correlation with the infant's category of 'attend', which indicated the infants' responsivity to their mothers' support. The sequential analysis was then employed to examine whether all instances of 'modify' were attended to by the infants. Tables 6.15 - 6.17 show that this was not the case. 'Reveal object's property' was attended to generally 50% of the time, while 'create discovery environment' was attended to less than 50% of the time. The younger infants attended to 'demonstrating' and 'teaching' more than the older ones. The sequential analysis also showed that infants' attention is worst when mothers 'create discovery environment' and it adds support to the suggestion that this category evokes manipulative responses more than visual ones.

Table 6.15 Percentages of 'reveal object's property' that were responded to by the various infants' activities

Groups	Infant Categories				
	Attend	Responsive Sequential	Responsive Solitary/Contact	Non-Responsive Solitary/Contact	Negative
A	55	3	8	20	14
B	51	13	15	16	5
C	50	10	8	22	10
D	51	10	10	24	5
Mean	52	9	10	20	9

Table 6.16 Percentages of 'create discovery enviornment' that were responded to by the various infants' activities

Groups	Infant Categories				
	Attend	Responsive Sequential	Responsive Solitary/Contact	Non-Responsive Solitary/Contact	Negative
A	36	36	7	7	14
B	20	45	0	22	13
C	16	41	14	17	12
D	21	45	6	12	16
Mean	23	42	7	15	14

Table 6.17 Percentages of 'demonstrate/teach' that were responded to by the various infants' activities

Groups	Infant Categories				
	Attend	Responsive Sequential	Responsive Solitary/Contact	Non-Responsive Solitary/Contact	Negative
A	60	15	12	6	7
B	68	32	0	0	0
C	45	16	8	16	15
D	39	41	6	9	5
Mean	53	26	7	8	7

As the tables reveal, infants of all ages responded by appropriate 'sequential' acts to the three sub-categories of 'modify' on most of the time. If we combine together the measures that indicate synchrony (attend and responsive sequential) we find that, on average, 61% of 'reveal object's property', 65% of 'create discovery environment' and 79% of 'demonstrate/teach' were directly reciprocated. Occasionally the infants' responses were characterised by procuring the object the mother had handled ('responsive contact-acts') or incorporating the mother's theme into their own 'solitary' activities ('responsive solitary acts'); for example, the mother may give the infant a container to fill with smaller items but instead of complying the infant uses the container as a cup and pretends to drink from it. Total lack of reciprocity was manifested only when the infants responded negatively to their mothers' attempts to modify their behaviours or when they ignored such attempts and pursued their own solitary and object-contact activities ('non-responsive solitary/contact' acts). However, as the figures on the tables show, only a small percentage of the mothers' behaviour was responded to in that manner: 15% of 'reveal', 29% of 'create' and 29% of 'demonstrate/teach' were responded to negatively.

In summary, the correlational analysis on its own gave either an idealised picture of the integration of behaviour (as in the case of the sub-categories of 'modify') or an incomplete one (as in the case of 'participate' and the infants' acts). When the results obtained from this analysis are considered jointly with the results that were derived from the sequential analysis the picture which emerges shows that, on the whole, each partner regulated their behaviours according to the on-going activities of the other partner. Thus, the mothers increased their 'eliminate' acts whenever the infants increased their negative acts; the infants increased their attention whenever the mother increased her 'modifying' activities. However, both mother and infant did not always reciprocate each other's activities,for example, not all infant negative acts were eliminated and 'participate from background' was adopted towards all types of infants' activities including the negative ones. The infants', too, failed to perform, or refrained from carrying out tasks their mothers had requested them to do. The best reciprocity was manifest in relation to 'support manipulation' and 'object-contact' acts. No age trends emerge with regard to interpersonal synchrony except that 'negative behaviour' was responded to more directly at a younger age and 'support manipulation' is also reciprocated better during the period of 6-12 months while older infants were more attentive to their mothers' teaching.

6.3.2 Cognitive Compatibility between the mothers' forms of 'support' and the level of the infants' activities.

(i) 'Enhance' and 'Modify'

The passive role of 'enhance interaction' could be regarded as supportive to cognitive development if mothers 'participate from background' in response to the infants' activities that are indicative of an advanced level of cognitive functioning and they adopt 'support manipulation' when infants' cognitive level is low. A 'modifying' role, on the other hand, may be adopted when the infants' 'solitary' acts are characterised by a limited repertoire of undifferentiated schemes. When mothers adopt a directive role we would also expect the infants' 'sequential' acts to be well advanced as a result of reciprocating the mothers' directive activities and of their ability to reciprocate.

If 'enhance interaction' is supportive to cognitive development, then it would correlate positively with those 'solitary' acts that imply high levels of cognitive functioning such as 'differentiated schemes', 'social use of objects', 'imaginative' use, 'symbolic reference' and all acts that involve the manipulation of two or more objects simultaneously. 'Enhance' would also correlate negatively with activities that stem from low level cognitive functioning such as 'undifferentiated' schemes. From Figure 6.3a it can be seen that the correlation between 'enhance' and high-level 'solitary' acts is positive in all cases except group C, and significant for group B ($r = 0.87$; $p < 0.05$). This positive association is an index of the compatibility of the mothers' role to the infants' performance, and especially during the period 9-12 months, but not during the period 12-15 months. However, if we consider one such type of high level activities, namely, 'construct', we find that it correlates negatively in all instances except during the period 15-18 months. This implies that 'enhancing' interaction was not suitable for eliciting constructive play from the

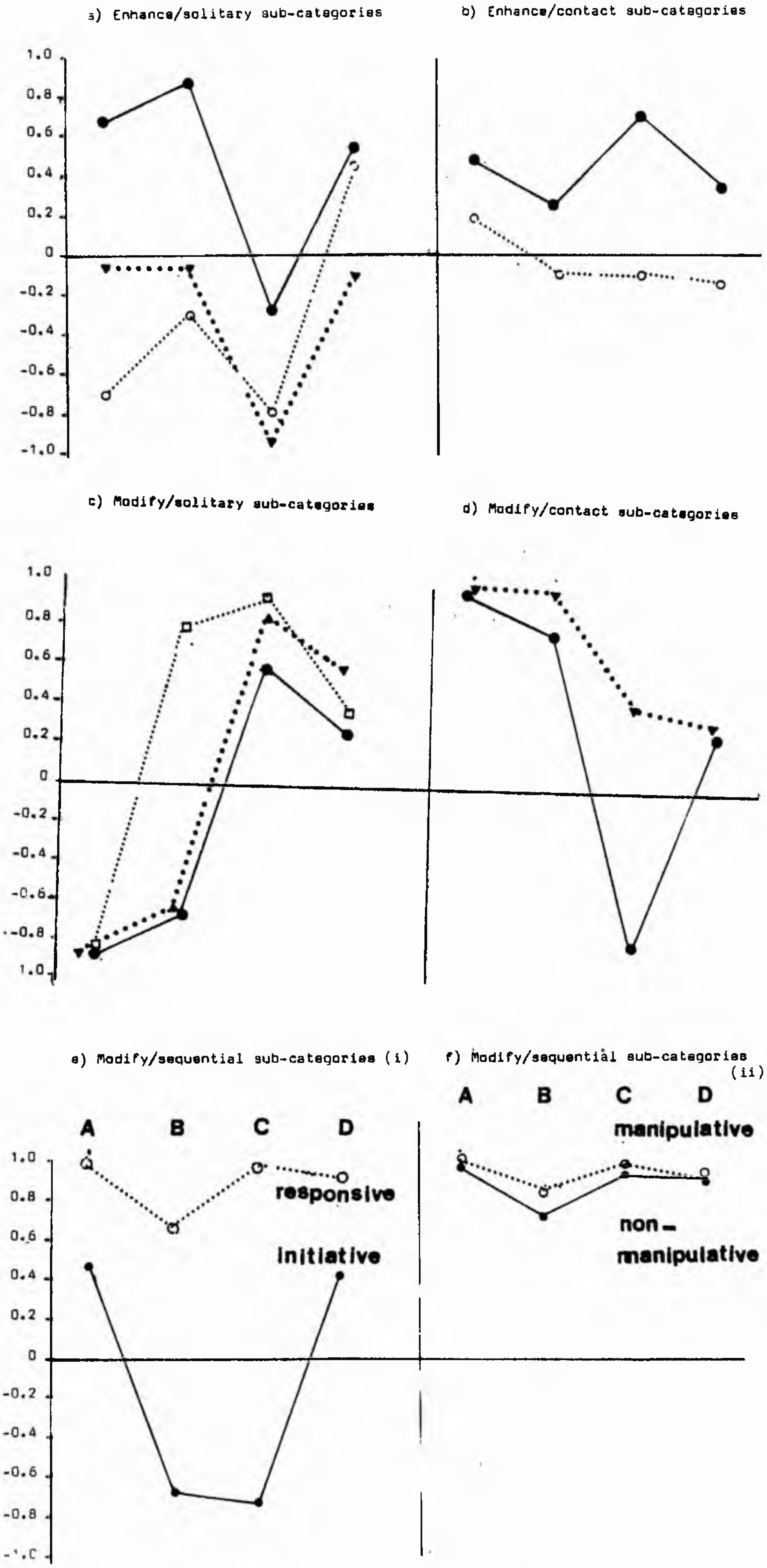

Figure 6.3 Cognitive compatibility between the mothers' 'enhance' and 'modify' and the infants' activities

infants of this sample, although it seemed to be associated with other kinds of advanced 'solitary' play. Low-level 'solitary' acts, however, correlated negatively with 'enhance', and the correlation was significant for group C ($r = -0.94$; $p < 0.05$). This finding is an index of the appropriateness of the mothers' passive role to the infants' spontaneous play since it was associated with a decrease in activities that involve less cognitive capacities. In other words, the mothers encouraged cognitively advanced play. Concerning 'contact' acts, 'enhance' would be an appropriate role if it is positively associated with acts that indicate the infant's interest in objects and his active efforts to procure them as opposed to passive, visual contact. Figure 6.3b shows a low, positive correlation between 'enhance' and all 'object-contact' acts, and a low, negative correlation with 'looking'. These results seem to indicate that mothers do not enhance infants' non-manipulative play with objects to the same extent they enhance 'solitary' play and certainly they do not enhance passive 'looking' at toys.

The data on interpersonal synchrony showed a negative correlation between 'enhance' and 'sequential' acts. In terms of cognitive compatibility this could be interpreted as indicative of the incompatibility of 'enhance' and infants' activities that involve the integration of cognitive and social skills. It is possible, then, that 'enhancing interaction' gives the child little opportunity to develop the abilities to perform technical tasks within a cooperative context.

The correlational data on 'enhance' interaction indicate that when mothers adopt a passive role, the infants, generally, perform high level 'solitary' acts, but not ones involving constructions. They also perform few low-level 'solitary' acts and 'looking'. Thus, 'enhance' was favourably associated with spontaneous play, but it may have failed to support the achievement of tasks that involve higher-level cognitive abilities such as in construct and manipulative-sequential acts.

Examination of the correlations of 'modify interaction' and the sub-categories of 'solitary' acts show that the relationship between these behaviours changes according to the infants' age. From Figure 6.3c it can be seen that 'modify' correlates negatively with the three sub-categories of 'solitary' acts during the period 6-9 months. At 9-12 months the correlations are still negative between 'modify' and high- and low-level 'solitary' acts, but positive for 'construct'. During 12-18 months, 'modify' correlates positively with all sub-categories of 'solitary' acts; the correlation is significant at 12-15 months for 'construct' and low-level acts. It seems then, that mothers adopt a modifying role probably in response to the lack of all types of infants' solo play during the period 6-12 months. As infants get older modifying seems to become more effective since it was then associated with an increase in 'constructions'. During the period 12-15 months the correlation between 'modify' and low-level 'solitary' acts and 'construct' could be attributed to the mothers' perception of their infants' cognitive status: infants who engaged in a great deal of low-level 'solitary' play were associated with mothers who did a great deal of 'modifying' probably to increase or accelerate their infants' cognitive capacities, while infants who exhibited more capacities during their solo play may have influenced their mothers in decreasing 'modifying' acts since the infants were capable of pursuing high-level activities independently of the mothers' interventions. The positive correlation between 'modify' and 'construct' might represent the beneficial effect of 'modify' on this form of 'solitary' play. It is possible that by observing their mothers' modifying activities the infants learnt how to perform these activities and such learning was displayed in the infants' solo play.

Unlike 'enhance', 'modify' shows a greater amount of correlation with 'object-contact' acts, and, like 'enhance', the correlation is positive except in the case of group C (Figure 6.3d). With regard to passive 'looking', the correlations between it and 'modify' were positive for all groups and significant for groups A and B at 0.001 level. This means that 'modify' is complementary to 'enhance' in terms of certain cognitive functions. Thus, in reaction to the infants' passive looking at toys the mothers might have decreased their 'enhancing' and increased their 'modifying' so as to stimulate the infant to actively contact objects. The mother's own manipulations of objects (involved in most instances of 'modify') seemed to entice the infants to contact objects, just as 'support manipulation' did.

With regard to the cognitive level of the infants' responsive-sequential acts, Figure 6.3f shows that 'modifying interaction' is associated with high-level 'sequential' acts, (i.e. those involving actual manipulation of objects such as in 'imitate', 'discover', 'reciprocate game' and 'comply'), in a similar manner to their association with low-level responsive acts (i.e. those involving no or minimal manipulation of objects such as 'attend', 'appreciate spectacle' and 'receive objects'). These results emphasise the infants' responsivity to the mothers' behaviour as the important outcome of the directive role, regardless of the cognitive level of such responses.

The results so far highlight the cognitive compatibility between the mothers' forms of support and the infants' activities with objects, both in relation to a passive role and a directive role. However, from the correlational analysis it is difficult to establish the direction of cause and effect, especially with reference to the passive role: for example, enhancing interaction may provide the infant with opportunities to increase his high-level 'solitary' play or it could be reactive to the infants' autonomous but skilful manipulation of objects. In this case even sequential analysis would not resolve the issue, since it will only provide us with information on whether or not 'enhance' was accompanied by 'solitary' acts. As with interpersonal synchrony, group C showed significant correlations in several instances and much more than the other groups. For this group 'enhance' seemed to be less supportive of cognitive development than 'modify' since it did not show the expected association with high-level 'solitary' acts, while 'modify' was positively related to 'construct' and negatively related to non-instrumental contacts with objects.

(ii) 'Enhance' sub-categories

Figure 6.4a shows that the correlations between 'provide stable base' and the infants' activities are generally low; they are positive for 'solitary' and 'sequential' acts and negative for 'contact' and 'negative' acts. During the period 12-15 months the correlation between 'provide stable base' and 'negative' acts is significant ($r = -0.91$; $p < 0.05$). Although most of the correlations are low they indicate that 'provide stable base' was supportive to cognitive development in that it was positively related to the two main types of infants' activities that involve exploring and manipulating objects, namely, 'solitary' and 'sequential' acts, and negatively related to activities involving minimal or no manipulation of objects ('contact' and 'negative' acts). During 12-15 months 'provide stable base' is especially associated with reduced negative behaviour.

When we consider 'participate from background' alone, we find the correlations between it and the sub-categories of 'solitary' acts are still low, although they tend to correlate positively with high-level 'solitary' acts (Figure 6.4b). Moreover, this correlation increases with age. With respect to 'construct', however, 'participate' correlates negatively with it during the period 9-18 months and there is almost no

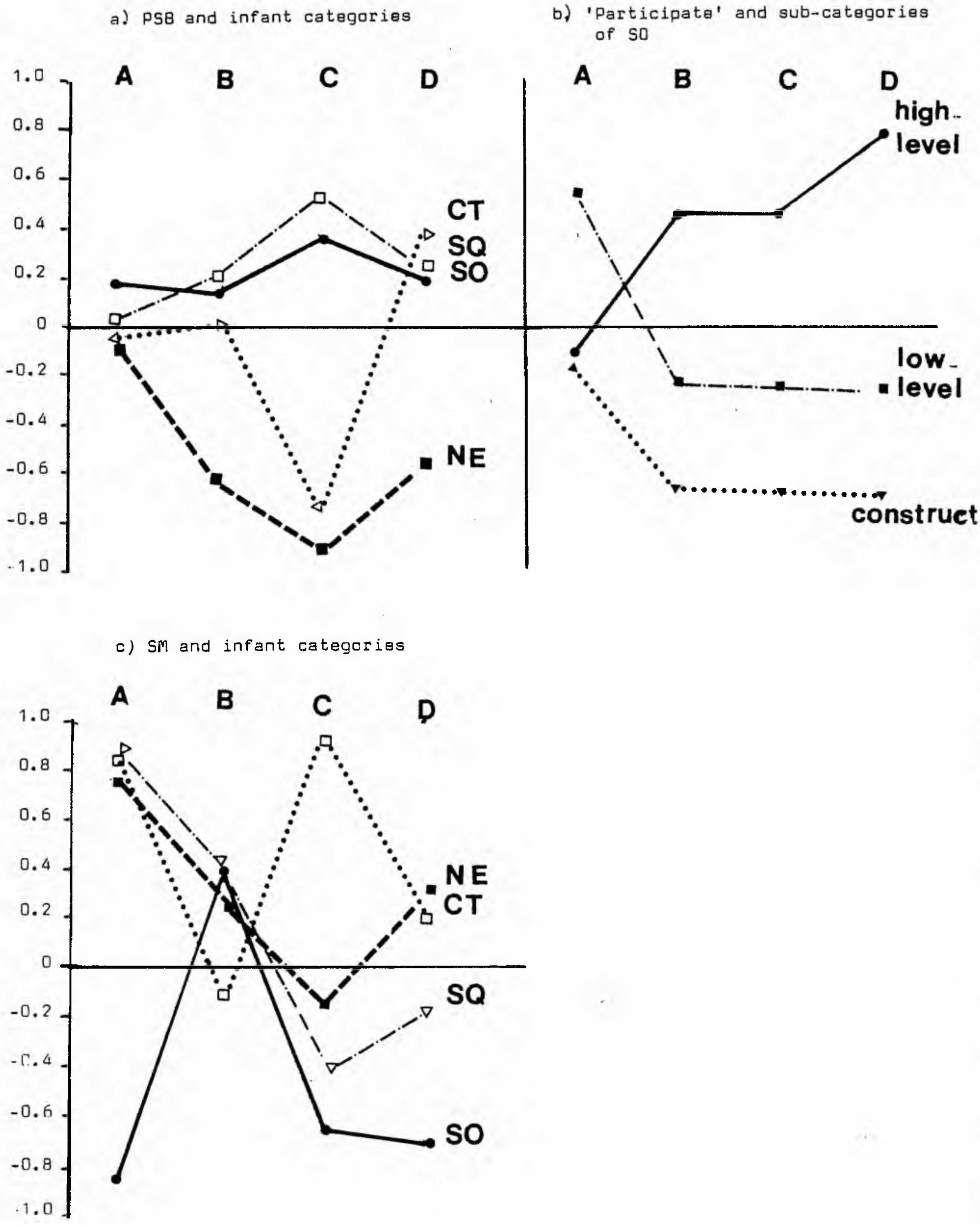

Figure 6.4 Cognitive compatibility between maternal sub-categories of enhance and the infants' activities

correlation between the two during 6-9 months. This is congruent with the previous findings concerning the relationship between 'enhance' and the sub-categories of 'solitary' acts.

Concerning 'support manipulation', as Figure 6.4c shows, the correlations between it and the infants' various activities are generally low and vary from positive to negative. For group A, 'support manipulation' correlates positively and significantly with 'contact' and 'sequential' acts and quite highly with 'negative' acts, while 'solitary' acts correlate negatively with 'support manipulation'. Group C showed a significant positive correlation between 'support manipulation' and "contact' acts ($r = 0.98$; $p < 0.01$). These results indicate that 'support manipulation' fulfilled its supportive function in so far as it elicited 'contact' acts but only during the periods 6-9 months and 12-15 months. During the other two periods 'support manipulation' failed to achieve such functions.

(iii) 'Modify' sub-categories

Figure 6.5 shows a lack of correlations between 'assist' and the infants' activities. The only significant correlation is found with group B where 'solitary' acts correlated negatively with 'assist' ($r = -0.94$; $p < 0.01$). It is difficult to explain this association in terms of cause and effect since mothers who 'assisted' a lot could have been interfering with their infants' 'solitary' play and, consequently, suppressing it. Alternatively, mothers 'assisted' in order to help their infants to engage in more 'solitary' play; infants whose repertoire of solo activities was rich needed little assistance.

During the period of 12-18 months 'assist' showed a negative but non-significant correlation with 'negative' acts, probably because helping an older infant to achieve his goals made it less likely for him to get frustrated or bored with the task(s) he was engaged in. However, the

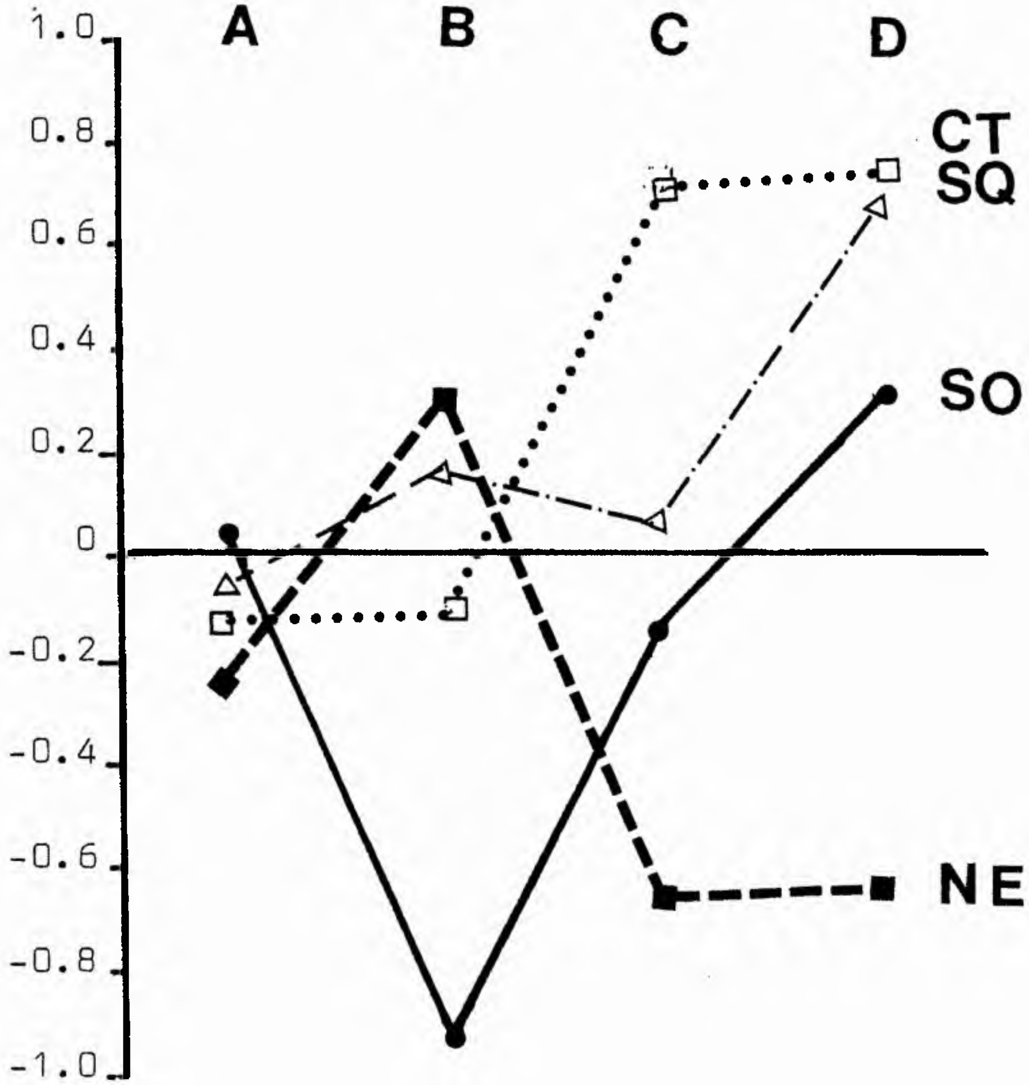

Figure 6.5 'Assist' and infant categories

general pattern of correlations indicates that 'assist' played a small and undefined role in the cognitive development of these infants.

The correlations between 'reveal object's property' and the baby's major acts are very similar to those between 'create discovery environment' and the infants' acts (Figures 6.6a,b,c,d). Therefore, these two maternal categories will be discussed together.

The correlations between the two maternal categories and 'solitary' acts (Figure 6.6a), 'contact' acts (Figure 6.6b) and 'negative' acts (Figure 6.6d) followed a developmental trend. 'Solitary' acts and 'reveal/create' were negatively correlated during the period of 6-9 months but the direction of the correlation changed to positive at later periods and significantly so at 12-15 months. Both 'contact' acts and 'negative' acts were positively related to 'reveal' and 'create' at earlier periods but the correlations became negative and significant at later periods. 'Sequential' acts, on the other hand, (Figure 6.6c) correlated very well with both 'reveal' and 'create'. For all groups the correlations are positive and significant or only just below significance level.

The associations between 'solitary' acts and the two maternal activities indicate that infants at this age were recipients of their mothers' modifying role but what they received during joint play was not transferred into solo play. As infants got older they seemed to be able to consolidate what they had learnt during their mothers' 'modifying' acts, and, consequently, 'reveal' and 'create' may have affected their 'solitary' play favourably. During the period 12-15 months the infants seemed to have benefited from their mothers' 'revealing' and 'creating' when they were playing on their own. The decrease in correlations after 12 months may be attributed to the development of social skills that tipped the balance in favour of joint play with others.

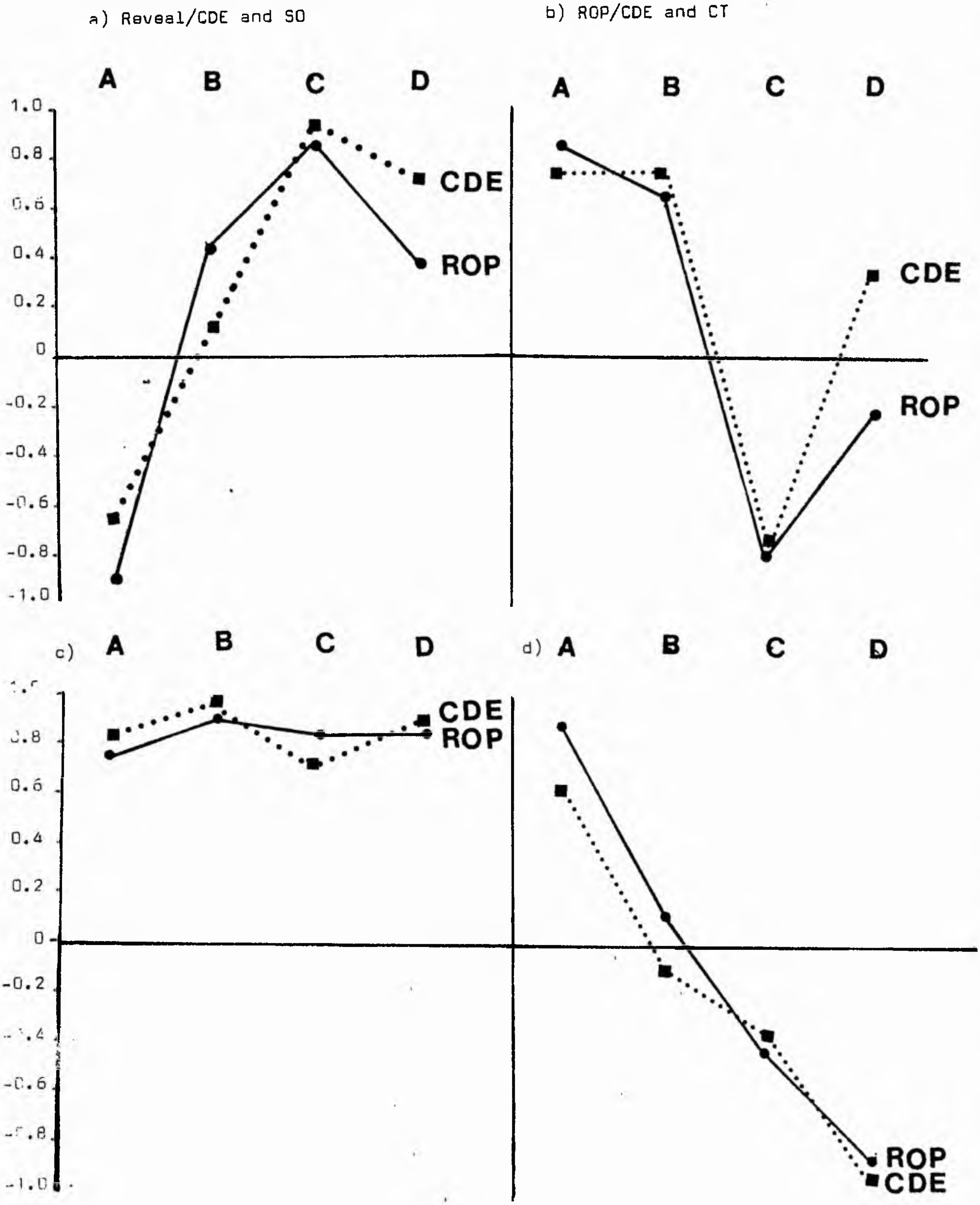

Figure 6.6 Cognitive compatibility between ROP/CDE and the infants categories

The association of 'object-contacts' with 'reveal' and 'create' during the period 6-12 months shows that these maternal behaviours may have stimulated the younger infant to contact objects, presumably the same ones that their mothers had already manipulated as in the case of Eckerman's study (Eckerman et al, 1979). However, like the correlations with 'modify' at 12-15 months maternal behaviour seemed to have had an opposite effect on the infants' contacts with objects.

The positive and almost perfect correlations between 'reveal/create' and 'sequential' acts indicates that the maternal behaviours received complementary responses from the infants at all ages. From this we can conclude that 'reveal' and 'create' had fulfilled their supportive function in so far as they elicited reciprocal activities from the infants, but the level of the cognitive complexity of the infants' responses cannot be determined at this stage. It is only by considering the mothers' activities in relation to those infants' activities that refer to the cognitive level of the behaviour that we can appreciate the effects of maternal support. This is shown in Figures 6.7a and 6.7b.

From Figure 6.7a it can be seen that the amount of correlation between 'create' or 'reveal' and manipulative 'sequential' acts was greater than that between 'create/reveal' and non-manipulative 'sequential' acts represented in Figure 6.7b. Generally, the amount of correlation between the infants' activities was greater with 'create discovery environment' than with 'reveal object's property'. During the period 12-15 months 'reveal object's property' was less associated with manipulative sequential acts and more correlated with non-manipulative sequential acts. At the later period, 'create discovery environment' showed greater association with non-manipulative sequential acts than 'reveal object's property'. The conclusion to be drawn from these associations is that 'reveal object's property' was less supportive than 'create discovery

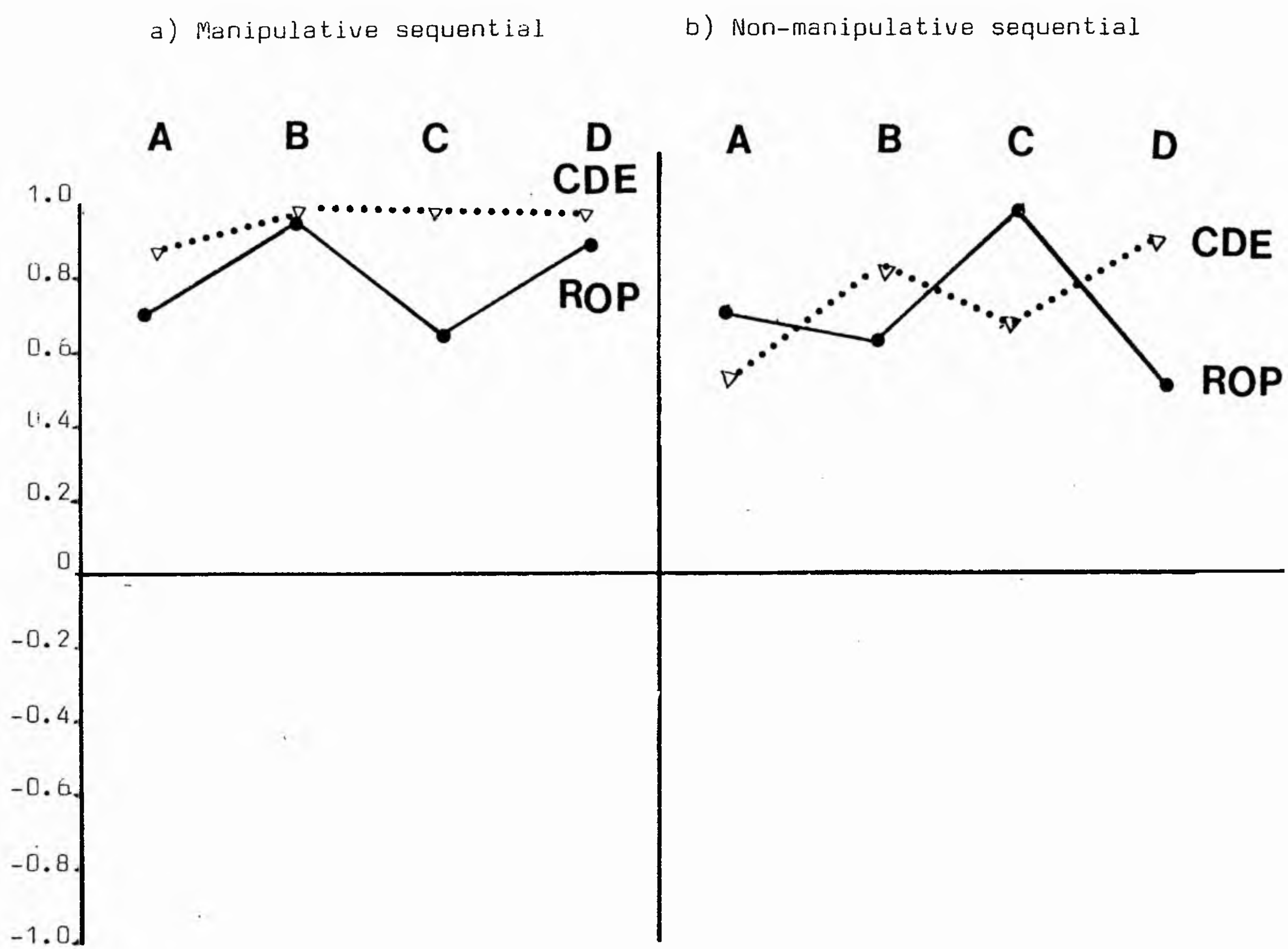

Figure 6.7 Relationship between the major sub-categories of 'modify' and the infants' sequential behaviour

environment' until the infants were 15-18 months old. After 15 months the two categories exchanged roles. This is probably due to 'reveal' being less demanding than 'create', that is, when revealing mothers' do not require from the infants a specific manipulative response; therefore, 'reveal' may elicit only attention or appreciation of the spectacle. As the infants get older they probably respond in more involved manner to their mothers' revealing, for example, by imitating what their mothers had revealed.

Having considered the relationship between 'reveal' and 'create' and the infants' sequential acts, I shall now examine the relationship between the main sub-categories of 'reveal' and 'create' and some of the infants' activities. Here I shall consider two types of infants' behaviour: visual behaviour towards toys and which occurs either spontaneously ("look at toy') or in response to the mother ('attend"). Similarly, the sub-categories of 'reveal' and 'create' were correlated with the infants' cognitively advanced manipulative behaviours, those that occur spontaneously ('construct') and those which are reactive to the mothers' initiatives ('discover'). The aim is to find out whether the sub-categories of the mothers' directive role are associated only with responsive behaviours or whether the effect extends to spontaneous play as well.

Figures 6.8a and 6.8c show that the pattern of correlation between 'elicit' and visual behaviour is very similar to that of 'fulfil' and visual behaviour. From Figure 6.8b it can be seen that the pattern of correlation between 'elicit' and manipulative behaviour is almost identical to that of 'fulfil' and 'manipulative' behaviour in Figure 6.8d. Thus, the 'elicit' sub-category of 'create' had the same effect on infants' activities as the 'fulfil' sub-category of 'reveal'. The correlations between each of the maternal sub-categories and both types of infants' visual behaviour are all positive, although some of them are very low.

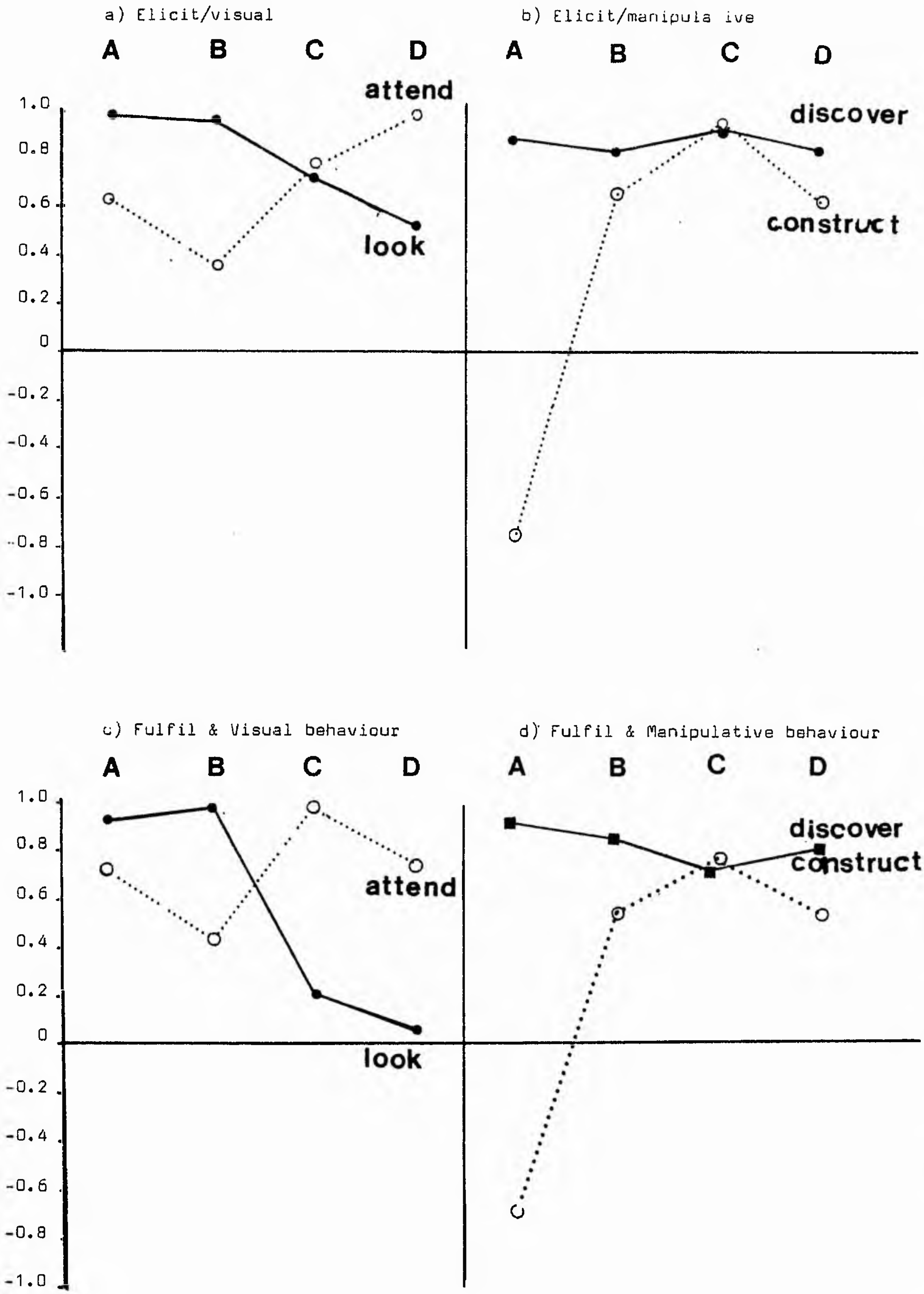

Figure 6.8 Relationship between the sub categories of ROP and CDE and the infants' visual and manipulative responses

Both 'fulfil' and 'elicit' correlate significantly with 'looking' during the period of 6-12 months, after which the correlation decreases steadily with age and the decrease is more marked for 'fulfil' and 'look' than for 'elicit' and 'look'. 'Attend' correlates poorly with the maternal categories during the period of 6-12 months but then the correlation increases with age and becomes significant for 'fulfil' at 12-15 months ($r = 0.97$); $p < 0.01$) and for 'elicit' at 15-18 months ($r = 0.98$; $p < 0.01$). Thus, when infants were young their mothers' 'fulfilling' and 'eliciting' was associated with passive looking but when they got older the mothers' behaviour became more related to responsive looking. This seems to suggest that for young infants 'eliciting' and 'fulfilling' was reactive to their non-involvement in play with objects, and, therefore, the mother may have sought to stimulate the infant to engage in exploratory and constructive play. Mothers of older infants, on the other hand, may not have 'fulfilled' or 'elicited' in response to passive looking at toys but by their behaviour they may have led to the infants' increased attention. On the whole, both 'looking' and 'attending' were more related to 'fulfil' than to 'elicit'.

When we consider the relationship between 'fulfil/elicit' and manipulative behaviour (Figures 6.8b and d) we find that 'discover' was positively and highly correlated with both types of maternal behaviour, while 'construct' was negatively correlated with the mothers' activities during the period 6-9 months. After 9 months the correlation becomes positive but low. During 12-15 months 'construct' correlates significantly with 'elicit' ($r = 0.96$; $p < 0.01$). Thus, at all ages, fulfilling and eliciting was favourable to discovering. At 9-18 months infants seemed to have benefited from their mothers' 'fulfil' and 'elicit' not only when they were making constructions in response to her initiatives but also when they were engaged in 'solitary' play. Younger infants (6-9 months) did not show this tendency. This may be attributed to their inability to replicate their mothers' activities in absence of immediate modelling. Alternatively, the mothers may have fulfilled in response to their infants' own shortcomings with the hope of directing the infant's play into more constructions. With the older infants there is also the alternative interpretation that mothers may have elicited responses or fulfilled functions with which their infants were already familiar and ones which were performed during solitary constructions. Hence the high correlations between 'fulfil' and 'construct' on the one hand, and 'elicit' and 'construct' on the other hand.

Finally, with regard to 'demonstrate/teach' and the infants' main categories, as Figure 6.9 reveals, the correlations were generally low at 6-12 months, and high at 12-18 months. During the latter period both 'solitary' and 'sequential' acts correlated positively with the maternal category while 'negative' acts correlated negatively. At 6-9 months 'solitary' acts were negatively correlated with 'demonstrate/teach'. Once again, the interpretation of such association is double-edged. On the one hand, mothers whose infants did few 'solitary' acts may have done more 'teaching' than mothers whose babies did a lot of 'solitary' acts in order to help them increase the amount of their 'solitary' play. Babies of 6-12 months are less cognitively sophisticated so they need a lot of 'teaching' to enhance their cognitive development. On the other hand, mothers who taught a lot may have hampered their infants' solitary play thereby reducing its frequency. In the former case teaching would be beneficial, while in the latter case it would be non-supportive to cognitive development. At age 12-18 months teaching is positively associated with 'solitary' play and the correlation is almost significant at 12-15 months ($r = 0.84$). Here the more the 'teaching', the more the 'solitary' acts. This may be attributed to the increased capacity of the older infants ε) DM/T

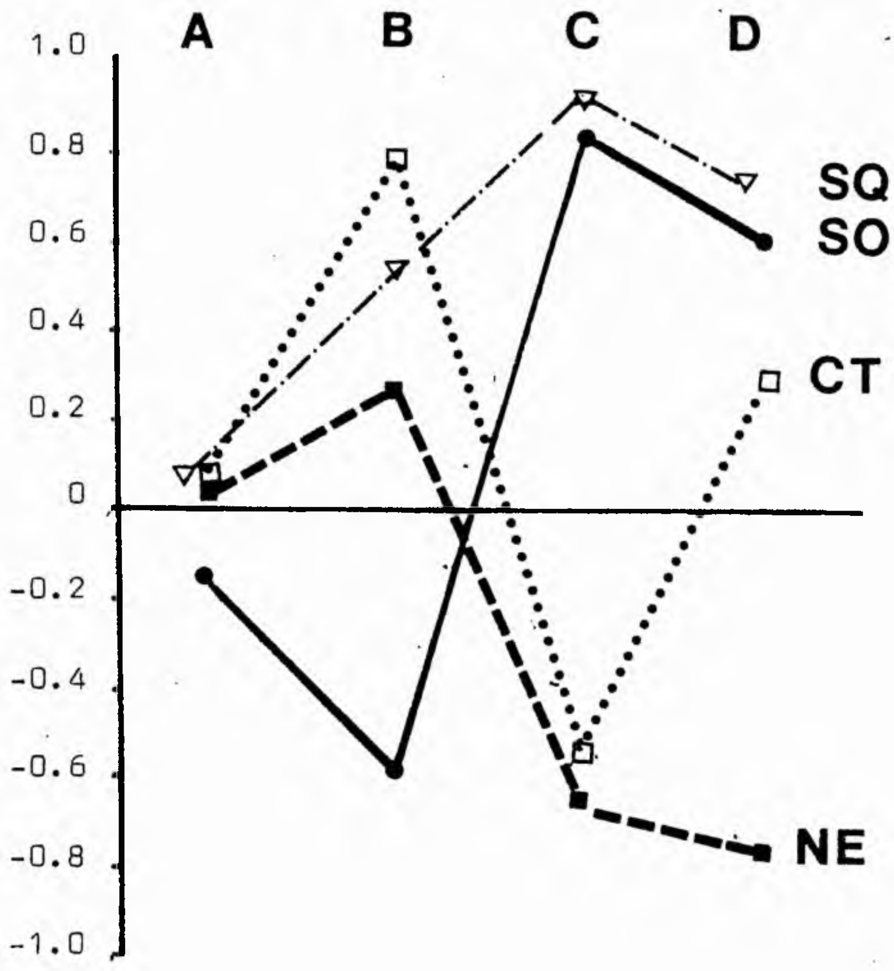

Figure 6.9 Relationship between 'demonstrate/teach' and the infants' major activities

to extrapolate from their mothers' teaching into their own solo play. Alternatively, 'teaching' may be cognitively compatible with the infants' level of comprehension at this age, whereas before that it was not. The pattern of correlations between 'sequential' acts and 'teaching' shows that as infants get older, reciprocating their mothers' 'teaching' improves.

With regard to the cognitive level of the infants' 'sequential' acts, as Figure 6.10a reveals, 'demonstrate/teach' is positively and significantly associated with non-manipulative sequential acts and which are characterised, by a low cognitive status. In fact, the graph for non-manipulative sequential acts repeats almost exactly that of 'demonstrate/teach' and 'sequential' acts. It follows, then, that 'demonstrating/teaching' was relatively ineffective in eliciting 'sequential' acts of a complex level.

Concerning the association of 'demonstrate/teach' with visual behaviour, as Figure 6.10b shows, 'looking' does not correlate well with 'demonstrate/teach' although the two behaviours are positively related during the periods 6-12 months and 15-18 months. However, 'demonstrate/teach' correlates extremely well with 'attend'; the correlation being almost perfect for groups A, C and D. Thus, like 'reveal' and 'create', there seems to be little relationship between 'teaching' and passive 'looking' at toys and a stronger relationship between this form of mothers' 'modifying' and the infant's attention to her. Attending to the mother's teaching increases the likelihood of its effectiveness and we can conclude, therefore, that the mother's behaviour could have been supportive to the infant's cognitive development.

Figure 6.10d shows the relationship between 'demonstrate/teach' and manipulative activities. 'Teaching' correlates poorly with both 'imitate' and 'construct', although the correlations tended to increase in a positive direction as infants got older. At 6-9 months 'teaching' and 'imitation' were negatively correlated which means that mothers may have had to repeat

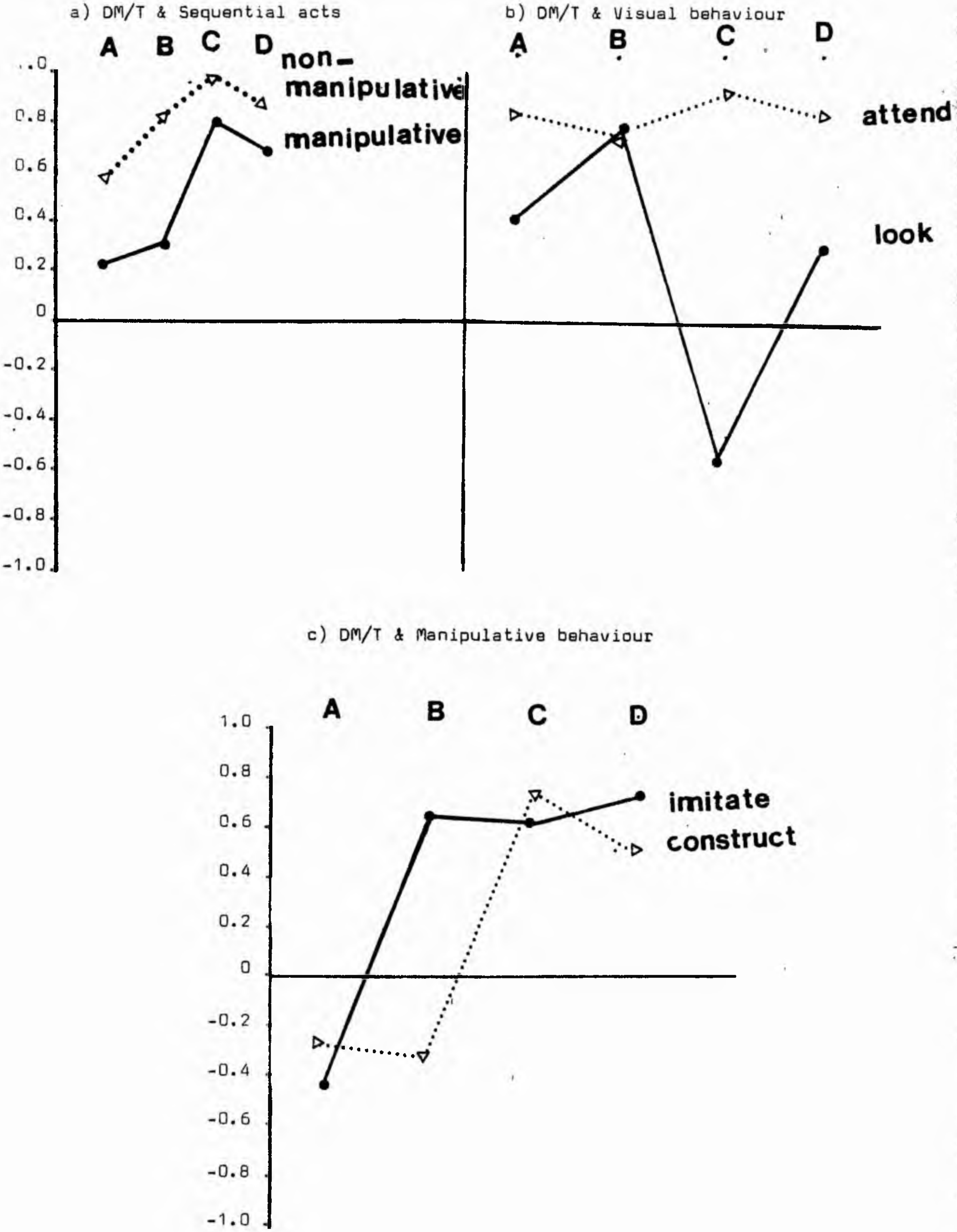

Figure 6.10 Relationship between 'demonstrate/teach' and the various infants' activities

their teaching activities over and over before they got imitated by the infants. Therefore much of the mothers' teaching at this period may not have been complemented. Groups B, C and D show the same amount of correlation and they are all positive. So at an older age infants improve in complementing their mothers' teaching. Like 'imitate', 'construct' correlates poorly with 'demonstrate/teach' and negatively at 6-12 months but positively at 12-18 months. Thus, overall, 'demonstrate/teach' seems to be unrelated to the infants' solitary constructions.

From Figure 6.9 it can be seen that 'negative' acts are positively related to 'demonstrate/teach' at 6-12 months, but negatively related at 12-18 months. The correlations increase with age but they are not significant. Such results indicate that older infants may find teaching stimulating while younger ones probably react to it by engaging in 'negative' behaviour.

In summary, the passive role of 'enhancing' interaction was found to be appropriate to the infants' solo play. When the mothers' participation in their infants' play was minimal, the infants were usually engaged in 'solitary' acts and 'contact' acts that were generally characterised by cognitive advancement and active involvement in object-play, although such a form of participation did not seem to help the infant in constructing towers, slotting shapes and similar activities. However, 'enhancing' interaction may be fostering only one style of play, namely, a 'solitary' one to the exclusion of the other style of engaging in technical play together with a social agent. On the instances when the mothers participated in a more direct manner (i.e. 'modified interaction'), the infants' reciprocal activities were in proportion to the mothers' but they were not necessarily cognitively advanced. However, the infants' solo activities and especially those of the older ones seemed to be favourably affected by episodes of joint play with the parent since an increase in 'modify' was associated with an increase in making constructions with objects. Of the sub-categories of 'modify', 'create discovery environment', in general, and 'elicit', in particular, were strongly associated with advanced responsive acts and ones that involve manipulation of objects rather than mere visual contact with them. On the other hand, 'reveal object's property' and its sub-category 'fulfil' were associated with cognitive advancement of 'solitary' play and of visual exploration of objects, both spontaneous and reactive. The more didactic forms of modifying, namely 'demonstrating' and 'teaching' did not seem to be greatly related to the infants' responsive acts although the positive association of the two behaviours showed an increase with increases in the infants' age. To some extent, 'demonstrate/teach' was cognitively compatible with the infants' reciprocal activities since increased 'teaching' was associated with decreased non-manipulative responses (although it was also associated with a decrease in imitations). Solitary constructions were unaffected by 'demonstrate/teach'. Finally, cognitive compatibility between the mothers' forms of support and the infants' styles of play was more apparent during some periods than during others. Thus, at 12-15 months, compatibility of 'enhance' with the infants' behaviours was at its best, while 'modify' was most compatible with the infants' level of performance during the period 12-18 months. 'Create discovery environment' was also most compatible with the infants' responsive and 'solitary' acts at 12-15 months, while 'reveal object's property' was the candidate at 15-18 months. Thus, at 12-15 months, infants benefit equally from 'enhance' and 'modify' while at 15-18 months they benefit more from 'modify' than 'enhance'.

6.3.3 Cognitive Compatibility between the mothers' behaviour and the infants' scores on the IPDS.

This section examines the relationship between the main forms of the two maternal roles and the infants' scores on the Piagetian scales of cognitive development. The aim here is to find out whether specific infants' experiences, identified with certain maternal behaviours would reflect on the infants' performance on cognitive tests; for example, 'object-permanence' would be expected to correlate positively with the mothers' activities that promote the infants' contacts with objects and exploration of their properties. In terms of the maternal Hierarchy, most of level-3 categories would provide experiences that are supportive to 'object-permanence' but of these categories 'support manipulation' and 'create discovery environment' would be particularly relevant. The former category directly encourages the infant to procure objects while the latter encourages retrieval of vanishing objects. 'Causality' and 'space' were both described as having a motivational component (Uzgiris and Hunt, 1975) and, therefore, they would be expected to correlate positively with experiences that motivate the infant to manipulate objects, as well as experiences that reveal to the infant the sources of causes and effects and the spatial relations of objects. Such experiences reside in the maternal behaviours of 'provide stable base', 'assist', 'reveal object's property', 'create discovery environment' and 'demonstrate/teach'. The three types of schemes represented by scales VIA, VIB and VIC all stem from the infant's autonomous play with objects as well as from schemes which he may acquire through observing others. 'Schemes with social objects' are particularly acquired through social interaction with others, while the contents of the schemes relating to multiple objects are similar to the tasks contained on the scale on 'space'. Consequently, the experiences provided by 'provide stable base', 'reveal object's property', 'create discovery environment' and 'demonstrate/teach' would be expected to correlate with the three scales on 'schemes'; in particular, 'schemes with single objects' would be closely associated with 'provide stable base' while 'schemes with multiple objects' and 'schemes with social objects' would be strongly related to 'reveal', 'create' and 'demonstrate/teach'. I shall now present the correlations with maternal categories for each separate scale.

(i) Object-permanence

Figures 6.11a and 6.11b show that 'object permanence' correlates best with 'provide stable base' at 6-9 months, and with 'support manipulation' at 12-15 months. During the latter period the correlation is significant ($r = 0.90$; $p < 0.05$). 'Modify' sub-categories, on the other hand, correlate negatively with 'permanence' except for 'assist' during the period of 12-18 months. Thus, it seems for the infants of this sample 'enhance' sub-categories provide favourable experiences for development of the concept of object whereas the 'modifying' experiences are less favourable. This also indicates that 'object permanence' developed relatively independently of the infants' social environmental experiences apart from the parent's background participation when the infants were 6-9 months old and her initiations of infants' contacts with toys when they were 12-15 months old.

(ii) Causality

As can be seen from Figures 6.11c and 6.11d 'causality' also correlated poorly or negatively with maternal activities. With regard to 'enhance' sub-categories, 'provide stable base' and 'support manipulation' were negatively associated with the development of the concept of 'causality': at 6-9 months the correlations between 'support manipulation' and this scale was significantly negative ($r = 0.97$; $p < 0.05$) while the scale correlated negatively with 'provide stable base' at 15-18 months.

Therefore, as expected, passive parental involvement

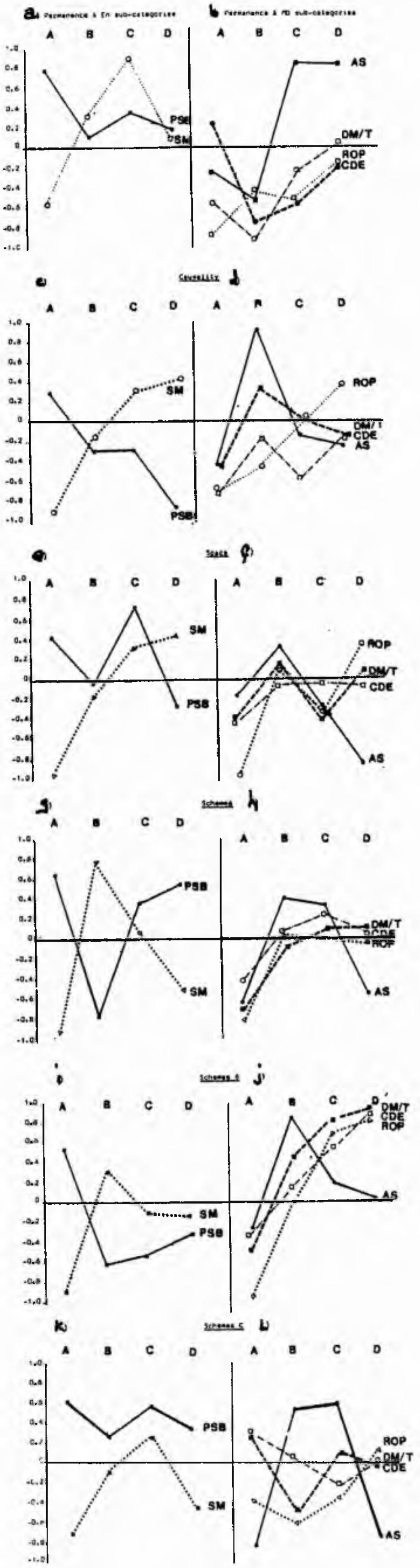

Figure 6.11: Relationship between maternal categories at level 3 of the hierarchy and the infants' scores on the IPDS

was associated with poor performance on the scale with a motivational component that involves the realisation of the role of others as sources of causes and effects. The developmental decrease of the negative correlation between 'causality' and 'support manipulation' indicates that as infants get older their performance of tasks related to causality is more likely to benefit from 'support manipulation'. However, the negative correlation between 'provide stable base' and 'causality' increased with age which indicates that for older infants 'provide stable base' is inappropriate. These two findings indicate the tendency for cognitive development to become more dependent on active interactions with the animate environment during the later stages of sensorimotor development. Contrary to expectations, 'modifying' behaviour did not correlate positively with 'causality' in a significant manner except for group B with 'assist' showing a significant positive correlation with the Scale ($r = 0.93$; $p < 0.05$). Since 'assistance' usually involves the achievement of the infants' goals for him or responding to his requests for help it provides the infant with opportunities to learn about means and ends and the associations between causes and consequences. The content of 'assist', therefore, matches the content of 'causality' and may explain the positive correlation between them. The view proposed previously that cognitive development becomes more related to environmental experiences as infants get older gains further support here but only with reference to 'reveal object's property' since the negative correlation between it and 'causality' decreases gradually and eventually becomes positive at 15-18 months.

(iii) Space

Figures 6.11e and 6.11f show that the scale measuring the abilities to represent objects spatially correlates poorly with the sub-categories of 'enhance' as well as the sub-categories of 'modify', and that there are more positive correlations with 'enhance' than with 'modify'.

Of the two sub-categories of 'enhance', 'provide stable base' shows a higher positive correlation than 'support manipulation' with respect to group A and group C. 'Support-manipulation' is negatively correlated with 'space' at 6-9 months but the negative correlation decreases during the period of 9-12 months after which it becomes positive. This is a repetition of the pattern of 'support manipulation' and 'permanence' and 'causality' which was mentioned earlier. Here, encouraging older infants to procure objects was related to the development of the concept of 'space'. Contrary to expectation, 'reveal object's property', 'create discovery environment' and 'demonstrate/ teach' did not show a positive relationship with 'causality' but rather a negative one, especially for 'reveal' at 6-9 months ($r = -0.98$; $p < 0.05$) and for 'assist' at 15-18 months ($r = -0.85$). There was almost no correlation between 'create discovery environment' and 'space'. These results indicate that the concept of space in infancy is not dependent on social environmental experiences. Moreover, attempts to 'modify' the infants' manipulation of objects were associated with poor performance on the scale measuring spatial abilities. This tendency could be interpreted in two ways: Firstly that 'modifying' led to the infants' poor performance on the scale on 'space', or, secondly, mothers whose infants were less competent on spatial representation of objects, attempted to compensate for their infants' incompetence by involving them in activities that have the potential of accelerating spatial abilities in the long run.

(iv) Schemes with single objects

From Figures 6.11g and 6.11h it can be seen that the correlations between 'schemes with single objects' and the sub-categories of 'enhance' and 'modify' are low, with the negative correlations being greater than the positive ones. 'Provide stable base' correlates positively with the Scale for groups A, C and D, but negatively for group B. 'Support manipulation', on the other hand, follows an opposite pattern; for group A it correlates negatively and significantly with single-object schemes ($r = -0.97$; $p < 0.05$), positively for group B and no correlation for group C, after which the direction of the correlation becomes negative again. Thus, it seems that at each period 'provide stable base' and 'support manipulation' exert different effects on 'single-object schemes'. At 6-9 months and 12-18 months 'provide stable base' was beneficial to-, and influenced by, 'single-object schemes' while 'support manipulation' was not. At 9-12 months unlike 'provide stable base', 'support manipulation' was favourably associated with 'schemes' with single objects.

There was little relationship between 'modify' sub-categories and 'single-object schemes', which contradicts the expectation of a positive correlation between the two. At 6-9 months all sub-categories of 'modify' were negatively related to 'single-object schemes' which could be interpreted as either 'modify' having an adverse effect on the development of such schemes, or mothers' modifying behaviour being reactive to the infants' lack of 'single-object schemes'.

(v) Schemes with multiple objects

Figure 6.11i shows that 'enhance' sub-categories correlate with 'multiple-objects schemes' in a similar manner to the correlations between the same categories and 'single-object schemes'. Figure 6.11i, on the other hand, shows that 'multiple-objects schemes', unlike 'single-object schemes' correlate well with 'modify' sub-categories. With respect to 'enhance' sub-categories, 'provide stable base' correlates negatively with multiple schemes except during the period of 6-9 months. 'Support manipulation' correlates also negatively with 'multiple-objects schemes' at 15-18 months. This confirms the prediction that a directive role would help infants to develop the abilities to coordinate objects together such as by making constructions with them. The results are also congruent with the finding of cognitive compatibility between 'modify' and 'construct' which was presented in section 6.3.2. 'Reveal object's property', 'create discovery environment' and 'demonstrate/teach' also resembled each other in terms of the amount of correlation with 'multiple-objects schemes' as well as the developmental progression of the correlations which were initially negative but gradually became positive and significant. This adds to the evidence that the supportive function of 'modify', as measured by the Scales, increased with age.

(vi) Schemes with social objects

Figures 6.11k and 6.11l show that 'provide stable base' is positively correlated with 'schemes with social objects', whereas 'support manipulation' is negatively correlated with the scale in most instances. With regard to the sub-categories of 'modify', the correlations were more negative than positive. These findings indicate that only 'provide stable base' was slightly supportive to development of social schemes during infancy.

If we consider the developmental trends of the correlations of the IPDS and the mothers' behaviour, we find that at 6-9 months 'provide stable base' correlates positively with all six scales. According to the Binomial test of distribution, this tendency for the correlations to be positive is statistically significant ($p < 0.01$;2-tailed). At 9-12 months the correlations between 'provide stable base' and the various scales is significantly less positive than during the previous period in 6 out of 6 cases ($p < 0.01$). In fact, the correlations were negative in 4 out of 6 cases. At 12-18 months the direction of correlation is inconsistent. From this it follows that at 6-9 months 'provide stable base' shows a positive relation to cognitive development and a negative one at 9-12 months, but no relation during the period of 12-18 months.

With regard to 'support manipulation' for group A in 6 out of 6 cases the correlations with the IPDS are negative ($p < 0.05$). At 9-12 months the correlations are less negative than previously in 6 out of 6 cases ($p < 0.01$). At 12-18 months, again, there is no consistent relationship. These tendencies also reveal a clear relationship between 'support manipulation' and cognitive development during the period of 6-12 months, when it is negative at 6-9 months and positive at 9-12 months.

The four sub-categories of 'modify' show a negative correlation with the IPDS in 21 out of 24 cases. For group B the correlations were less negative than before in 17 out of 24 cases. For 'object-permanence' the correlations were all less positive. For groups C and D, the correlations were all neutral or less negative except in the case of the scale measuring 'schemes with multiple objects' where the correlations were increasingly positive. 'Assist' showed a different pattern in that it correlated positively with 'causality', 'multiple' and 'social-objects' schemes at 9-12 months, but negatively during the other periods. A positive correlation between 'assist' and 'permanence' was found at age 12-18 months, whereas at 6-12 months the correlations were negative. These results indicate that at 6-12 months there was a clear relationship between 'modify' and cognitive development. At 6-9 months the relationship is negative, while at 9-12 months the negative associations become significantly less so, that is, 'modify' becomes more favourable than before. At 12-15 months there is no clear relationship between 'modify' and cognitive functions except for a favourable association with 'multiple-objects' schemes. Thus, at a later age 'modifying' experiences are important for the development of schemes with multiple objects.

It is difficult to interpret the meanings of these associations. Thus, the negative relations between 'support manipulation' and 'modify' with the IPDS at an earlier age could be compensatory or could be indicative of non-supportive maternal intervention. In other words, mothers who have infants with poor performance on cognitive tasks adopt modifying strategies to compensate for their infants' lack. Alternatively, mothers who 'modify' at an earlier age interfere with their infants' cognitive advancement as measured by the scales. It is likely that the first interpretation is nearer to the truth because of the earlier findings presented in this chapter. 'Modify' was negatively associated with high-level 'solitary' acts but positively associated with 'construct'. Thus, mothers who 'modify' have infants who are less capable of advanced 'solitary' acts. It was also positively associated with manipulative 'sequential' acts so that when the mothers' participation was more involved it improved the infants' performance. 'Enhance' was negatively associated with 'construct'. Thus it seems that 'modify' had an advantage over 'enhance' in that it was favourably associated with 'solitary' acts characterised by advanced cognitive capacities and sequential acts that are characterised by integration of social skills with technical ones.

Overall, the correlations of the mothers' activities with the infants' scores on the IPDS indicated that the mothers' participation was hardly related to the infants' performance of cognitive tasks, since most of the correlations were not significant. However, 'provide stable base' tended to be associated with advanced performance in the scales of 'object-permanence', 'space' and 'schemes with single objects'. Development of 'object permanence' and 'single-object schemes' were expected to develop relatively independently of involved interactions with other, and, therefore, their association with 'provide stable base' is understandable, but the association of 'space' with 'provide stable base' is contrary to expectation. 'Support manipulation' followed a developmental progression where at 6-12 months it was negatively, or little related to 'permanence', 'causality' and 'space' and at 12-18 months it was positively correlated with the same scales. For all groups, maternal 'support manipulation' was negatively related to infants' schemes with objects. 'Assist' was positively related to the IPDS more than the other maternal categories were, but only at certain periods. Thus, at 12-18 months, it was favourably related to 'permanence'; at 9-15 months it was related to complex and social-objects' schemes, and at 9-12 months to 'causality' and 'schemes with multiple-objects'. 'Reveal object's property', 'create discovery environment' and 'demonstrate/teach' were negatively related to 'permanence', 'causality', 'space' and 'single-and-social-objects schemes'. However, these 'modifying' activities were positively related to 'multiple-object schemes' at 12-18 months. The conclusion to be drawn from these findings is that the effectiveness of the passive role was different at different ages and, generally, it was more closely associated with 'permanence' and 'space'. An active role, on the other hand, was related to the development of schemes involving more than one object.

6.3.4 Relationship between the cognitive level of the infants' play and the scores on scale VIB.

Scale VIB which measures spatial abilities was selected since its contents are most representative of the types of activities that the infants engage in during interpersonal play.

Figure 6.12 shows that all types of infants' activities were significantly correlated with the scale during the period 6-9 months, with 'solitary' acts showing a positive correlation, while 'contact', 'sequential' and 'negative' acts were negatively related to 'multiple-objects schemes'. During later periods 'solitary' acts remain positive while 'sequential' acts change from negative to positive. It is possible that at 6-9 months solo play facilitated the acquisition of 'multiple-objects schemes', as well as was influenced by them; at 12-18 months both 'solitary' and 'sequential' acts were involved. If we consider the items of the scale the likelihood of this interpretation increases since the later items passed by the older infants involved coordinating objects into structures, sharing them with others and naming them. Such activities are probably more dependent on the social environment than the activities constituting the less advanced items of the test such as 'hitting' objects together or applying differentiated schemes on them.

When comparing the relationship between the infants' activities and scores on Scale VIB (Figure 6.12) with the relationship between the mothers' activities and the infants' scores on the same scale (Figure 6.11i) we find that the patterns of relationships are generally similar. Thus, if we consider 'solitary' acts and the corresponding maternal category, 'provide stable base', we find that both correlate positively with the scores on Scale VIB at 6-9 months and negatively at 9-12 months. However, at 12-18 months 'provide stable base' correlates negatively with the

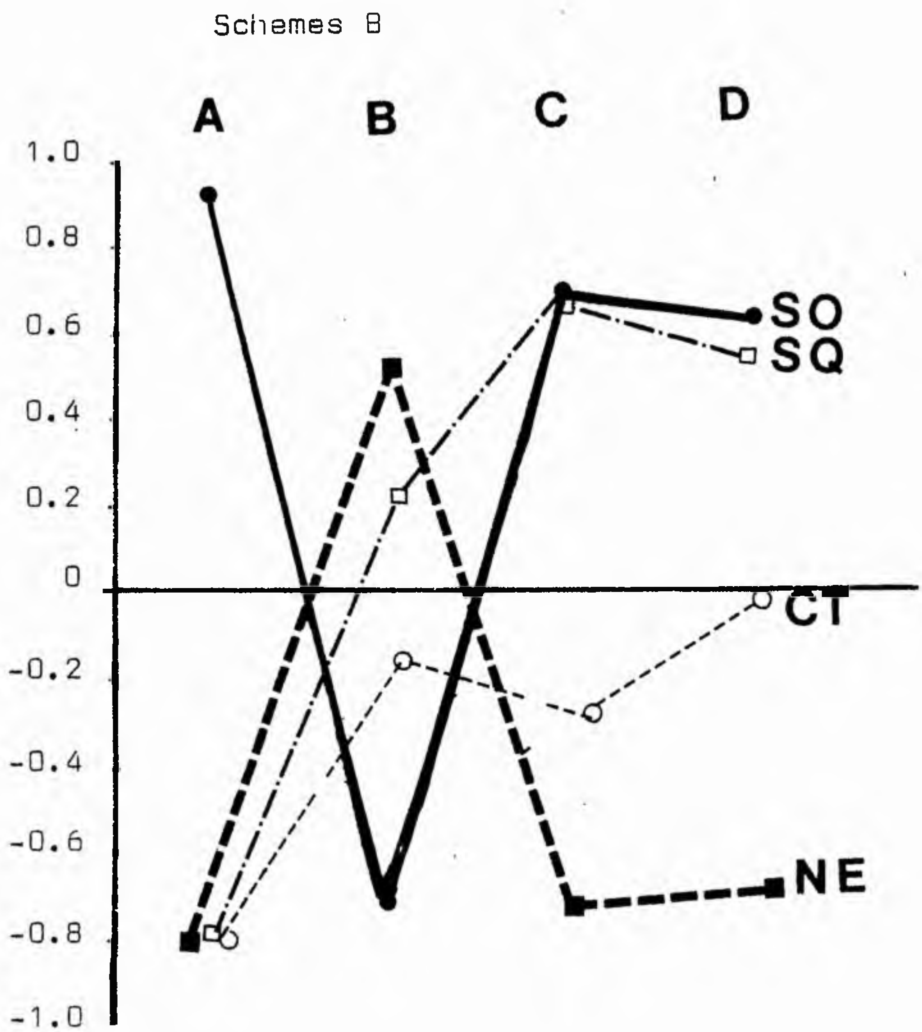

Figure 6.12 Relationship between the infants' activities and their scores on the scale on schemes with multiple-objects

scores, while 'solitary' acts correlate positively. These findings indicate that 'provide stable base' may not have been influential to the infants' performance on the scale measuring 'schemes' with multiple objects. It is possible to attribute this to the fact that the content of the scale largely involved assembling objects into structures (i.e. 'construct'). From the earlier data (Figure 6.4b) it was found that the sub-category of 'provide stable base' ('participate'), correlated negatively with 'construct'. From this we may infer that 'provide stable base' was non-supportive to the infants' activities that involved technical manipulation of multiple-objects. In other words, developing such skills was less dependent on the mothers' passive involvement in the infants' play. However, infants who frequently engaged in spontaneous manipulation of objects were the ones who scored highly on 'schemes with multiple objects'. This is probably because such 'solitary' play was characterised by 'constructions' and which were negatively related to 'provide stable base' (Figure 6.4b). These findings point out that at later stages of sensorimotor development 'provide stable base' was less influential to the infants' cognitively advanced 'solitary' acts as well as performance on some of the IPDS.

With regard to 'support manipulation' and 'contact' acts, both categories correlate negatively with 'schemes' on multiple-objects during the period 6-9 months. At 9-18 months the correlations are low and negative in 5 out of 6 cases. These results show that 'support manipulation' was related to Scale VIB in the same way as 'contact' acts were related to this scale. Thus, encouraging the infants to procure objects, as well as the infants' non-instrumental contacts of objects seemed not to influence the infants' performance on the scale measuring 'schemes' with multiple objects.

Of the 'modify' sub-categories 'reveal object's property', 'create discovery environment' and 'demonstrate/teach' were related to Scale VIB (Figure 7.11j) in the same way as 'sequential' acts were (Figure 6.12). In all cases the correlations were negative at 6-9 months; the correlations then decreased gradually after 9 months and became positive at 12-18 months. This pattern is opposite to the pattern of 'provide stable base' and Scale VIB where the correlations were initially positive and then they became negative. These findings indicate that the development of 'schemes' with multiple objects was more dependent on a directive role of maternal participation than on a passive role, but only after 12 months. The findings also show that the relationship between the infants' 'sequential' acts and the scores on Scale VIB was the same as the relationship between the mothers' 'modifying' activities and the scores on the scale.

In summary, 'schemes' with multiple objects seem to benefit more from activities that are learnt in the context of reciprocal interactions with others and which involve 'revealing' to- or 'teaching' or allowing the infant to 'discover' how to perform complex activities with more than one object.

6.3.5 Conclusions

The interactions of the mothers and their infants who were observed in this study, could be described as relatively balanced since they were characterised by the mothers' adoption of the kind of role that was in synchrony with her infant's ongoing activities. The infants, too, in a more limited way, gave evidence of complementing their mothers' behaviour.

When the infants were engaged in 'solitary' acts and 'contact' acts the mothers remained in the background and contributed to their infants' activities by watching them and talking to them. However, occasionally, the mothers' background participation was associated with the infants' rejection of toys (e.g. 'participate' was positively correlated with 'negative' acts at 12-18 months, and it also occurred simultaneously with them, on average, 18% of the time). In such instances, although the mothers' behaviour was still in synchrony with the infant's (since it constituted a passive role while the infant was adopting an active role), her participation failed to achieve the main goal of keeping the infant's interest in the toys and directing his efforts towards manipulating them.

The infants' contribution to interpersonal synchrony with regard to their mothers' 'enhancing' is manifest in the positive association of 'contact' acts with the mothers' 'support manipulation' and in the high percentage of 'support manipulation' that was followed by contacts with objects.

When the mothers adopted the directive role of 'modify interaction', they elicited complementary sequential responses from the infants of all ages. However, on occasions, 'modify' was responded to by less appropriate reciprocal behaviour ('contact' acts), inappropriate ones ('negative' acts) and non-compatible ones ('solitary' acts).

On the few occasions when 'modify' elicited 'contact' of the same objects, interpersonal synchrony was still maintained. However, a considerable proportion of 'modify' was followed by non-responsive 'contact' and 'solitary' acts (20% of 'reveal', 15% of 'create' and 8% of 'demonstrate/teach' were followed by infants' independent 'solitary' and 'contact' activities). Such instances indicate a lack of synchrony since the mother's theme was independent of the infant's. Thus, the positive correlation between 'modify' and 'solitary' acts may have been partly due to incongruent 'solitary' play as well as 'solitary' responsive acts. It is also possible that the correlation was brought about by a sequence of 'sequential' acts followed by long bouts of 'solitary' play during which the responses to the 'modifying' activities were re-enacted. In this case, the relationship between those two forms of activities would be less relevant to the issue of synchrony and indicative of cognitive compatibility.

Since the majority of 'modify' were responded to by manipulative sequential acts and 'attention', we can conclude that, on the whole, the mother-infant interactions were balanced whenever the mother 'modified' those interactions.

The periods 6-9 months and 12-15 months were marked by compatibility of the infants' responses to their mothers' forms of support.

Concerning the issue of cognitive compatibility between environmental experiences and the infants' level of competence, the correlational analysis revealed a good deal of balance between forms of parental support and the infants' cognitive functioning. Thus, when the mothers' involvement in the infants' play was minimal, the infants pursued 'solitary' activities that were characterised by advanced cognitive capabilities except that they did not involve assembling objects into structures. This form of play seemed to benefit more from the directive maternal role, 'modify', and especially from 'reveal object's property' and 'create discovery environment'. 'Background participation' was ineffectual at eliciting advanced 'solitary' activities during the period 6-9 months, probably because at this period the infants had a very limited repertoire of skills with objects. However, when 'background participation' was responsive to infants' tactile contact with toys, such contacts took the form of picking up a toy, pulling it nearer, or locomoting towards it, rather than merely looking at it. Thus, by being passive, the mothers were not altogether ineffectual.

Contrary evidence to this statement comes from the data related to group C where 'enhance' was negatively correlated with high level 'solitary' acts. At this age the infants' advancement in 'solitary' play was favourably related to the 'modifying' role. Thus, it seems that at 12-15 months cognitive development was more influenced by stimulation from external sources. This is compatible with other findings suggesting that after the first year parental influence is especially important (White et al, 1973; Bradley et al, 1979). Bradley and her associates found that maternal involvement in terms of encouraging and facilitating achievements becomes a positive influence at 12-24 months. Thus, it follows that at this age adopting a passive role was less appropriate to the infants' cognitive 'needs'. More active involvement of the mothers was not only beneficial to the infants' 'solitary' activities at 12-15 months, and particularly those involving constructions, but they were also beneficial to eliciting a different style of play, one that combines technical and social skills. In this instance, the technical skills were characterised by complex manipulative responses such as imitation of models, slotting shapes, building towers and filling and emptying containers.

However, from the correlational analysis it is still unknown whether the mothers who 'enhanced interaction' adopted that role because it matched their infants' high-level 'solitary' acts, while the mothers' adoption of the 'modifying' role influenced the infants' abilities to make 'constructions' with objects? According to Bradley et al's findings (1979) mothers are influenced by their infants' cognitive capacities when the infants are below one year of age; that is, parental support is reactive to the infants' needs but does not influence it. After 12 months infants become more receptive and, accordingly, are affected by parental support, rather than affecting it.

With a few exceptions, the correlations between the IPDS scores and the mother's and infant's activities indicated consistent relationship between parental support and cognitive development as measured by the scales. Thus, 'provide stable base' seemed to be favourably related to single- and social- objects 'schemes' at all ages. 'Support manipulation' was positively related to 'causality' and 'space' at 12-18 months, while 'assist' was positively related to 'permanence' during the same period. Also at this period, the other sub-categories of 'modify' seemed to have a positive influence on 'schemes' with multiple-objects. These results provide further support to the suggestion that more directive parental intervention is more influential at later stages of sensorimotor development.

On the whole, more significant correlations were obtained for the mother and infant activities than for the IPDS scores and mother/infant categories. These may indicate that the effects of parental support are more noticeable with respect to the infants' spontaneous activities than with their performance in a testing situation. As such, cognitive abilities that were expressed during interpersonal play could be regarded as more closely related to experience and to specific types of maternal stimulation that seemed to exert different influences at different stages of development. Thus, infants' intelligence seems to be better expressed during encounters with objects in a social context than during formal testing. In this respect, it is probably more fruitful to study intelligence in the context of daily experiences and to look for its indices in the infants' responses to such experiences, rather than in their responses to test items. As Church (1971) suggests, "by watching babies encounter and cope with objects, one can find a great many situations that are easily adaptable to formal testing. We tend to forget that the world is an intelligence test and that babies in normal environments spend much of their waking time exploring these environments and solving the puzzles they present" (pp 177-178). One can argue that the scales of the IPDS, with the exception of 'object-permanence' closely resembled natural situations and, consequently, were likely to elicit 'intelligent behaviour' as expressed by the infant during interactions with its parents. However, in the present study responses to such test items were less related to social experiences than spontaneous activities during interpersonal play. This may be attributed to two factors:

Firstly, the test scores may have been less representative of true competence since they referred to only one point in time whereas the playing activities were based on several observations of the infants.

Secondly, the IPDS represent specific areas of sensorimotor intelligence but they were correlated with global behavioural categories which may directly influence more global aspects of intelligence.

Finally, it is worth remembering that interpreting correlations is problematic especially when large matrices (as in the present case) are concerned. Significant correlations may have been produced by chance, while true relationship between experience and cognitive development may have been masked. Despite these problems the correlational analysis revealed interesting developmental tendencies between parental support and infants' activities that are indicative of underlying cognitive capacities.

CHAPTER VII

CASE STUDIES

CHAPTER VII

CONTENTS:

7.1 Introduction

In this chapter the interactions between eight individual infants and their mothers will be described in detail. Each of the four age-groups that were selected for study are represented here by two infants. These infants were chosen on the basis of their performance on the IPDS: from each group the infant who performed worst on all or most of the scales and the infant who performed best were selected. This criterion was not maintained in the case of group C since there was not a single worst performer. An infant in this group may be worst on one scale and best on another (Appendix F). Thus, the worst performing infant was, more-or-less, arbitrarily chosen, while the other scored highest on 4 out of the 6 scales.

In selecting a pair of infants who emerged as different according to their performance in tests measuring cognitive abilities, the aim here was to examine whether these infants showed any differences when interacting with their mothers and, more important, whether such differences could be accounted for in terms of differences in the experiences which these infants had encountered in the course of their interactions with their mothers. In other words, the aim was to find out whether parental support was expressed differently for each infant. If so, then one can conclude that individual differences in cognitive abilities are partly associated with differences in environmental stimulation which may be adaptive to the infants' particular needs, or it may be responsible for the infant's competence or incompetence. Similar efforts to examine the relationship between environment and the cognitive development of two contrasting groups of infants have already been made by Carew and her team (1975). Their findings showed that although the child is to a considerable extent "an originator and creator of his own intellectual experiences", his potential competence is actualised by encounters with a stimulating environment characterised by adults' active participation in the infant's play and similar dealings with the inanimate world. As Carew et al put it, the role of the adult is "to challenge the child, to present novel concepts, information and skills, and to expand, elaborate, or improve ideas". This leads to the view that early cognitive functioning is interactive in that the infant affects his cognitive development directly by actively exploring his environment, and indirectly by influencing the behaviour of his care-givers and initiating stimulation from them. However, such initiatives need to be reciprocated by a sensitive, attentive and competent care-giver, one who matches her forms of 'support' to the infant's "rapidly changing interests and abilities" (White et al, 1971). Hence, a study of cognitive development must consider the role of the parent as well as the performance of the child, with the view that either or both of these could constitute sources of variance among individuals.

In comparing the parental support of the two different infants in each group, and in attempting to detect the sources of the differences, I shall focus on the following:

1. Whether the infants were also different during episodes of interpersonal play. This tells us whether or not poor performers in the scales measuring cognitive abilities are also less competent in the way they manipulate toys during free play (e.g. their 'solitary' play may be characterised by cognitively low-level activities, and their 'sequential' acts may consist of, predominantly, visual responses such as attention).

2. Whether parental support was quantitatively and qualitatively different for the two dissimilar infants.

3. Whether the mother-infant interactions of the advanced infants

were characterised by more synchrony and cognitive compatibility than those of the less advanced infants. Here it is assumed that synchrony and compatibility are indicative of infants' advancement as well as effectiveness of maternal support: a socially competent infant may be more motivated to perform tasks jointly with his mother (e.g. 'attend'), and more able to reciprocate her modifying activities (e.g. 'imitate').

4. Whether the activities of the two partners were reciprocal in terms of their sequential patterning, characterised by immediate goal-achievement and the infants' compliance to his mother. Both (3) and (4) will be examined with particular reference to three themes in the interactions.

The first theme involves the infant' 'negative' behaviour and the ways the mothers respond to negative states. This theme was chosen for several reasons. Firstly, in the previous chapter it was found that only a small proportion of 'negative' acts were responded to by the category which is believed to be complementary to 'negative' acts, namely, 'eliminate undesirable behaviour'. This leads to the question of whether or not responding by 'eliminate' to the majority of 'negative' acts is typical of all mothers or whether mothers with poor performers are more concerned with dealing with 'negative' behaviour (i.e. maintaining interpersonal synchrony). Secondly, it was suggested in Chapter IV that frequent 'negative' behaviour could imply a certain cognitive incompetence. If so, do poor performers persist in 'negative' behaviour more than the good performers? Do such infants respond negatively to their mothers' active attempts to deal with 'negative' acts? Thirdly, by looking at the mothers' responses to 'negative' acts it should be possible to examine whether mothers of poor performers deal with such acts in different ways from mothers of good performers (e.g. 'modify' versus 'no response'), and which forms of parental efforts are most effective.

The second theme involves the mothers' 'reveal object's properties' and the infants' responses to this form of support. 'Reveal object's property' was selected, since, together with 'create discovery environment', it is representative of the major sub-categories of 'modify' and is very similar to 'create' in terms of frequency and patterns of correlations with various other variables. Furthermore, according to the results presented in Chapter VI, of all the sub-categories of 'modify', 'reveal' was least attended to by the infants. This was partly because the possible types of responses are less fixed than in the case of 'create' or 'teach'. Thus we want to know what are the typical responses of the two types of infants, and, in particular, to what extent is 'reveal' likely to be followed by 'imitate', in which case it would be fulfilling a similar function to 'demonstrate/teach' with respect to the infants' reactions.

The third theme is that of 'demonstrating' and 'teaching'. It was chosen because it was rarely observed in this study (relative to the other categories of level-3 of the mother's Hierarchy, with the exception of 'assist'). Therefore, one is interested in examining the conditions under which it occurs and whether it is associated with the infants' failures to engage in advanced activities. It is also representative of the type of parental support that can have immediate effects, so we want to examine to what extent it achieved its goals, and whether such goals were achieved by different means for infants with different cognitive capacities. 'Demonstrate/teach' also represents the start of a type of pre-school education which may be relevant to the child's later school experiences, since of all types of 'create possibilities' this form of support is the most didactic and most similar to class-room situations.

Finally, excerpts of mother-infant interactions for each case will be presented and compared in an attempt to elucidate the general flavour of different interactions, and to describe certain complexities which may, in future research, be quantified. Examples of these, is the timing of shifts of topics by the mother; for example, one mother may change her form of support from 'provide stable base' to 'assist' at the point when the infant has attempted an action on his own several times but failed and was beginning to show signs of frustration. Also, examination of excerpts may reveal the nature of sequences between similar or different topics; for example, one mother may follow one episode of 'reveal object's property' by more of these, while another mother may intersperse her 'revealing' among bouts of 'provide stable base'. These two tendencies may have differential effects on the infants.

7.2. Methodology

Comparisons between each pair of subjects were based on the following:

1. Differences in the scores on the IPDS: For each pair the scores on each of the six scales were matched and a t-test was applied to determine whether the overall performance of each infant was statistically different from that of his partner.

2. Differences in types of infants' playing activities. Here the infants were compared in terms of the frequencies of the four major acts, 'solitary', 'contact', 'sequential' and 'negative' on repeated visits by means of t-tests. The comparisons were based on equal numbers of visits for each pair of infants in groups B and D (B = 6 and D = 5) and on unequal numbers of visits for the pairs in groups A and C (A1 = 8, A4 = 6; (C1 = 6, C5 = 5).[1]

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1. For all cases, '1' designates the best performer, while '4' or '5' designates the worst performer.

3. Differences in maternal support. This involved comparisons among the frequencies of level-2 and level-3 categories; t-tests were used to determine whether the differences were significant.

4. Degree of interpersonal synchrony: the mother-infant categories that are regarded as complementary in terms of their communicative functions were correlated together. These are 'enhance' and 'modify' versus 'solitary' and 'sequential' acts, 'participate' versus the four major infants' activities, 'support manipulation' versus 'contact' acts, 'eliminate' versus 'negative' acts and 'modify' versus 'attend'.

5. Degree of cognitive compatibility. This involved correlations of forms of parental support and the infants' categories that reflect cognitive abilities which were described in the previous chapter (Section 6.1.2). The correlations, both here and for interpersonal synchrony, were based on matching pairs of categories for every visit.

6. Sequential patterning of mother-infant behaviour. Here for each mother-infant pair, the number of 'participate from background', 'support manipulation', 'reveal', 'create', 'demonstrate' and 'teach' were examined with reference to the infant's (and sometimes mother's) preceding activities, and the types of responses these behaviours elicited from the infants. 'Participate' and 'support manipulation' were also examined with reference to the infants' activities that occurred simultaneously with them. With regard to 'negative' acts, these were examined with reference to the maternal behaviours that preceded them, the types of maternal responses and their consequences in terms of the infants' reactions. Mother or infant behaviour was expressed as a percentage of the corresponding behaviour of the opposite partner. For example, if one infant had a mean of 60 negative acts (based on the frequency of negative acts on each visit), and negative acts were preceded by 'provide

stable base' on 40 occasions, then the proportion of negative acts that were preceded by 'provide stable base' was 66.6%.

7.3 Cases A1 (Alan) and A4 (Adrian) : Group A infants.

7.3.1 Background Information

Group A is represented here by two male infants. The first infant (Alan), who scored best in the group, was a second-born, and his age was 6 months, 1 week at the start of the observations. He had a brother, three years old, who was present during most of the visits and who was a considerable source of frustration to the infant. The mother's age was about 26 years. She was friendly, and she seemed relaxed and behaving naturally during the observations. She often devised novel and entertaining activities with the toys to amuse her infant. The father was present during the observations only once. Alan and his brother possessed many toys; many of them were educational (e.g. books, posting boxes, building bricks, lego and aeroplane models). Alan often showed interest in the toys, and when his brother was not there, he was hardly distressed.

The second infant who had the lowest scores on all scales will be identified as Adrian. He was a first-born and was one of the two bone-retarded infants mentioned in Chapter II. At the beginning of the observations he was 6 months and 2 weeks old. However, he still could not sit up without support, nor could he grasp visually-presented objects. Adrian showed a great interest in the observer and was a very sociable and contented baby. His mother, a 31-year-old ex-school-teacher, was also cheerful and she often expressed affection towards Adrian. She was quite interested in the project and she often asked questions concerning children's development. Her favourite theme of interaction was a joint game of building towers for Adrian to knock down. The father was never present during the experimenter's visits. Adrian played with less toys than Alan, and his toys were mainly of two types: dolls and stuffed animals and sound-emitting toys such as squeaking, rubber animals and rattles.

7.3.2 Quantitative differences between the infants

(i) Scores on the IPDS

Figure 7.1 reveals that Alan and Adrian showed most differences on the scale measuring 'causality' but their scores were very similar on the scale on 'object-permanence'. Overall, the t-test showed that the two infants differed significantly in their performance ($t(5) = 2.51$; $p < 0.05$). For Alan, the worst performance was on 'object-permanence' while his best performance was on 'causality'. Adrian performed worst on 'simple schemes' and best on schemes relating to social objects. 'Causality' seems to differentiate the two infants more than any of the other scales.

Examination of the infants' performance on individual items (Appendix E) reveals that Alan exceeded Adrian on items relating to knowledge of the specific properties of objects (e.g. hitting two objects together, letting go of them and scraping or rolling certain ones, as in the scale measuring schemes with multiple-objects). He also manifested anticipation of consequences of his own and others' actions and knowledge of the sources of such actions (e.g. on 'causality' Alan succeeded in repeating his action that produced a spectacle with object, and he also responded appropriately to the spectacle created by an agent). Adrian, on the other hand, manifested knowledge of the properties of objects used in the context of interaction with others (e.g. rolling the ball in the scale measuring schemes with social objects). The significance of these

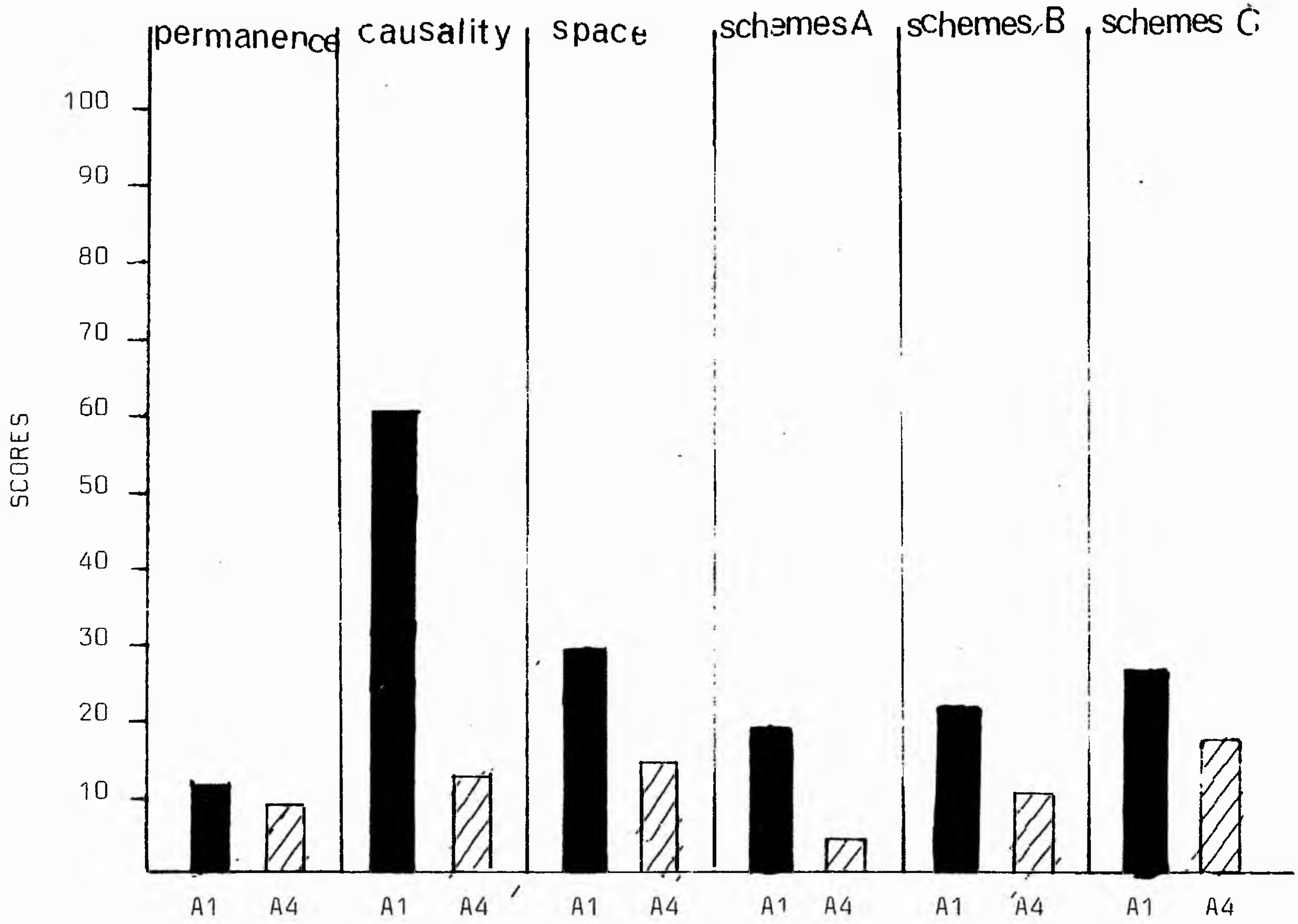


Figure-7.1 Scores on the IPDS for the 2 infants in group A differences becomes more meaningful when they are related to differences in the infants' experiences, as well as their spontaneous interpersonal activities.

(ii) The infants' major activities

Figure 7.2 shows that the frequency of 'solitary' acts was significantly greater for Alan than Adrian. Adrian performed more 'contact' 'sequential' and 'negative' acts; all except 'negative' acts were significant at 0.05 level.

With regard to 'solitary' acts, it seems that Alan was more advanced than Adrian since he was able to pursue activities with objects on his own. Furthermore, a greater proportion of high-level 'solitary' acts was achieved by Alan, and he performed less low-level 'solitary' acts than Adrian. 8% of Alan's solitary acts consisted of 'constructions', with none for Adrian.

In terms of 'contact' acts, Adrian could be regarded as less cognitively advanced than Alan since he engaged in more minimal contacts with the toys, and the majority of these consisted of distal contact in general, and passive looking in particular.

Adrian exceeded Alan in the frequency of 'sequential' acts. This could indicate Adrian's advancement since 'sequential' acts involve the ability to attend to the mother together with performance of joint actions on the toys. A large proportion of Adrian's 'sequential' acts consisted of 'games'. However, Adrian was less attentive than Alan.

Although the differences between the two infants on 'negative' acts were not significant, there was a tendency for Adrian to engage in such behaviour more often than Alan. This could stem from his inabilities to manipulate objects for sustained periods of time and his lack of a rich repertoire of schemes that would keep him involved in manipulation of toys

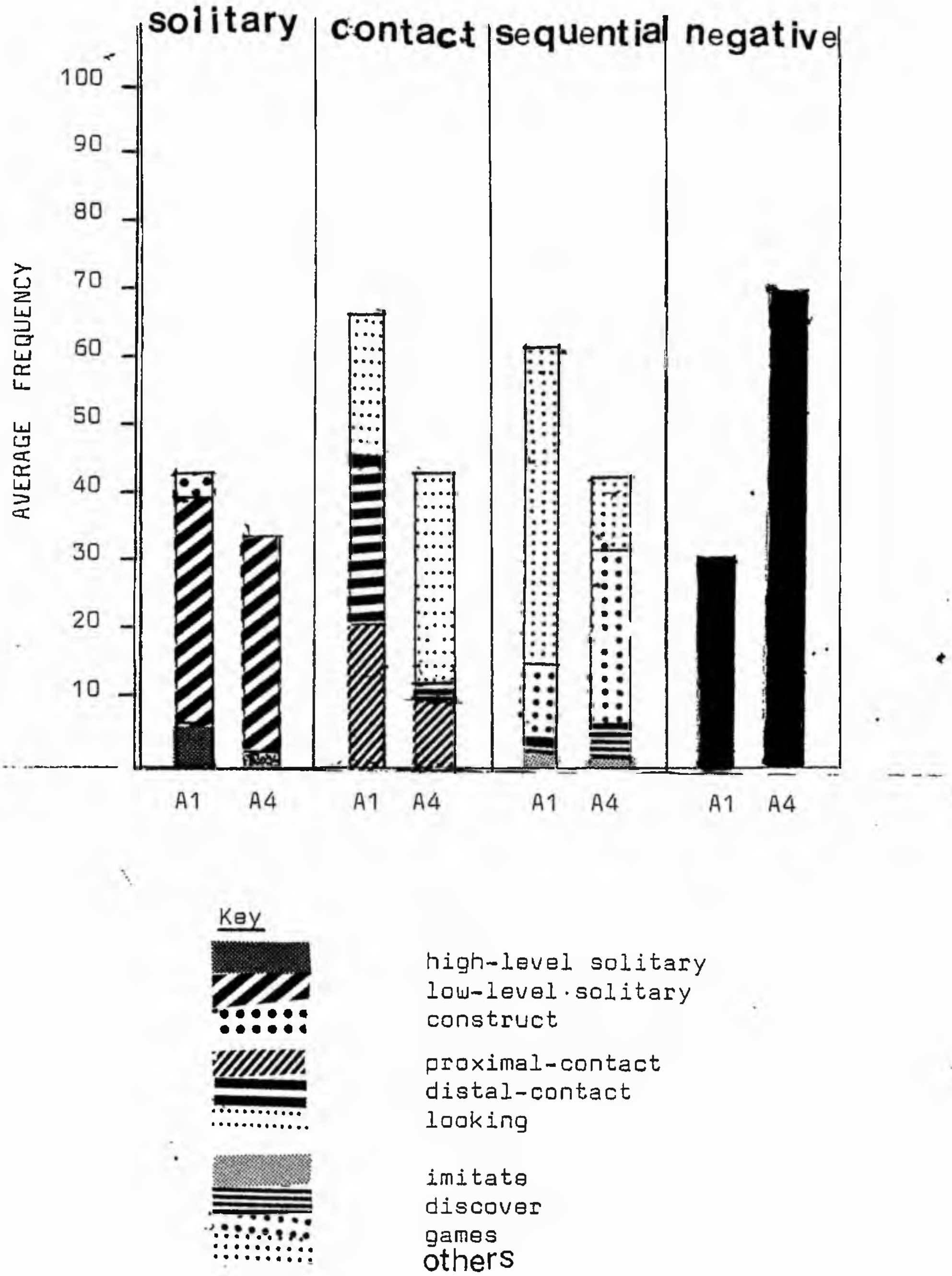


Figure 7.2 Frequency of the activities of the 2 infants of group A

for longer durations.

To some extent these results are consistent with the results on the IPDS: Alan showed more advancement on activities that require knowledge of the properties of objects and the way to manipulate these objects according to their properties, while Adrian seemed to be advanced in social skills both in terms of possessing a richer repertoire of schemes with social objects and in reciprocating activities that depended on others' initiations. However, overall, the two infants still emerged as different, with Adrian being less competent than Alan. Thus, differences in the performance on the IPDS were also manifest in the infants' spontaneous activities with the toys.

(iii) Maternal activities

From Figure 7.3 it can be seen that the mothers of the two infants 'enhanced' to an almost equal extent, with Alan's mother 'enhancing' slightly more. Similarly, Alan received slightly more 'provide stable base' than Adrian. However, Adrian had significantly more 'support manipulation' ($t(12) = 2.6$; $p < 0.05$). This could be attributed to the condition of Adrian. Being bone-retarded, the motor development of this infant was slow and so the mother may have tried to compensate for that by making the toys easily available to the infant and by engaging in acts that would enable him to procure them.

With regard to 'modify interaction', Figure 7.4 shows that the infant with poorer scores on the IPDS received significantly more 'modifying' ($t(12) = 2.27$; $p < 0.05$). This difference is seen in all the sub-categories of 'modify' except 'demonstrate' where the frequency was slightly higher for Alan. 'Reveal object's property' was significantly different for the two infants ($t(12) = 2.59$; $p < 0.05$).

Thus, for this pair of infants, when 'solitary' acts were less frequent

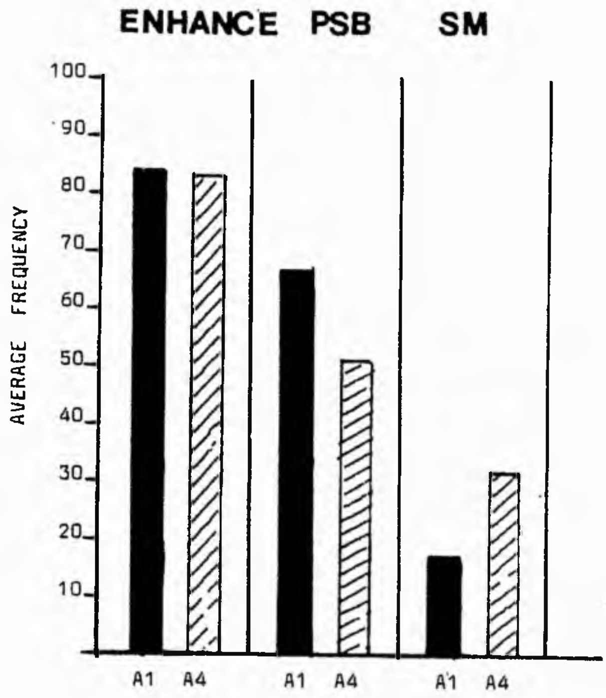


Figure 7.3 Frequency of 'enhance' and its immediate sub-categories for the 2 infants in group A

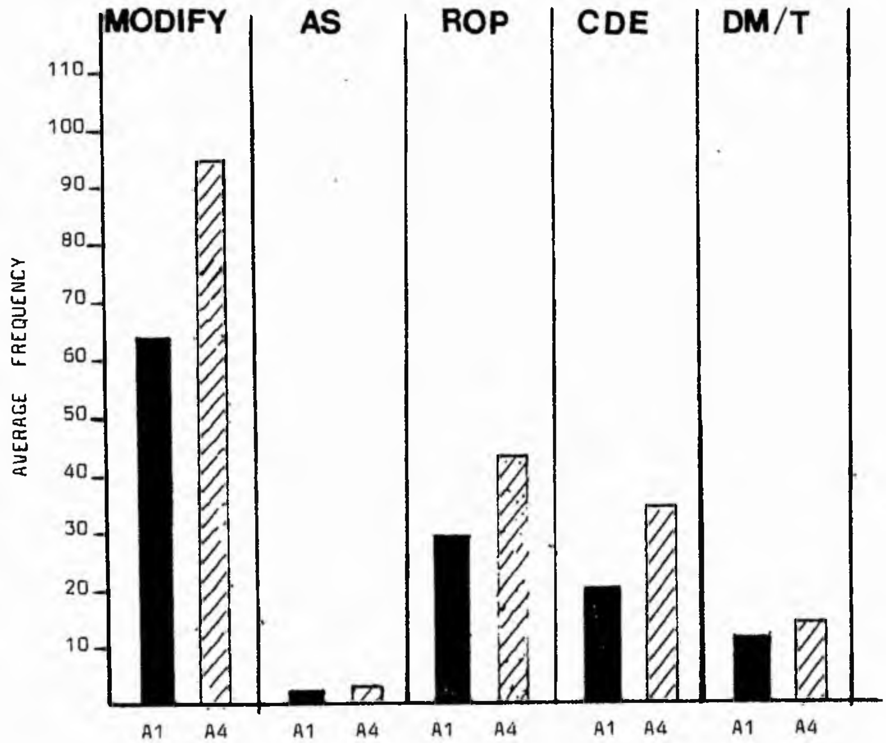


Figure 7.4 Frequency of 'modify' and its immediate sub-categories for the 2 infants in group A

and consisted of low-level activities, (as in the case of Adrian), the mothers' 'modifying' activities were more frequent. This seems to indicate that like 'enhance', 'modify' is reactive to the infants' level of cognitive functioning and may be selectively adopted by some mothers to meet their infants' cognitive needs. In the case of Adrian, the form of 'modify' that seemed to meet that need most was 'reveal object's property' since it was significantly more frequent in his case than in Alan's.

7.3.3 Relationship between mother and infant behaviour

(i) Interpersonal Synchrony

Table 7.1 shows that the correlations between 'enhance' and also its sub-category 'participate' and 'solitary' acts were greater for Alan than for Adrian. In the case of Adrian, 'modify' correlated negatively with 'solitary' acts, though not significantly. For Alan, the correlation between 'modify' and 'solitary' acts was positive and significant at 0.01 level. For both infants, 'modify' correlated positively and significantly with the complementary infant's category, 'sequential' acts. This implies that the mothers' 'modifying' was appropriately reciprocated by both infants, and in the case of Adrian increases in 'modify' were associated with decreases in 'solitary' acts and vice versa.

From Table 7.1 it can also be seen that 'eliminate undesirable behaviour' showed a low, positive correlation with 'negative' acts in the case of Alan, but no correlation for Adrian. 'Support manipulation' showed a low, positive correlation with 'object-contacts' only for Alan, but for Adrian the correlation was negative and significant. 'Modify' was positively attended to by both infants and significantly so by Alan. ($r = 0.83$; $p < 0.05$). For Adrian the correlation was 0.36.

* $p < 0.05$ for df = 6(A1) and df = 4(A4)

** $p < 0.01$ for df = 6(A1) and df = 4(A4)

*** $p < 0.001$ for df = 6(A1) and df = 4(A4)

Table 7.1 Correlations between the mother and infant categories that describe interpersonal synchrony

		Solitary	Contact	Sequential	Negative
Enhance	A1	0.75*	-	0.62	-
	A4	0.22	-	0.27	-
Modify	A1	0.92***	-	0.97***	-
	A4	-0.51	-	0.97***	-
Participate	A1	0.97***	0.64	0.82*	0.20
	A4	-0.52	0.75	0.62	-0.45
Eliminate	A1	-	-	-	0.33
	A4	-	-	-	-0.01
Support	A1	-	0.46	-	-
Manipulation	A4	-	-0.85*	-	-

These results seem to indicate that Alan's mother 'enhanced' and 'participated' in proportion to her infant's 'solitary' acts while both infants increased (or decreased) their 'sequential' acts in proportion to similar increases or decreases of their mothers' 'modify'. 'Sequential' acts are, by definition, largely responsive, and they were especially so during the period 6-9 months (cf Chapter IV); therefore, we can conclude that Alan's and Adrian's 'sequential' acts were influenced by 'modify' rather than influencing it. With respect to 'eliminate' and 'negative' acts, the positive correlation between them in the case of Alan could indicate that his mother paced the frequency of her 'eliminate' activities in response to changes in the frequency of Alan's 'negative' acts. The positive correlation between 'support manipulation' and 'contact' acts, also in the case of Alan, could be interpreted that Alan varied the frequency of his reactive 'contact' acts in proportion to changes in the frequency of his mother's 'support manipulation', while Adrian's mother may have increased her 'support-manipulation' whenever the infant's contacts with objects were infrequent, and vice versa. Alan also attended more than Adrian to his mother's 'modify'.

Now let us turn to the temporal patterning of the mother-infant behaviour in order to examine the extent to which the associations depicted by the correlations were supported by the sequential analysis of the data.

Table 7.2 shows that the proportion of 'solitary' acts that were simultaneous with the mother's 'participate' was greater for Alan. 51% of his 'solitary' play was associated with 'participate' as opposed to 25% in the case of Adrian. Also Adrian showed complete difference from Adrian in that 21% of his 'solitary' acts were responsive to his mother's 'participate' behaviour. In the case of Adrian, his 'solitary' acts tended to precede his mother's 'participation' while Alan's acts did not. Slightly more of Alan's 'contact' acts were associated with 'participate' than in the case of Adrian (37% versus 32%). The two infants were similar in terms of the sequential patterning of 'negative' acts and 'participate' (27% versus 25%). In terms of lack of synchrony (i.e. when the mother 'participates' and the infant is engaged in simultaneous 'sequential' or 'negative' acts), Alan was slightly worse than Adrian (29% versus 25%). In all the other patterns of 'participate' and the infants' activities Alan came better (88% versus 57%).

Table 7.2 Percentages of infants' activities that are associated with the mothers' 'participate'. The association is in 3 directions: ⟵p⟶ simultaneous with the baby's acts; p⟶ followed by the baby's acts; ⟶p followed from the baby's acts.

Infant acts		⟵ p ⟶	p ⟶	⟶ p
Solitary	A1	30	21	0
	A4	15	0	10
Contact	A1	33	2	2
	A4	20	2	10
Sequential	A1	2	0	0
	A4	0	0	0
Negative	A1	24	0	3
	A4	21	2	2

Since 'support manipulation' is an initiative category complemented by the infant's category of 'contact' acts, the infants' various responses are considered as percentages of the mother's 'support manipulation'. Table 7.3 shows that both infants were identical in complementing their mothers' 'support manipulation' with 'contact' acts, but Alan also responded by 'sequential' acts (i.e. 'receive' objects that were offered to him). Also for Adrian, after 'contact' acts, the most likely response to 'support manipulation' was 'negative' acts (22%), whereas for Alan it was 'solitary' or 'sequential'. Thus, Adrian's responses were less complementary than Alan's.

Table 7.4 <u>Percentage of infants' 'negative' acts responded to by different maternal acts</u>

Mother's responses	A1 (Alan)	A4 (Adrian)
Eliminate	12	19
Support manipulation	20	20
Modify interaction	28	30
Participate	24	19
No response	16	12
Active dealing	60	69

Table 7.5 <u>Percentages of 'modify' sub-categories that were attended to by the 2 infants</u>

Attend & modify sub-categories	A1 (Alan)	A4 (Adrian)
Reveal object's property	60	50
Create discovery	57	14
Demonstrate/teach	83	38
Mean	67	34

Table 7.3 Percentages of 'support manipulation' associated with the infants' acts

Support Manipulation	← SM →				SM →				→ SM			
	SO	CT	SQ	NE	SO	CT	SQ	NE	SO	CT	SQ	NE
Alan (A1)	26	44	0	30	13	68	13	6	15	31	0	54
Adrian (A4)	15	51	0	34	6	70	2	22	3	46	3	48

Concerning 'eliminate undesirable behaviour', Table 7.4 shows that only a small proportion of the infants' 'negative' acts were directly dealt with in the form of 'eliminate', with Adrian having more of his 'negative' acts eliminated than Alan. However, less than 50% of 'negative' acts were not dealt with actively, (i.e. they were not responded to, or the response was 'participate'). Adrian had a slightly lower proportion of these than Alan. Thus, both mothers 'eliminate' few of their infants' negative acts, but they do respond in an active manner in over 50% of the time. Adrian's mother deals more with 'negative' behaviour than Alan's.

From Table 7.5 it can be seen that Alan was more attentive to his mother's 'modifying' activities than Adrian. This finding substantiates the positive correlation that was found between 'modify' and attention for Alan but not for Adrian.

The sequential analysis confirms the tendencies depicted by the correlational analysis. Thus, more of Alan's 'solitary' acts were associated with his mother's 'participate' than Adrian. Although the correlational analysis depicted a negative relationship between Adrian's 'contact' acts and his mother's 'support manipulation', and a positive one between the same activities in the case of Alan and his mother, yet the two infants were identical in terms of the percentages of 'support manipulation' that were responded to by 'contact' acts. The differences in the direction of the correlations could be attributed to differences in the mothers: Alan's mother probably "paced" her 'support manipulation' in proportion to her infant's 'contacts', while Adrian's mother "compensated" for his lack of making contact with toys, so that most 'support manipulation' tended to occur during the visits when Adrian engaged in least 'contacts', and least 'support' occurred when Adrian contacted objects most. Since Adrian and his mother engaged in more 'contact' acts and 'support manipulation' than Alan and his mother, the infants may have emerged as similar in terms of complementing maternal support with appropriate 'contact' acts, though in actual fact Adrian's responses were less complementary than Alan's since he responded with more 'negative' acts and less 'sequential' acts to his mother's 'support'.

The sequential analysis, like the correlational one, showed that only a small proportion of 'negative' acts were 'eliminated', but unlike the correlations, more of Alan's acts were eliminated.

Finally, there was more reciprocating of the mother's 'modifying' by 'attention' for Alan than Adrian, and this was revealed by both types of analyses. Thus, overall, Alan and his mother seem to keep more of their activities in synchrony than in the case of Adrian and his mother. This could be attributed to Alan being more competent than Adrian, so he was more responsive to his mothers' activities (e.g. 'attend'). Consequently, more involvement in play was probably expected from him (e.g. more dealing with his 'negative' acts), and some proportion of his 'solitary' acts were encouraged by the mother's 'participate from background'. Adrian, on the other hand, showed responsivity mainly to his mother's attempts to engage him in minimal manipulation of objects (con-tact' acts).

(ii) <u>Cognitive Compatibility</u>

Table 7.6 shows that 'enhancing' was compatible with Alan's 'solitary' acts in that the correlation between 'enhance' and high-level 'solitary' acts was positive. 'Construct', on the other hand, did not show the same positive relationship with 'enhance'. For Adrian, 'enhance' was unrelated to any of the sub-categories of 'solitary' acts. 'Participate' showed the same associations with the sub-categories of 'solitary' acts and it correlated well with Alan's high-level ones.

For Alan, the relationship between 'modify' and advanced 'solitary' acts was less strong than in the case of 'enhance'; in fact 'modify' correlated positively and significantly with low-level 'solitary' acts. For Adrian, 'modify' correlated more than 'enhance' with high-level solitary acts and it was negatively correlated with low-level ones. Thus, by 'modifying inter-action' Adrian's mother decreased the likelihood of his engaging in low-level 'solitary' acts while, by 'enhancing', the level of his solitary play seemed to have been unaffected. In the case of Alan, 'modifying' was also associated with increases in high-level 'solitary' acts as well as low-level ones. The positive relationship between 'modify' and low-level 'solitary' acts could have been due to the mother adopting 'modify' in response to Alan's low-level play. By doing so, she may have also influenced his solo play so that it involved more advanced activities, probably extrapolated from the 'modifying' activities. When 'enhancing' Alan's interaction, the mother encouraged advanced activities, in other words, she adopted a passive role in response to high-level constructive 'solitary' play and only to a lesser extent to low-level and 'construct' acts.

Table 7.6 Correlations between the mothers' forms of support and the infants' activities

Pairs of correlations	A1 (Alan)	A4 (Adrian)
Enhance/high-level solitary	0.80**	0.16
/low-level solitary	0.49	0.20
/construct	0.45	-
Modify/high-level solitary	0.69*	0.51
/low-level solitary	0.89***	-0.54
/construct	0.08	-
Participate/high-level solitary	0.95***	0.46
/low-level solitary	0.76*	0.49
/construct	-0.23	-

Table 7.7 shows that Alan's 'solitary' acts were positively and significantly correlated with his mother's 'provide stable base', 'create discovery environment' and 'demonstrate/teach'. Adrian's 'solitary' acts seem to be relatively unrelated to his mother's activities, although there was a tendency for 'create discovery environment' and 'demonstrate/teach' to be negatively related to 'solitary' acts. These results indicate that 'provide stable base', 'create' and 'demonstrate/teach' were supportive to Alan's solo play. 'Provide stable base', probably encouraged 'solitary' acts while 'create' and 'demonstrate/teach', as mentioned in the previous sub-section, enabled the infant to be more advanced in 'solitary' play through learning from his mother's 'modifying' activities. For Adrian, on the other hand, the negative correlation between his 'solitary' acts and 'create' and 'demonstrate/teach' may have been compensatory, that is,

when Adrian engaged in little 'solitary' acts his mother intervened by performing more of the sub-categories of 'modify'.

'Contact' acts correlated positively and significantly with 'provide stable base' and, to a lesser extent, with 'demonstrate/teach' in the case of Alan and negatively and significantly with 'support manipulation' in the case of Adrian. In Alan's case, his mother's minimal participation was not only responsive to his 'solitary' acts but also to his 'contacts' with objects. The sequential analysis showed that 37% of Alan's object-contacts were associated with 'participate' from background. One could argue that such contacts are equivalent in their cognitive status to the low-level 'solitary' acts and, consequently, the association of 'provide stable base' and 'contact' acts could be regarded as indicative of less cognitive compatibility. 'Demonstrate/teach' may have enticed the infant to procure objects his mother had handled. In the case of Adrian, the negative correlation with 'support manipulation' and 'object-contacts', like that between 'enhance' and 'solitary' acts may have been reactive to the infant so that he was encouraged to handle objects more.

Table 7.7 also showed that Alan's 'sequential' acts were positively related to his mother's 'provide stable base', 'create discovery environment' and 'demonstrate/teach'. No ready explanation can be offered for the positive correlation between 'sequential' acts and 'provide stable base', while the correlations with 'create' and 'demonstrate/teach' could indicate that these maternal activities had achieved their immediate goals in terms of reciprocal responses from Alan. For Adrian, too, this seems to be the case, and he also complemented his mother's 'reveal object's property' more than Alan did. This implies that 'reveal' was more supportive to the infant with less cognitive abilities than to the one with more abilities; it was also better reciprocated than 'create' and 'demonstrate/teach' by the less competent infant presumably because it demanded less complex responses from him (e.g. 'attend' as opposed to 'discover' or 'imitate').

The association of 'sequential' acts with the mother's activities, besides pointing out the differences between the infants, also highlights their similarities. Both infants responded well to the sub-categories of 'modify'.

'Negative' acts, on the whole, correlated less well with the mothers' acts than the other infants' activities. Significant (or almost significant) relationships were found between it and 'support manipulation' in the case of Alan, and between 'negative' acts and 'support manipulation' and 'create discovery' in the case of Adrian. The correlation with 'create discovery' was negative. 3 out of 5 of the correlations with the sub-categories of 'modify' were more negative than positive in the case of Adrian. Thus Adrian may have responded favourably to his mother's active involvement in his object-play, and especially when that involvement was characterised by playing joint games, which was the predominant type of their 'create discovery environment' activities. For Alan, encouraging him to procure objects was correlated with 'negative' behaviour. This was partly brought about by the mother responding to 'negative' acts with 'support manipulation' rather than 'eliminate' (Table 7.4). Hence the association in the frequencies of these two behaviours.

To sum up, from the correlational analysis we can infer that both mothers' forms of support were compatible with their infants' level of cognitive functioning. For Alan this compatibility emerges when his mother 'enhanced' (or 'participated') and when she was 'demonstrating' and 'teaching', and to a lesser extent when she was 'creating discovery environment'. Thus, almost all types of 'create possibilities' seemed to be

Table 7.7 Correlations between the mother and infant activities that imply cognitive compatibility

For explanation of asterix code see p. 266

Mother's acts		Solitary	Contact	Sequential	Negative
Provide Stable Base	A1	0.80*	0.88*	0.66	0.45
	A4	0.20	0.67	0.39	-0.39
Support Manipulation	A1	0.27	0.46	0.23	0.70*
	A4	-0.08	-0.85*	-0.27	0.62
Reveal Object's	A1	0.28	0.33	0.45	-0.27
Property	A4	0.16	0.03	0.87*	0.37
Create Discovery	A1	0.67	0.42	0.81*	-0.33
	A4	-0.43	0.53	0.78	-0.78
Demonstrate/teach	A1	0.89**	0.74*	0.81*	0.22
	A4	-0.39	0.21	0.73*	-0.52

suited to Alan's activities in one way or another. When his mother's involvement was minimal, Alan was usually engaged in active and advanced manipulation. When his mother's participation was more directive, he followed her directions and he seemed to have reciprocated her actions. When we consider Adrian, minimal involvement of his mother was less supportive than in the case of Alan. Unlike Alan he seemed not to have sustained his own 'solitary' activities, nor were those activities cognitively advanced, but be did perform 'contact' acts when his mother was 'providing stable base'. However, it seems that the adoption of the 'enhancing' role was supportive in a less direct manner; when Adrian engaged in few 'contact' acts his mother increased her 'support-manipulation'.

Since the frequency of 'contact-acts' was greater in the case of Adrian than Alan, and Adrian's mother supported manipulation more than Alan's, it seems likely that 'support manipulation' was responsible for Adrian's 'object-contacts' over the longer term. It achieved immediate outcomes in the form of 'contact' or 'sequential' acts ('receive') on 72% of the time. Therefore, of the two sub-categories of 'enhance', 'provide stable base' seems to be more relevant to Alan's level while the other sub-category of 'support manipulation' seemed to have suited the less advanced of the two infants. The directive role of 'modify' was also supportive to Adrian's cognitive development in that it was associated with decrease in 'negative' behaviour and with Adrian's involvement in play in a social context.

7.3.4 <u>Themes of Interaction</u>

(i) <u>Dealing with the infants' 'negative' behaviour</u>

So far, the data on 'negative' acts showed that there was no significant difference between Alan and Adrian in terms of the frequency of their 'negative' acts, although Adrian manifested more of it. There was a low correlation between 'eliminate' and Alan's 'negative' acts while the two activities were unrelated in the case of Adrian. 27% of Alan's 'negative' acts and 25% of Adrian's occurred when their mothers' were 'participating from background'. 60% of Alan's 'negative' behaviour and 69% of Adrian's were dealt with in terms of 'eliminate', 'support manipulation' or 'modify interaction'. These results show the striking similarities between the two infants in terms of the amount of their 'negative' behaviour and in terms of some of the conditions that were associated with such behaviour and the ways their mothers coped with it. In this section we shall examine further the antecedents of 'negative' acts, by asking two questions.

Firstly, were both infants liable to be distressed or bored or fatigued by similar events? Secondly, once the infants were in this state, what was the most effective way of getting them out of it and which were the methods that failed to terminate their 'negative' acts?

Table 7.8 shows that a large proportion of both infants' 'negative' acts were preceded by 'enhancing'. This was followed by 'external events' (e.g. falling down or distracted by arrival of visitors or teased by siblings) for Alan and 'modify' for Adrian. Thus it seems that minimal stimulation from the mother was likely to lead to 'negative' reactions from the infants. For Alan a larger proportion of his 'negative' acts followed from 'participate' presumably because 'participate' was more frequent in his case than in the case of Adrian. Thus, what the infant's mother tended to do most was likely to be followed by 'negative' acts; for Alan this was 'enhance' and in the case of Adrian it was 'modify'. The presence of Alan's older brother during the interactions was responsible for 13% of the infant's 'negative' acts. Overall, the conditions that may have provoked 'negative' behaviour were very similar for both infants.

Table 7.8 Antecedents of 'negative' acts (as percentage of 'negative acts)

Antecedents	A1 (Alan)	A4 (Adrian)
External events	13	0
Non CP	10	12
Enhance	66	52
Modify	11	36

With regard to maternal responses to 'negative' acts, Table 7.4 shows that there was no predominant, single response and both mothers responded in an almost identical manner. The largest proportion of 'negative' acts, however, tended to be responded to by 'modify'. To what extent was this effective? As can be seen from Table 7.9, dealing with 'negative' acts produces 3 types of consequences. The first type consists of the success of the mother's efforts in that the 'negative' behaviour is terminated. Here the infant responds directly to what the mother had done (e.g. stops crying after being picked up; come back to field of play after being requested to do so). The second type concerns the failure of the mother's efforts, that is, the continuation of 'negative' behaviour following from what the mother had done or did not do (e.g. whimpering not responded to, followed by more whimpering). In the third type, the infant does not respond to anything the mother has done (i.e. reciprocate her activities), but terminates his own 'negative' behaviour by resuming play (e.g. 'leaving field' responded to by mother 'call back', followed by infant picking up another distant toy - away from field - and engaging in 'solitary' acts with it). Of these types of responses continuation of the 'negative' acts was the most common regardless of the type of maternal response. However, 'participate from background' was least effective for Alan since 56% of his 'negative' acts that were responded to by 'participate' failed to be terminated. For Adrian, too, 'participate' was least effective, followed by 'modify' and 'support manipulation'. The most effective form was 'modify/support manipulation' for Alan and 'eliminate' for Adrian. Thus, in each case, the atypical maternal form of participation with the particular infant brought best results while the familiar form was less successful. It seems that varying the predominant form of support was related to termination of 'negative' acts. This is probably because infants need variety to prevent and/or stop them from getting bored or distressed or interested in salient stimuli that are unrelated to cooperative tasks. However, Adrian needed more specific intervention in the form of 'eliminate'. In their responses, the infants were again very similar, complying or resisting to the same extent. However, Alan showed more autonomy than Adrian by resuming play on his own accord more often.

Examination of the theme of coping with negative behaviour revealed that there are no apparent emotional differences between the two infants which may have been determined by cognitive differences.

Table 7.9 Percentages of 'negative' acts responded to by various maternal acts, and the consequences of these acts as a percentage of the total number of negative acts responded to by each type of maternal act .

Maternal Responses	Termination		Continuation		Resumes	
	A1	A4	A1	A4	A1	A4
Eliminate	17	43	50	43	33	14
Modify/Support	40	30	20	65	40	5
Manipulation	-	-				
Participate	-	-	56	72	44	28
No response	-	-	50	50	50	50
Mean	28.5	36.5	44	57.5	42	24

(ii) Revealing the properties of objects

From the data presented in previous sections of this chapter, it was found that Adrian's mother revealed significantly more than Alan's and that 60% of 'reveal' were attended to by Alan, while Adrian attended to 50%. 'Reveal' also correlated positively and significantly with Adrian's 'sequential' acts; for Alan the correlation was still positive but low.

If we consider the major sub-category, 'fulfil', we find, as Table 7.10 shows, that the correlations between it and Alan's various, complementary or related activities are generally low; there was a low, positive correlation between 'fulfil' and 'construct'. This may indicate that 'fulfil' had some influence on Alan's 'solitary' play. For Adrian, 'fulfil' was positively and significantly correlated with his 'attention' to mother. Thus, even when we exclude 'describe', the other sub-category of 'reveal', the pattern of correlation with the infants' activities remains unchanged. These results also indicate that 'reveal' was strongly associated with Adrian's visual-contact with the toys.

Table 7.10 <u>Correlations between 'fulfil' and some of the infants' activities</u>

	Attend	Look	Discover	Construct
Alan (A1)	0.43	0.45	0.25	0.35
Adrian (A4)	0.84*	0.62	0.13	0.50

How, then, do the mothers 'time' their 'revealing' activities, and on the occasions when the infants did not respond by 'attend', how did they react?

Table 7.11 shows that a large proportion of 'reveal' takes place when Adrian is already 'looking' at the toy in question (i.e. 'attending'), while for Alan the proportion is much less. A variety of Alan's activities preceded 'reveal'. Thus it seems that Adrian's mother 'timed' her activity with respect to what her infant was doing, and this might be related to Adrian's slower development. Alan's mother, on the other hand, seemed not to be concerned with that; (or Alan's activities were more diverse than

Table 7.11 Infants' activities that preceded 'reveal object's property' (as percentage of 'reveal')

Infants' activities	A1 (Alan)	A4 (Adrian)
Low-level solitary	27	14
High-level solitary	2	0
Contact	17	15
Non-visual contact (same object)	13	4
Attend	26	43
Sequential	3	2
Negative	18	22

Table 7.12 Mothers' activities that preceded 'reveal object's property' (as percentage of 'reveal')

Maternal acts	A1 (Alan)	A4 (Adrian)
Non-CP	2	2
Provide stable base	33	21
Support manipulation	10	17
Reveal object's property	42	43
Recruit	7	7
Other modify	6	10

Adrian's). Adrian's mother takes her initiatives from the infant's own activity and especially one that maximises the chances of his heeding her support. For example, 11% of the time when Adrian's mother 'revealed', Adrian was already in contact with the toy. This usually involved 'revealing' by verbal descriptions.

The majority of 'reveal' was preceded by previous 'revealing' in the case of both infants (Table 7.12). In other cases it was preceded by 'provide stable base;' more so for Alan. Thus it seems that 'reveal object's property' constituted prolonged displays and not only discrete events scattered randomly at different points of the interactions. It is possible then that the two mothers relied on that form of support as a way of entertaining the infants, and influenced their cognitive development only indirectly.

With regard to the consequences of 'reveal' the majority of its episodes were responded to by 'attend', and this was typical of both infants but more so of Adrian (Table 7.13). Also, Alan tended to make 'contact' with the same object, that is, he showed more active involvement than Adrian. There were more 'negative' responses from Adrian. 1% of 'revealing' was responded to by 'imitation' by Alan. Thus, the infants showed similarities as well as differences in their responses. Alan's responses were relatively more competent since they included 'contact' acts and one episode of 'imitation'.

(iii) Demonstrating and teaching

From Figure 7.5 it can be seen that Adrian's mother did more 'demonstrating' and 'teaching' than Alan's mother. Alan attended to 83% of his mother's 'demonstrate/teach' as compared with Adrian who attended to 38% only. 'Demonstrate/teach' also correlated well with all the major activities of Alan except 'negative' acts. In the case of Adrian, the

Table 7.13 Infants' immediate responses to 'reveal object's property' (as percentage of 'reveal')

Consequences of 'reveal'	A1 (Alan)	A4 (Adrian)
Solitary acts	10	10
Contact acts	2	0
Contact (same object)	28	8
Attend	49	62
Sequential acts	1	0
Imitate	1	0
Negative acts	9	20

mother's activity correlated positively and significantly only with his 'sequential' acts. These findings indicate that 'demonstrate/teach' was more supportive in the case of Alan since it was attended to most of the time and it was also associated favourably with his other activities. We shall now examine when and how his mother did her 'demonstrate/teach' as compared with Adrian's and to what extent their activities achieved their goals.

Table 7.14 shows that the majority of Alan's mother's 'demonstrate/teach' followed from her 'provide stable base' and 'm odify' while Alan was 'attending' to the toy or was engaged in 'negative' acts. In the case of Adrian 'demonstrate/teach' followed almost exclusively from 'modify', while Adrian was attending to- or contacting the toys. Thus, both mothers timed their 'demonstrate/teach' well with respect to their infants' behaviour, mostly when the infant was already attentive to the toys and, therefore, more receptive. Alan's mother also seemed to use 'demonstrate/teach' to stimulate him when he was in a negative state.

'Teaching', like 'revealing', probably was sustained for some period, that is, one teaching episode was followed by another. This would account for it being mostly preceded by 'modify'. This indicates that mothers were probably persistent in their teaching. Also, the mothers may have expanded other 'modifying' activities such as 'reveal' or 'create' into 'teaching'.

Concerning the teaching strategies that were used by each mother, as Table 7.15 shows, Alan's mother's predominant strategy was 'modelling'

Table 7.14a. Maternal activities and (b) infants' activities that preceded 'demonstrate/teach'

Maternal acts	Antecedents	
	A1 (Alan)	A4 (Adrian)
Recruit	18	15
Provide stable base	36	8
Support manipulation	12	0
Modify	34	77

Infant acts	Antecedents	
	A1	A4
Attend	27	64
Solitary	31	0
Contact	10	26
Sequential	7	2
Negative	25	8

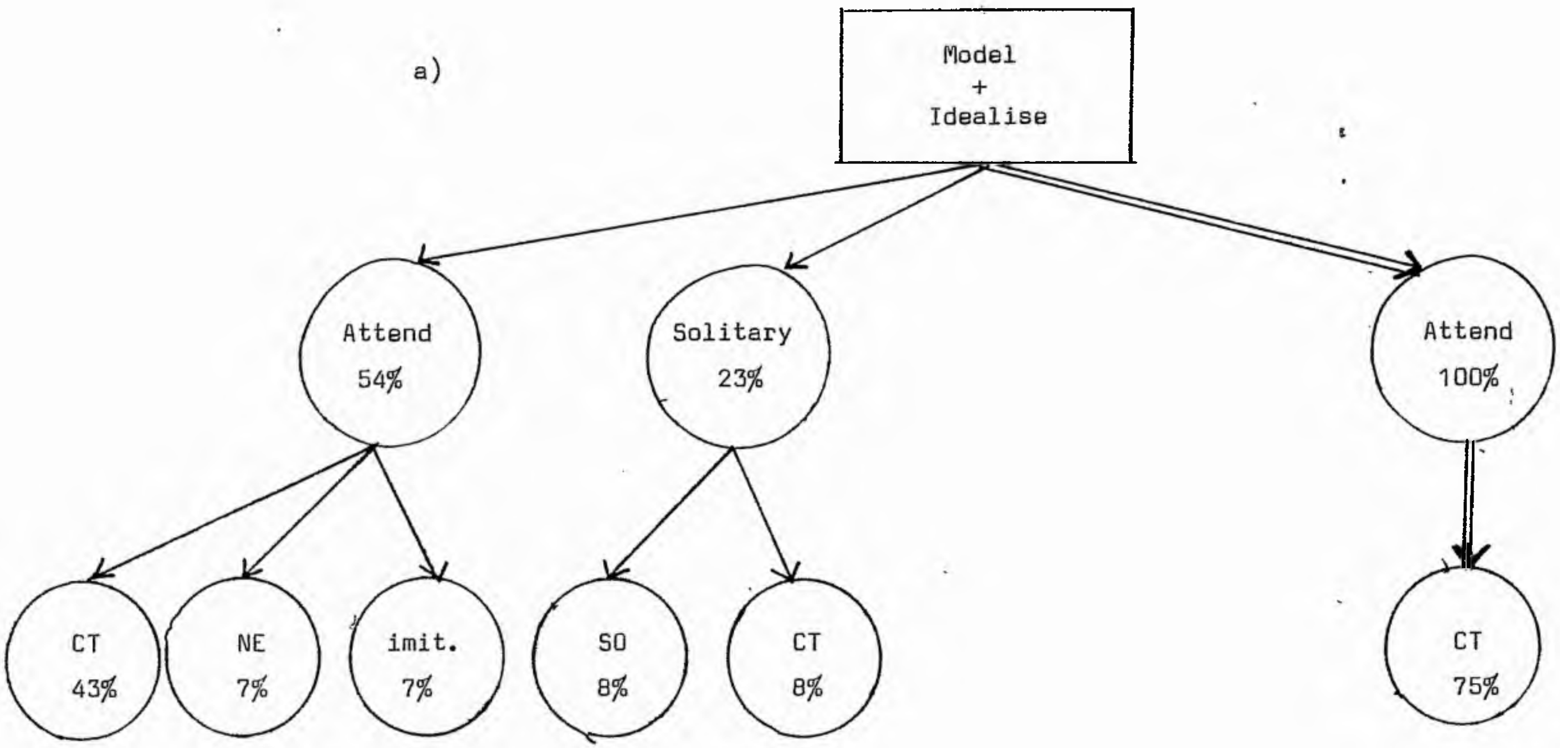
and 'idealising' while Adrian's mother 'simplified'. The next frequent strategy was 'simplify' in the case of Alan, and 'model + idealise' in the case of Adrian. During the last two visits Alan's mother also used the 'instructing' strategy. These results seem to indicate a developmental trend in terms of selection of a teaching strategy; for very young or less competent infants 'simplify' seems to be compatible since it puts lesser demands on the infant such as when the mother guides his hand into performing the activity she is trying to teach him, or when she breaks up a difficult task into simpler and smaller components. 'Modelling' + 'idealising' is more difficult than 'simplify' since it involves re-enacting a longer sequence of actions without direct help. It is less demanding than either 'model' or 'instruct' since the 'idealising' provides the infant with extra cues for attending to the relevant features of the task and making him more able to remember how to perform it. Thus, both mothers selected the strategy that suited their infants' level best. Alan, the more advanced, was, on occasions, taught by the simplest of all strategies, but, predominantly, by 'model + idealise'. As Alan got older, the mother progressed to more difficult strategies, namely, 'instruct'. Adrian, the less competent of the two infants, was taught predominantly by 'simplifying'; on occasions his mother progressed to 'model + idealise'. Now we shall consider to what extent these strategies were successful.

Table 7.15 Teaching strategies

Teaching strategy	A1	A4
Model + idealise	77	24
Model	0	12
Simplify	21	64
Instruct	7	0

Figures 7.5a, b, c, show that 44% of 'simplify' were imitated by Alan, compared with 29% for Adrian. Adrian 'attended' more than he 'imitated' his mother's strategy. Alan also was non-responsive to his mother's 'simplifying' when he reacted with 'negative' acts or pursued

a)


Model
+
Idealise
Attend
54%
Solitary
23%
Attend
100%
CT
43%
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7%
imit.
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CT
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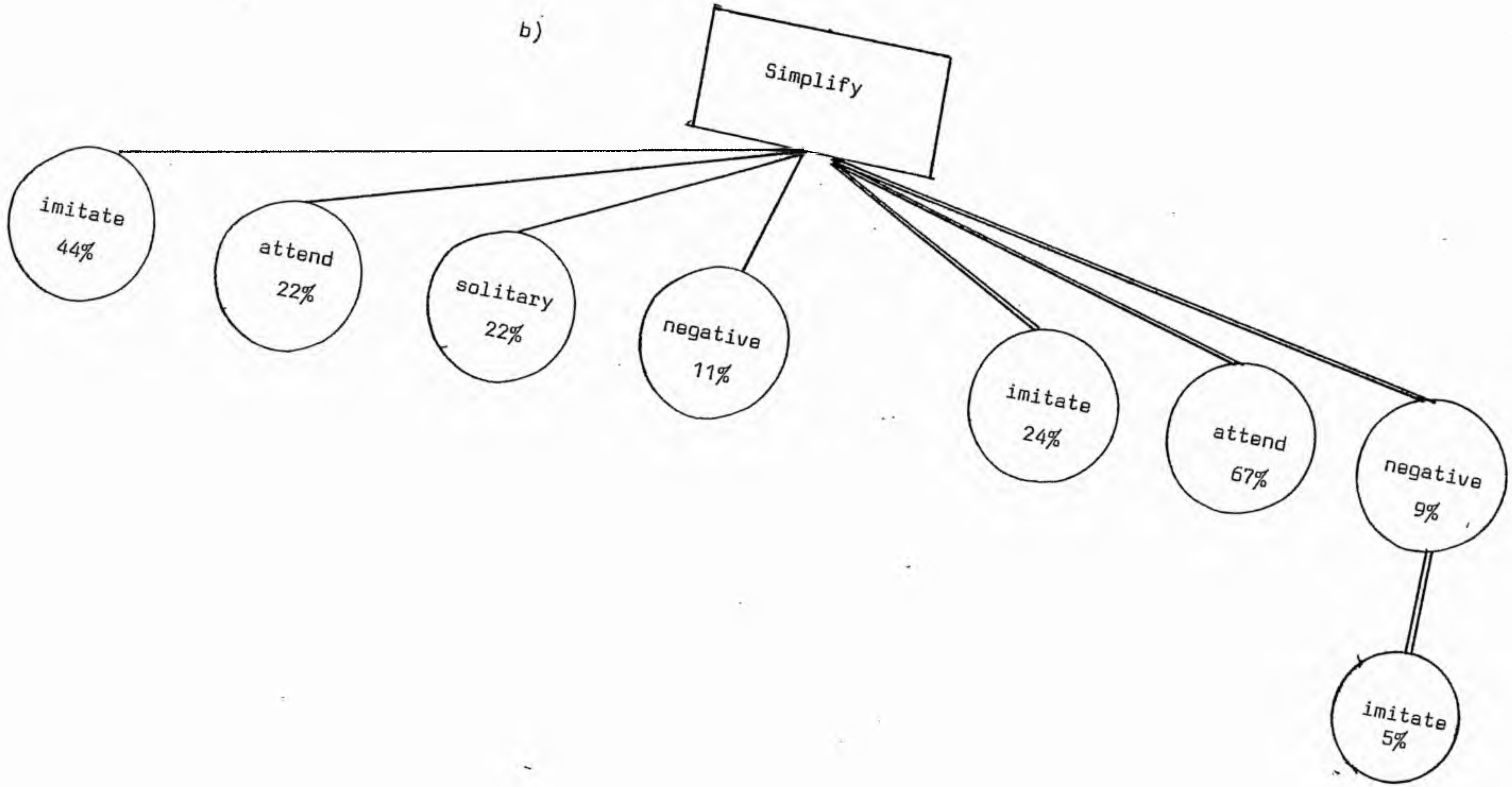
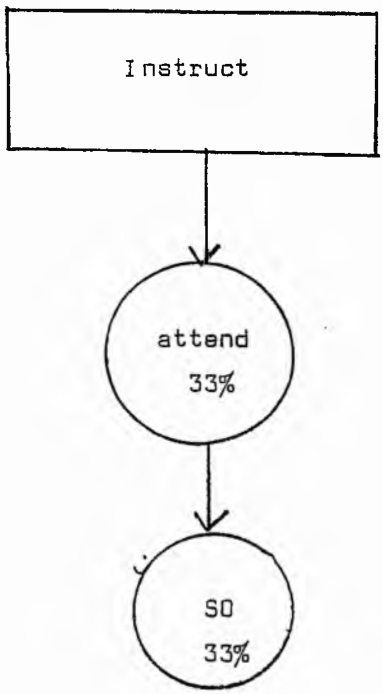
b)


Simplify
imitate 44%
attend 22%
solitary 22%
negative 11%
imitate 24%
attend 67%
negative 9%
imitate 5%

c)



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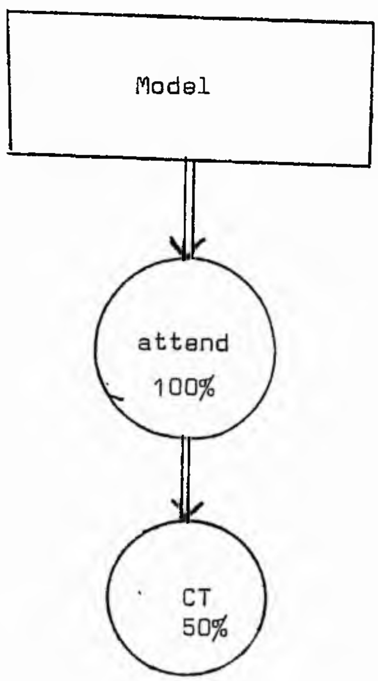

Figure 7.5 Group-A infants' responses to their mothers' teaching strategies (as percentages of the frequency of the relevant strategy).

his independent theme of solo play (33% of teaching was responded to in this way). There were less 'negative' responses from Adrian. Thus, the predominant 'strategy' in the case of Adrian did not always achieve positive outcomes. In the case of 'model + idealise', Alan 'imitated' only 5% of them and Adrian 'imitated' none. Adrian responded exclusively by 'attention' which he sometimes followed by 'contacting' the object. Alan also responded mostly by 'attending' or 'contacting' the toy (50%), by 'solitary' and 'negative' acts on 48%. None of the 'modelling' or 'instructing' episodes were 'imitated' by either infant. Thus, both 'simplify' and 'model + idealise' were not always 'imitated' but 'model + idealise' was effective insofar as the infants attended to the action. The two infants differed in the types of their responses: Alan's responses were diverse while Adrian reacted by visual regard. In conclusion, the most effective strategy at 6-9 months was 'simplify' followed by 'model + idealise'.

7.3.5 Excerpts from Interactions

(i) Alan and his mother ($1\frac{1}{2}$ minutes)

This excerpt is taken from the third visit. Alan was then 7 months old.

Mother (M) is looking at Alan who has just crawled away from the toys and is sitting by a book-shelf with an ornament on one of the shelves. He looks at the ornament and then reaches for it and pulls it towards him. M responds immediately by a reprimanding "no!" Alan glances at her briefly and then resumes his attempts to remove the ornament from the shelf. M then goes to him, picks him up and stands him by the toys while still holding him. While doing so, Alan sees a tower which his mother had constructed during a previous episode. He moves towards it and knocks it down. His mother appreciates his action with a laugh. She then picks up two of the scattered, build-up beakers and starts hitting them together rhythmically. Alan watches her with a smile. M repeats the activity. She then extends it into a game. She hits the beakers rhythmically, accompanying her action with a tune. Each sequence in the game is terminated in a peak: a hard hit with the beakers and a clicking sound made by the mother. Alan finally, terminates the game by turning his head away. He then picks up one of the beakers and holds it passively, while his mother watches him. She hits the beaker she is holding against the one Alan is holding. She then holds her own beaker steady and asks him to hit his beaker against hers. Alan complies and hits his mother's beaker once. He then looks at the picture of the animal at the base of his beaker. M tells him the name of the animal. Alan looks again at the picture and his mother repeats the name.

Commentary[2]

This account reveals several aspects of the mother's support which cannot yet be described statistically. Firstly, it reveals how one form of 'create possibilities' follows from another, and how different episodes are linked together. It also reveals more about the functions of the mother's categories. Thus, the account begins with the infant engaged in

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2.Although similar commentaries are appropriate for each excerpt, they will be limited only to this one in order to give the reader an idea of what information can be derived from such excerpts.

'negative' acts and the mother 'participating'. The nature of the 'negative' acts makes the mother's 'participation' appropriate for it allows the infant to extend his explorations of the environment to all kinds of objects. However, when the 'negative' act becomes threatening, it is no longer tolerated by the mother. The mother's initial response to negative acts was gentle and non-obtrusive; it relied on distal communication. However, its failure called for stronger tactics. Even then, the 'eliminating' action led naturally to, and was blended into, a 'support manipulation' to which the infant responded favourably. His action then inspired the mother with a new activity. Using the beakers from the tower he had knocked down, she 'revealed' to the infant an unconventional use of them. Having succeeded in drawing her infant's interest to this activity, she then expanded it into a game in which she played the active role. The infant merely appreciated that role. However, when he had had enough of it he terminated it by gaze aversion; the mother got the message and allowed herself to be controlled by her infant. He then engaged in low-level solitary play while the mother 'participated' seemingly, passively to that. At the right moment the mother expanded on the infant's theme to teach him a more complex activity with the same object, an activity that the infant had already encountered during their previous game. Thus 'participate' here served the function of encouraging the infant's play but it also allowed the mother to detect the right moment for more directive intervention, namely, when the infant was holding the toy passively. Her teaching strategy could be described as 'simplifying' since she was performing the hitting action jointly with the infant and she was also breaking it into a simpler component. Thus, rather than holding both beakers and hitting them together, the mother holds one of the beakers for the infant. Alan's 'imitation' was followed by his own 'solitary' play involving visual inspection of the same toy. The mother followed his initiative and 'described' to him the object he was already in contact with.

(ii) Adrian and his mother ($1\frac{1}{2}$ minutes)

This account is taken from the third visit when Adrian was 7 months, 1 week old.

M is building a tower while Adrian watches her. After completing the tower M pushes it close to Adrian. Adrian still looks at the tower. M then holds Adrian's hand and makes him tilt the tower. She lets go of his hand and looks at him expectantly. He keeps gazing at the tower. M takes his hand again and makes him knock down the tower. She then exclaims while Adrian looks at the scattered beakers. At her exclamation, mother and infant engage in eye-to-eye gaze. M terminates their gazing by offering Adrian a beaker. He looks at it. She then points at the picture on the beaker and names it. Meanwhile, Adrian is gazing round into space. M pushes the beaker nearer to him. Adrian is still looking away. He then falls on his back and starts crying. M picks him up and vocalises to him soothingly. When he stops crying she places him by the toys and he looks at them. M then spreads the toys in an array around Adrian. He looks at the toys as his mother is handling them. M takes a key-rattle and hides it between two beakers using one beaker as a lid. She then shakes the beakers and offers them to Adrian. He looks at them and then turns his head away. M uncovers the lid and shows Adrian the rattle. Adrian has started to fuss at this stage.

These two accounts show striking similarities in the contents of the interactions of these two infants with their mothers. Thus, both mothers deal with 'negative' behaviour, 'participate', 'reveal', 'create discovery' and 'teach'. However, the sequencing of these activities and their integration with the infants' ongoing activities as well as the infants' behaviour, are different in each account. Alan's mother appears to be reactive to her infant even when she 'modifies' in that she derives her activities from the infant's own initiatives. However, Adrian's mother keeps inventing situations in the hope that they would capture her infant's interest and lead to manipulative responses. Even eye-to-eye contact, which is normally terminated by the infant, is here terminated by the mother probably because for Adrian visual regard constituted his major interactive behaviour which he sustained over long periods. Both mothers use the 'simplifying' strategy to teach their babies but only Alan imitates his mother's action. One gets the impression that Alan and his mother's interaction is very much like a 'dialogue' whereas in the case of Adrian and his mother it is almost a 'monologue'. It is noteworthy that Adrian never manipulates the toys during this excerpt of the interaction. He only watches his mother. It is uncertain whether this type of behaviour was actually helping Adrian to learn about things and actions in his environment. It seems that Alan's mother was pacing her activities with her infant's level of cognitive functioning and always help her infant to advance a step further. Thus she starts with an activity that is (presumably) already familiar to Alan, namely, knock a tower down. This progresses into a game involving hitting objects together. Thus Alan is probably learning about hitting objects in an informal and amusing context. He is later given the opportunity to re-enact the activity himself after it was 'simplified' by the mother. Finally, the mother progresses into revealing to her infant the symbolic reference to objects. Adrian's mother, on the other hand, seemed to be 'accelerating' her infant's development, that is, she was trying to get him to perform actions which are far above 'the margins of his abilities' such as in attempting to get him to knock down the tower and to find the hidden rattle. These differences between the two mothers were probably due to the differences between the infants: Adrian, who was very incompetent, had to be taught from scratch, whereas for Alan maternal support expanded his already developing abilities. The excerpts also substantiate the interpretations given to the correlational and sequential analyses.

Examination of these two cases revealed the cognitive differences between the two infants and which seemed to be quite large. Such differences emerged from the infants' scores on the IPDS, their spontaneous activities and the relationships between their activities and the mothers'. Finally, the excerpts also revealed the differences in competence between them. This raises the question of whether these differences could be attributed to experiences with the mother. The analysis and the excerpts seem to indicate that both mothers were responsive to their infants' performances, and, therefore, they were influenced by their infants' cognitive abilities, and each mother adapted her support to suit the particular needs of her infant. Thus, in the case of the competent infant, the mother 'enhanced' mainly by 'participating' in his advanced activities, and 'modified' when the occasion arose. The mother of the incompetent infant 'supported manipulation' and 'modified' more. When she 'participated' the infant's 'solitary' activities lacked complexity and variety. However, 'enhancing' could have still been supportive to this infant's cognitive development since it gave him the opportunity to exercise his already existing schemes, although this form of 'support' had to be substantiated by 'modifying' his schemes.

7.4 Cases B1 (Brian) and B5 (Betsy): Group B infants

7.4.1 Background Information

Brian

Brian, who scored highest on the IPDS scales, was a first-born child. He was 9 months old at the start of the observations. The mother was 25 years old. She seemed to enjoy the visits and during the observations she sometimes initiated conversations with the observer(s). The father appeared during the observations only briefly. The family lived in a small house close to their parents with whom Brian spent a considerable time. Brian had a large number of toys including non-manufactured ones. He was a very active baby and his favourite pastime was to hold his mother's hand and walk around the room. He also enjoyed watching television and could recognise the music-titles of some of the programmes! He was also very interested in the experimenter but restricted his interaction with her to exchanging toys and visual regard.

Betsy

Betsy was also 9 months old when she was first visited. She had two older sisters, the eldest was 12 years old and the youngest was 5 years old. During one visit, both sisters and their friend were present and Betsy was left in their charge while the mother was kept busy by other things. Although this session was very interesting it was not included in the analysis since it was not typical of Betsy's interpersonal play. The mother was 36 years old. She was very gentle in her play with the baby and their favourite theme of play was 'give-and-take' games. Betsy spent a considerable time in a play-pen. She was a contented and playful baby. Her favourite play things were empty plastic bottles and containers. Betsy had the poorest scores on the IPDS in her group.

7.4.2 Quantitative differences between the infants

(i) Scores on the IPDS

As can be seen from Figure 7.6 the scores of the two infants were different on every scale. This difference was found to be statistically significant ($t(5) = 7.37$; $p < 0.001$). The scores were most similar for 'object-permanence' and very different on 'schemes with a single object'. Brian's poorest scores were on 'permanence' and 'space' and his best score was on 'causality'. Betsy was worst on 'schemes with multiple objects' and best on 'causality'. Thus both infants seemed to be relatively advanced on 'causality'. As in the case of the previous two infants, 'permanence' seemed to be a less noticeable source of variation, while the scales on 'schemes' highlighted the differences between Brian and Betsy.

Examination of the detailed performance of the two infants reveals the cognitive differences between them. Most of these differences emerge in relation to the scales with motivational components and those that express the infants' repertoire of skills that are acquired either through social encounters or through the infant's repeated manipulations of similar objects (e.g. containers). Thus Brian was more advanced on the steps of Scale V which related to active exploration of the environment and mobility (making a detour), but not on the steps that require concentration, attention to others and perception of relations between objects and objects, or objects and space (e.g. building towers). Betsy showed deficits in all these aspects and in other similar ones involving technical skills (e.g. activating a mechanical toy in Scale IV). Brian was interested in sharing his experiences with others and manifested his abilities to incorporate them into his play by the predominance of 'show' and 'give' in his repertoire of schemes. With social objects

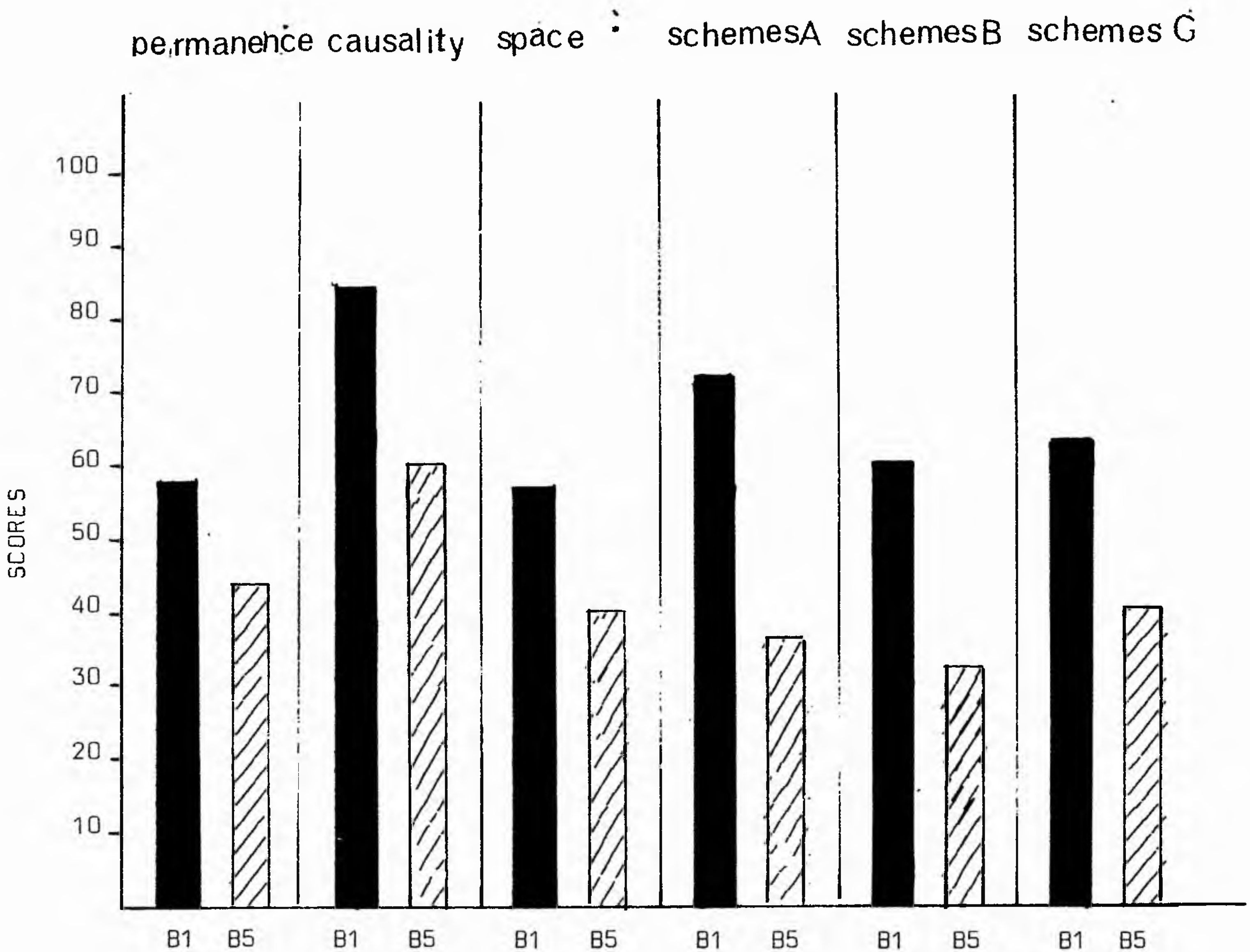


Figure 7.6 Scores on the IPDS of the 2 infants in group B

the differences between the infants become more apparent. Although the final score for Betsy was lower than that for Brian, yet she engaged in diverse activities but none of them were predominant and, therefore, did not meet the criterion for perfect or near-perfect success. She seemed to relate social objects together (e.g. touching the doll with the spoon) and showed advancement in acquiring the conventional use of objects (e.g. turning the pages of the book). Brian's skills were less diverse and they involved advancement of technical use of objects (e.g. spinning the bangle) and integrating social and technical play (e.g. offering toys to his mother). Thus Brian was more advanced on technical skills. Both infants were similar in their social competence but Brian's involved co-operative play while Betsy's play involved early acquisition of social conventions. The following sections will examine whether such differences were also seen in the infants' interpersonal play.

(ii) Infants' major activities

From Figure 7.7 it can be seen that the two infants were very similar in the frequencies of their 'object-contacts' and 'sequential' acts with Betsy doing slightly more of these than Brian. The infants were very different on the frequency of their 'negative' acts, with Brian engaging in twice as much as Betsy ($t(5) = 3.23$; $p < 0.01$). Overall, Betsy engaged in significantly more 'solitary' play ($t(5) = 4.64$; $p < 0.005$).

These results seem to contradict the previous findings related to the infants' performance in the IPDS. Here, Betsy gives the impression of being more advanced than Brian since she manipulated objects more and rejected play less, but, since the differences between their 'sequential' play was not significant, it implies that Brian still maintained his capabilities to engage in cooperative play. However, if we examine the cognitive level of each infants' activities, we find that for Brian the

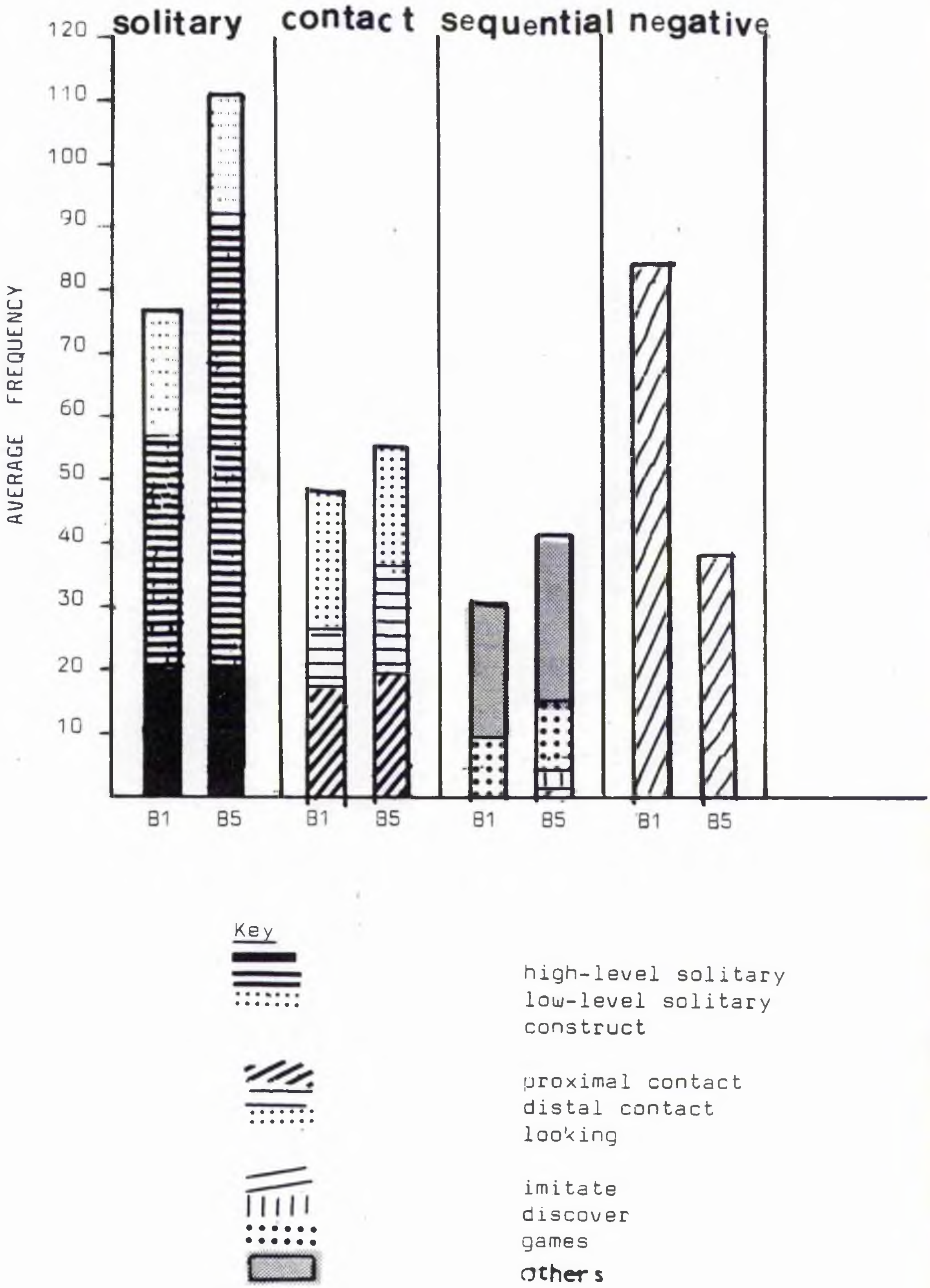


Figure 7.7 Frequency of the activities of 2 infants in group B

proportion of 'solitary' acts that were of a high cognitive level and 'construct' were more than that of Betsy's (although the absolute frequency was very similar for the two infants). Furthermore, low-level acts were more frequent in Betsy's solo play. Therefore, the cognitive differences found in the IPDS were also present in spontaneous 'solitary' play and which indicates that Brian was more technically advanced than Betsy.

Cognitive differences in 'contact' acts can be seen in relation to 'looking': 31% of Betsy's 'object-contacts' consisted of passive 'looking' as opposed to 19% for Brian.

'Sequential' acts also gave more credit to Brian when relative frequency is considered, but if we compare the infants in terms of absolute frequency, we find that Betsy 'discovered' and 'attended' slightly more than Brian. Betsy also played more games with her mother. Overall, Brian's 'sequential' play was predominantly responsive and dependent on what his mother was doing (e.g. 'games' and 'attention').

These results indicate that Betsy's level of cognitive functioning reaches that of Brian's when she was playing jointly with her mother. However, the infants are still different with regard to 'negative' acts. More frequent 'negative' acts in the case of Brian could be attributed either to his lack of interest and/or lack of motivation to engage in technical play with his mother (whereas he was more motivated to perform the tests), or to his mother 'creating' less possibilities for him. Although Betsy was less advanced according to the scales, when with her mother, and especially during 'sequential' play, she showed an improvement. According to these findings, cognitive differences between the two infants do exist, but in the case of the less advanced infant, the type of stimulation received probably compensated for her deficits in the short-term. Now we shall evaluate the truth of this statement by considering the differences in maternal behaviour and the relationships between mothers' and infants' activities.

(iii) Maternal Activities

From Figures 7.8 and 7.9 it can be seen that both mothers 'enhanced' more than they 'modified'. There was no difference in the frequency of 'enhance' but the frequency of 'modify' was significantly more for Betsy than for Brian ($t(5) = 2.50$; $p < 0.05$). Significant differences between the mothers were particularly manifest with respect to 'create discovery environment' ($t(5) = 2.35$; $p < 0.05$). 'Reveal object's property' was also slightly more frequent for Betsy. Thus, 'modify', in general, and 'create discovery environment' in particular, constitute definite differences in the two infants' experiences.

As with the previous cases, in the present ones the less advanced infant received more 'modifying'. Previously, more 'modifying' was mainly in the form of 'reveal object's property', while in the present case it was in the form of 'create discovery environment'. Once more the function of 'modify' and its sub-categories could be compensatory for Betsy: when her mother 'modified' by 'create discovery environment', Betsy's level of performance was similar to, if not more advanced, than that of Brian's. It is possible then that Brian's mother 'modified' less because of her infant's capabilities during solo play. However, as mentioned earlier, less 'modify' (and, consequently, less 'create possibilities') may account for the greater frequency of Brian's 'negative' acts. It is possible that Brian was more interested in cooperative activities with objects than in solo play and, consequently, 'enhance' in general and 'participate' in particular, motivated him less than 'modify'. This suggestion gains support from the fact that Brian scored better on scales with items that pertain to cooperative tasks. If this view is correct, then 'modify' would

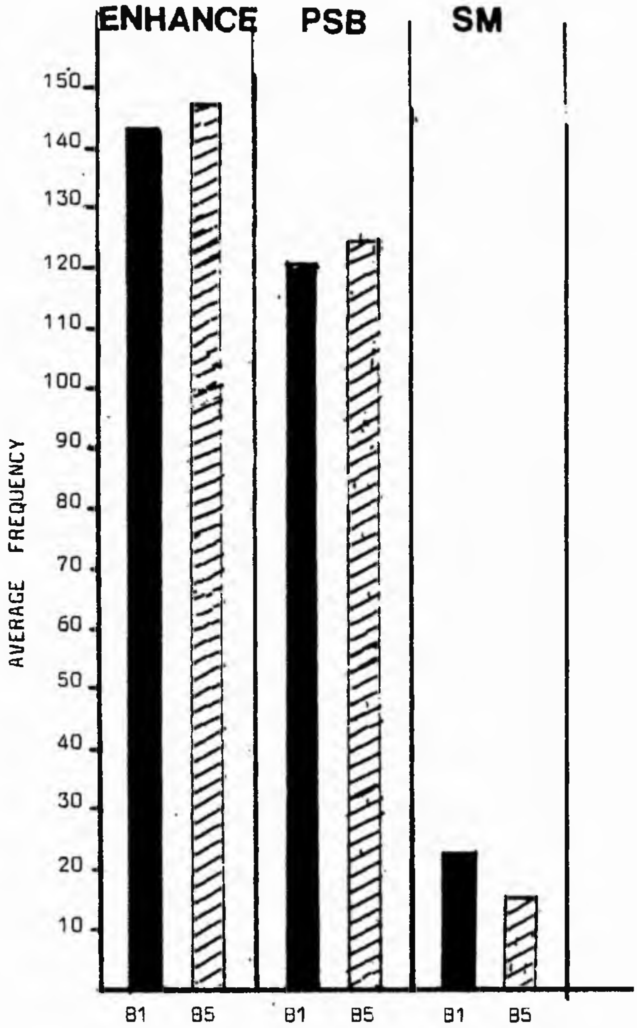


Figure 7.8 Frequency of 'enhance' and its immediate sub-categories for the 2 infants in group B

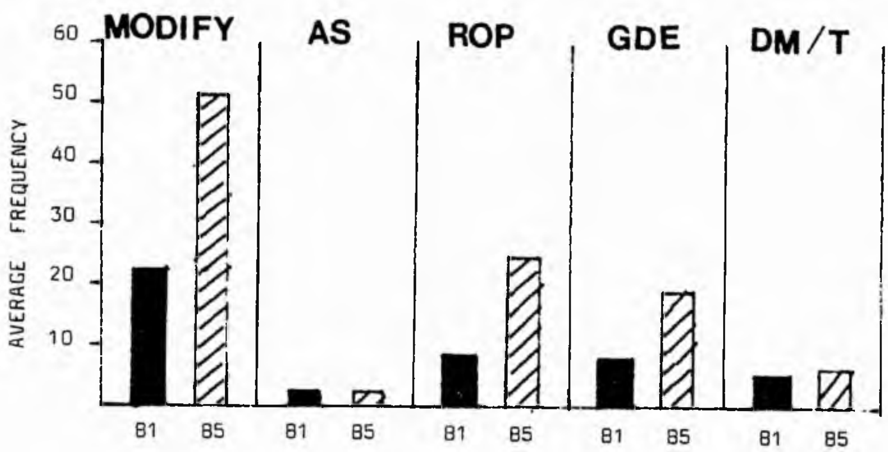


Figure 7.9 Frequency of 'modify' and its immediate sub-categories for the 2 infants in group B

have been more supportive to Brian's cognitive development had he received more of it. This possibility could be examined by the correlational and sequential analyses that follow.

7.4.3 Relationship between mother and infant behaviour

(i) Interpersonal synchrony

Table 7.16 shows that the correlation between 'enhance' and 'solitary' play was very low for Brian but positive and significant for Betsy ($p < 0.05$). 'Enhance' also showed the expected negative correlation with 'sequential' acts for Betsy and no correlation for Brian. 'Modify' showed the expected negative correlation with 'solitary' acts and the expected positive correlation with 'sequential' acts for both subjects. However, for Betsy the correlation between 'modify' and 'sequential' acts was higher and significant at 0.01 level. These results indicate that 'modify' was in synchrony with the activities of both infants but more so for Betsy. The frequency of 'enhance' was in proportion to the frequency of 'solitary' acts only for Betsy.

When we look at 'participate from background', like 'enhance', the amount of positive correlation with 'solitary' acts is greater for Betsy ($p < 0.01$). The correlations between 'participate' and the remaining infants' activities are low and they are negative with respect to Betsy's 'contact', 'sequential' and 'negative' acts. For Brian there was a low, positive correlation with 'negative' acts which could indicate that his mother adopted a passive role towards some of her infant's 'negative' acts.

'Eliminate undesirable behaviour' showed a low, positive correlation with 'negative' acts for both infants. Thus it seems that there was a slight tendency for mothers to distribute their 'eliminate' activities in proportion to their infants' 'negative' behaviour, with both mothers doing so to an equal extent.

'Support manipulation' also showed a low positive correlation with both infants' 'contact acts' which indicates that the infants increased or decreased their 'object-contacts' in proportion to the mothers' increases or decreases of 'support manipulation'.

'Modify' and 'attention' showed a low but negative correlation with respect to both infants, which is contrary to expectation (-0.61 and -0.55, respectively).

To sum up, the correlational analysis indicated that interpersonal synchrony was better achieved by Betsy and her mother, than Brian and his mother.

Table 7.16 Correlations between the mother and infant categories that describe interpersonal synchrony

Mother's acts		Solitary	Contact	Sequential	Negative
Enhance	Brian	0.16	-	0.10	-
	Betsy	0.83*	-	-0.63	-
Modify	Brian	-0.55	-	0.66	-
	Betsy	-0.55	-	0.94**	-
Participate	Brian	0.08	-0.48	0.02	0.21
	Betsy	0.87*	-0.57	-0.62	-0.30
Eliminate	Brian	-	-	-	0.47
	Betsy	-	-	-	0.36
Support Manipulation	Brian	-	0.60	-	-
	Betsy	-	0.66	-	-

* $p < 0.05$ for df = 4

** $p < 0.01$ for df = 4

As can be seen from Table 7.17, more of Betsy's 'solitary' acts were associated with her mother's 'participate' (54%) than in the case of Brian (36%). Brian's mother's 'participation' was associated with more of his 'contact' acts (32%) than Betsy's (25%).

Overall, the mothers' 'participate' acts were appropriate to the infants' ongoing activities on 72% of time for Brian, and 82% for Betsy. Thus, there was slightly more synchrony between Betsy and her mother than Brian and his mother. The correlations between 'eliminate' and 'negative' acts show that Brian's mother tended to respond to 'negative' acts more than Betsy's mother. However, from the sequential analysis the synchrony between Brian and his mother was better than that depicted by the correlational analysis with regard to 'participate' and 'solitary' and 'contact' acts.

Table 7.17 Percentages of infants' activities that are associated with the mothers' 'participate'

Infant activities		←P→	P→	→P
Solitary	B1	34	1	1
	B5	48	2	4
Contact	B1	27	2	3
	B5	20	2	3
Sequential	B1	5	0	4
	B5	2	0	3
Negative	B1	32	0	3
	B5	16	2	2

The infants followed 'support manipulation' by 'contact' acts in a similar manner. However, only about 40% of the mothers' 'support' were appropriately responded to, with Betsy responding slightly better (Table 7.18). On the whole, 56% of Brian's mother's 'support manipulation' were compatible with his various activities and 68% of Betsy's mother's 'support manipulation' were in synchrony with the infant's acts. Thus, synchrony is also slightly better for Betsy and her mother, but for both infants 'support manipulation' was associated with less synchrony than 'participate'. The sequential analysis helps to explain the positive correlation between 'support manipulation' and 'contact' acts. It also shows that for Brian more 'negative' than 'contact' acts were associated with 'support'.

Table 7.18 Percentages of 'support manipulation' associated with the infants' acts

	← SM →				SM →				→ SM			
	SO	CT	SQ	NE	SO	CT	SQ	NE	SO	CT	SQ	NE
Brian (B1)	0	11	0	26	0	30	11	7	0	4	4	7
Betsy (B5)	0	13	0	13	6	38	6	6	6	6	0	6

Table 7.19 shows the mothers' responses to their infants' 'negative' acts. Only 7% of these acts were 'eliminated' in the case of Brian and only 26% in the case of Betsy. This partly explains the low, positive correlation between 'eliminate' and 'negative' acts presented earlier (Table 7.14). A great proportion of both infants' 'negative' behaviour was reponded to by 'participate' and Brian's mother did so more often than Betsy's mother. Overall, only 16% of Brian's 'negative' acts were

actively dealt with ('eliminate', 'modify' and 'support manipulation') compared with 44% of Betsy's 'negative' acts. Thus, both mothers 'ignored' a large proportion of their infants' 'negative' behaviour but Brian's mother showed this to a greater extent, probably because Brian's 'negative' acts were greater than Betsy's (Figure 7.6). From this finding it can be seen that although 'enhancing' Brian's interaction was supportive to his 'solitary' and 'contact' acts, it was incompatible with his 'negative' behaviour. Thus, Brian's mother showed a tendency to adopt the 'enhancing' role regardless of the nature of her infant's play. Betsy's mother also showed the same tendency, but because Betsy engaged in less 'negative' acts, a smaller proportion of this behaviour was preceded by 'participate'.

Finally, Table 7.20 shows that Brian 'attended' to more of his mother's 'reveal object's property', 'create discovery' and 'demonstrate/ teach' than Betsy did. Thus, on the whole, Brian was more attentive to

Table 7.19 <u>Percentage of infants' 'negative' acts responded to by different maternal acts</u>

Maternal responses	B1 (Brian)	B5 (Betsy)
Eliminate	7	26
Support manipulation	7	10
Modify	2	8
Participate	65	47
No response	19	8

his mother's 'modifying' activities than Betsy was. The negative correlation that was found between 'modify' and 'attend' in the case of both infants could be explained as follows: although the infants attended to some of their mothers' 'modifying' acts, they did not regulate their attention in proportion to the frequency of her 'modifying'. This is because 'modify' exceeded 'attention' on some sessions; on the sessions when the mothers 'modified' less, the infants increased their 'attention' and ignored less this form of support.

Table 7.20 Percentages of 'modify' sub-categories that were attended to by the two infants

Modify sub-categories	Attend	
	B1 (Brian)	B5 (Betsy)
Reveal object's property →	58	44
Create discovery environment →	33	8
Demonstrate/teach →	75	67
Mean	55	40

Analysis of the data on interpersonal synchrony showed that, on the whole, both mothers integrated their various activities well with the infants' relevant acts, except that 'negative' acts were not always responded to in a directive or 'eliminating' manner. The interactions of Betsy and her mother were slightly more in synchrony than those of Brian and his mother. However, when his mother 'modified', Brian was more attentive.

Although cognitive differences were found between the infants, and although their mothers also differed in the frequency of 'modify', both infants were quite similar in interpersonal synchrony, with the worse performer showing more harmony in her interaction with her mother. This may be attributed to her mother's influence and regulation of her activities to pace those of her infant's, as well as the infant's social competence, responsivity and motivation. In the case of Brian, although he was the more cognitively advanced of the two, he was probably less motivated (except when 'modifying' took place), and, possibly, his mother also made less efforts to encourage his manipulations or to re-channel his 'negative' activities.

(ii) <u>Cognitive Compatibility</u>

Table 7.21 shows that 'enhance' and 'participate' were negatively correlated with Brian's high-level 'solitary' acts and 'constructions', whereas for Betsy the correlations were positive but not significant. e, 'Modify' correlated poorly or negatively with all types of both infants' 'solitary' acts. For Betsy, 'modify' was negatively and significantly related to her low-level 'solitary' acts ($p < 0.01$). From these results it seems that there was relatively little relationship between 'enhance/participate' and Brian's cognitive abilities manifested in his solo play. Thus his mother was probably 'enhancing' without consideration of the level of her infants' activities. In the case of Betsy, it seems that her mother 'enhanced' in proportion to Betsy's 'solitary' acts as a whole, so that her behaviour was also associated with both advanced and less advanced activities.. 'Modify' was more associated with Betsy's low-level acts than high-level ones, which may be attributed to the mother's attempts to substitute Betsy's low-level activities with more advanced acts such as the ones that constitute responses to 'modify'.

Table 7.22 reveals that the two sub-categories of 'enhance' were relatively unrelated to Brian's major activities. 'Modify' sub-categories, on the other hand, were more correlated with Brian's activities. The correlations were mostly negative with 'solitary' and 'negative' acts but positive with the more responsive categories of 'contact' and 'sequential' acts. 'Create discovery environment' and 'demonstrate/teach' in particular,

Table 7.21 Correlations between the mothers' forms of support and the infants' activities

Pairs of correlations	B1 (Brian)	B5 (Betsy)
Enhance/high-level solitary	-0.11	0.66
/low-level solitary	0.27	0.70
/construct	-0.45	0.53
Modify/high-level solitary	0.14	-0.10
/low-level solitary	-0.32	-0.87*
/construct	0.13	0.24
Participate/high-level solitary	-0.03	0.68
/low-level solitary	0.10	0.76
/construct	-0.08	0.49

correlated well with 'sequential' acts. These associations indicate that 'enhance' sub-categories, probably, were neutral in terms of their supportive function, while 'modify' sub-categories were more influential since they tended to be associated with increases in reciprocal acts and decreases in 'negative' behaviour. With respect to Betsy, the pattern of correlations could be interpreted as indicative of the supportive function of 'provide stable base' to 'solitary' acts only, and of 'reveal object's property' and 'create discovery environment' to 'contact' and 'sequential' acts. Increases in 'modify' sub-categories seem to be unrelated to the frequency of Betsy's 'negative' acts. Thus, for Brian, 'modify' could be regarded as more clearly supportive to his cognitive development than 'enhance'. For Betsy, both 'enhance' and 'modify' seem to be supportive. The most supportive 'modifying' categories were 'create discovery environment' and 'demonstrate/teach' for Brian, and 'reveal object's property' and, to a lesser extent, 'create discovery environment' for Betsy. Thus, as in the case of Adrian, 'reveal' was associated with the infant who emerged as less competent on the scales measuring cognitive abilities while 'create discovery' was associated with the more advanced infant.

Table 7.22 Correlations between the mothers' and infants' activities that imply cognitive compatibility

Maternal categories		Solitary	Contact	Sequential	Negative
Provide stable base	B1	0.09	-0.56	-0.08	0.48
	B5	0.82*	-0.55	-0.65	0.21
Support manipulation	B1	0.02	0.60	0.22	-0.31
	B5	-0.71	0.66	0.67	-0.51
Reveal object's property	B1	-0.60	0.60	0.47	-0.63
	B5	-0.72	0.87**	0.87**	-0.18
Create discovery	B1	-0.64	0.66	0.89**	-0.70
	B5	0.20	0.30	0.80*	0.17
Demonstrate/ teach	B1	-0.50	0.42	0.79*	0.09
	B5	-0.32	0.43	0.27	-0.19

However, a look at the temporal patternings of 'create discovery' and Brian's activities, reveals that the most common forms of 'create' were 'trigger' (request from the infant a familiar verbal or non-verbal act), 'defer' (request an infant to perform an activity by himself after he had asked the mother to perform it) and 'games'. 'Games' were always complemented by Brian by appreciating them and by performing the appropriate reciprocal act (e.g. mother places a beaker on Brian's head followed by Brian lowering down his head to drop the beaker on the floor). 'Trigger' was responded to mostly by 'comply' while 'defer' was responded to by 'initiative-sequential' acts; for example, Brian often requested actions or objects from his mother to which she replied, "you do it", or, "you get it yourself". To this, Brian often responded by repeating the same requests. Thus, Brian's responses to 'create discovery' were sometimes characterised by non-manipulative responses ('appreciate game') or non-reciprocal acts ('initiative sequential'), and, therefore, the positive correlation between 'create' and 'sequential' acts was not altogether indicative of cognitive compatibility.

7.4.4. Themes of Interaction

(i) Dealing with the infants' 'negative' acts

In the previous sections on the present cases it was mentioned that Brian engaged in significantly more 'negative' acts than Betsy. His 'negative' acts were also associated with his mother's 'participate' and 'support manipulation' slightly more than in the case of Betsy. For Betsy, 'negative' acts correlated negatively with her mother's 'create discovery environment'. It was also mentioned that a larger proportion of Betsy's 'negative' acts were dealt with by her mother. Thus, Betsy's mother seemed to be more responsive to her infant's 'negative' behaviour. Besides, certain forms of her 'modifying' seemed to be more effective than others. From these results, Betsy and Brian emerged as different in terms of the ways their mothers' responded to their 'negative' behaviour and in terms of which maternal activities were associated with a decrease in such behaviour. This section examines in what other ways the infants were different with respect to their 'negative' acts during interpersonal play.

Figure 7.23 shows that a large proportion of both infants' 'negative' acts were preceded by 'enhance', more so for Betsy. For Brian, 24% of his 'negative' acts occurred just after (or simultaneously with) non-create-possibilities acts such as talking to the experimenter or watching television. Non CP accounted for only 10% of Betsy's acts. Thus, for both infants, 'negative' behaviour was more likely to follow from their mothers' lack of participation or her passive involvement, with Brian showing a stronger inclination to engage in 'negative' behaviour when his mother was less involved.

Table 7.23 Maternal categories that preceded 'negative' acts

Antecedents	B1 (Brian)	B5 (Betsy)
External events	2	0
Non CP	24	10
Enhance	70	87
Modify	6	3

With respect to the mother's responses to 'negative' acts and their consequences, Table 7.24 shows both mothers responded largely by 'participate' followed by 'no response' from Brian's mother and 'eliminate' by Betsy's mother. In 70% of the time when his mother 'participated' Brian resumed his play independently of his mother's activity, whereas Betsy continued her 'negative' behaviour in response to her mother's 'participation'. 'Eliminate' was effective for both infants to the same extent. 'Modify/support manipulation' was the most effective form of dealing with Brian's 'negative' acts and least effective was 'not responding' followed by 'eliminating'. For Betsy, 'eliminate' and 'modify/support manipulation' were effective to an equal extent while 'no response' and 'participate' were the least effective. Thus, both infants were likely to initiate and continue 'negative' behaviour when their mothers were least involved in their play, while Brian ceased his 'negative' behaviour when his mother 'modified'. This supports the suggestion made earlier that less 'modifying' was connected with Brian's 'negative' behaviour.

Table 7.24 Responses to 'negative' acts and their consequences

Maternal Responses	Termination		Continuation		Resume play	
	B1	B5	B1	B5	B1	B5
Eliminate	25	30	50	40	25	30
Modify/Support	40	25	20	25	40	50
Participate	-	-	30	61	70	39
No response	-	-	55	75	45	25

(ii) Revealing the properties of objects

The correlational analysis presented in earlier sections showed that the category of 'reveal object's property' was positively correlated with the infants' 'contact' and 'sequential' acts, the correlation being significant for Betsy, while the sequential analysis showed that Brian attended to a greater proportion of his mother's 'reveal' (58%) than Betsy (44%). Thus, Brian was more attentive to his mother's 'revealing', but Betsy may have reciprocated her mother's 'activity' by manipulative rather than visual acts.

The main sub-category, 'fulfil' did not correlate well with the infants' activities (Table 7.25) and the correlations between it and 'attend' were negative. However, there was a slight tendency for this form of maternal support to be favourably associated with Betsy's sequential manipulative acts ('discover').

Table 7.25 Correlations between 'fulfil' and the infants' acts

Mother's act	Look	Attend	Construct	Discover
Fulfil B1	0.13	-0.57	0.03	-
B5	0.67	-0.10	0.05	0.72

When we consider the temporal patterning of 'reveal' with the infants' activities, we find that the majority of Brian's mother's 'reveal' tended to follow from her 'provide stable base' and from Brian's 'looking' at the toy or engaging in 'negative' acts (Table 7.26). Betsy's mother 'revealed' mostly in bouts and while Betsy was 'attending' to her mother. On occasions, Brian's mother 'revealed' after she had attempted to get Brian to procure objects, or in continuation of previous 'revealing'. In the case of Betsy, a considerable proportion of 'reveal' followed from 'provide stable base' and, to a lesser extent, from 'support manipulation'. Only 6% of 'reveal' was preceded by 'recruit'. Thus, for both infants 'reveal' was preceded by the same maternal activities.

The infants, too, were both engaged in similar activities when their mothers 'revealed': 'attention', 'negative' and 'contact' acts and low-level 'solitary' play. Brian's mother showed a tendency to 'reveal' when the infant was already engaged in cognitively advanced manipulation (Table 7.27).

The consequences of 'reveal' were very different for each infant (Table 7.28). Betsy's reactions were more diverse than Brian's. Brian's predominant responses were 'attending' and 'appreciating spectacle'. The proportion was smaller for Betsy although 'attend' and 'appreciate' constituted the majority of her responses. On 34% of the time Betsy 'ignored' her mother's 'revealing' and engaged in 'solitary' play. Brian

Table 7.26 Maternal activities that preceded 'reveal'
(as percentages of 'reveal')

Mother's categories	B1 (Brian)	B5 (Betsy)
Non CP	0	4
Provide stable base	57	30
Support manipulation	20	14
Reveal property	11	41
Recruit	6	6
Modify	6	5

Table 7.27 Infants' activities that preceded 'reveal'
(as percentages of 'reveal'

Infant categories	B1 (Brian)	B5 (Betsy)
Solitary (high-level and construct)	6	3
Solitary (low-level)	17	20
Contact (with same object)	0	7
Contact acts	20	16
Sequential acts	11	7
Attend	23	26
Negative acts	23	21

Brian did so only 15% of the time. 11% of 'reveal' was reciprocated by Betsy in the form of 'discovery'. This involved changing the theme of the mother's play to make it suit her own (e.g. mother builds tower, Betsy dismantles that tower). On the whole, Betsy attended less than Brian, and engaged more in autonomous activities and in more 'negative' behaviour.

The sequential analysis presents a different picture from that of the correlations, in that both infants were 'attentive' to their mothers' 'revealing' although the correlations between 'attention' and 'reveal' were negative. This was probably because the infants did not regulate the rate of their 'attention' in proportion to their mothers 'revealing' activities. Thus, it could be that when 'revealing' was most frequent, the infants' attention tended to deteriorate. In other words, when the rate of 'reveal' increased to a certain level it probably exceeded the infants' span of attention.

Table 7.28 Infants' responses to 'reveal'
(as percentages of 'reveal'

Infant activities	B1 (Brian)	B5 (Betsy)
Solitary	9	10
Solitary (with same object)	0	1
Contact	0	6
Contact (with same object)	14	15
Discover	0	11
Attend	71	39
Negative	6	18

The sequential association of 'contact' acts with 'reveal' explains further the positive correlations between the two activities. The positive correlation between 'fulfil' and Betsy's 'discover' was probably brought about by her responses to 'reveal' by 'discover' on 11% of the occasions when her mother 'revealed'.

In summary, both mothers timed their 'revealing' well with their infants' and their own behaviour. They also used 'reveal' as a means of dealing with 'negative' acts. The infants (and especially Brian) reciprocated their mothers' activity well. Once more, one gets the impression that Brian might have benefited more from 'modifying' activities such as 'reveal'.

(iii) Demonstrating and teaching

The correlational analysis between 'demonstrate/teach' and the infants' activities showed that 'demonstrate/teach' was relatively unrelated to Brian's activities, while in the case of Betsy 'demonstrate/teach' seems to be unrelated to her solo 'constructing' but that she reciprocated her mother's activity by 'imitation' and 'attention'.

Table 7.29 Correlations between 'demonstrate/teach' and the infants' activities

Mother's act		Look	Attend	Construct	Imitate
Demonstrate/ teach	B1	0.59	-0.21	-0.20	-0.20
	B5	-0.09	0.39	-0.43	0.83*

From Tables 7.30a and b, it can be seen that according to the sequential analysis the majority of 'demonstrate/teach' for Brian were preceded by 'provide stable base' and 'support manipulation', while for Betsy 'teaching' followed from 'reveal' and 'provide stable base'. Brian's activities, prior to 'teaching' were 'solitary' acts and Betsy's were 'solitary', 'attend' and 'negative' acts. Thus there was no predominant maternal or infant activities that tended to precede 'demonstrate/teach'.

Table 7.30 (a) Maternal activities and (b) infants' activities that preceded 'demonstrate/teach' (as percentages of 'demonstrate/teach')

Maternal acts	Antecedents B1	Antecedents B5
Recruit	0	12
Provide stable base	40	25
Support manipulation	40	13
Reveal property	0	38
Modify	20	12

Infant acts	Antecedents B1	Antecedents B5
Attend	20	25
Solitary	40	25
Contact	20	12
Sequential	20	18
Negative	0	38

Concerning the teaching strategies, as Table 7.31 shows, for Betsy the predominant strategy was 'simplify' followed by 'model'. On the last visit the mother adopted the 'showing' strategy. For Brian, 'model' was the most frequent strategy followed by 'simplify'. Neither mother 'idealised' with her 'modelling'. Thus the two mothers relied on non-verbal 'teaching' strategies and for the less advanced infant the 'simplifying' strategy was more common. In terms of the consequences of these strategies, as Figure 7.10 shows, 'simplifying' was most effective in eliciting 'imitations' from Betsy, and in eliciting 'attention' from Brian. 'Modelling', on the other hand, was not reciprocated by 'imitation'. Thus, at this stage, 'modelling' was too advanced for the infants while 'simplifying' was appropriate only to Betsy's level of competence. 'Teaching' achieved its immediate goals only with the infant who emerged as less competent according to the IPDS, This is either because this infant (Betsy) was actually more competent than the scales had shown her to be, or that she was more motivated than Brian to achieve goals during interpersonal play.

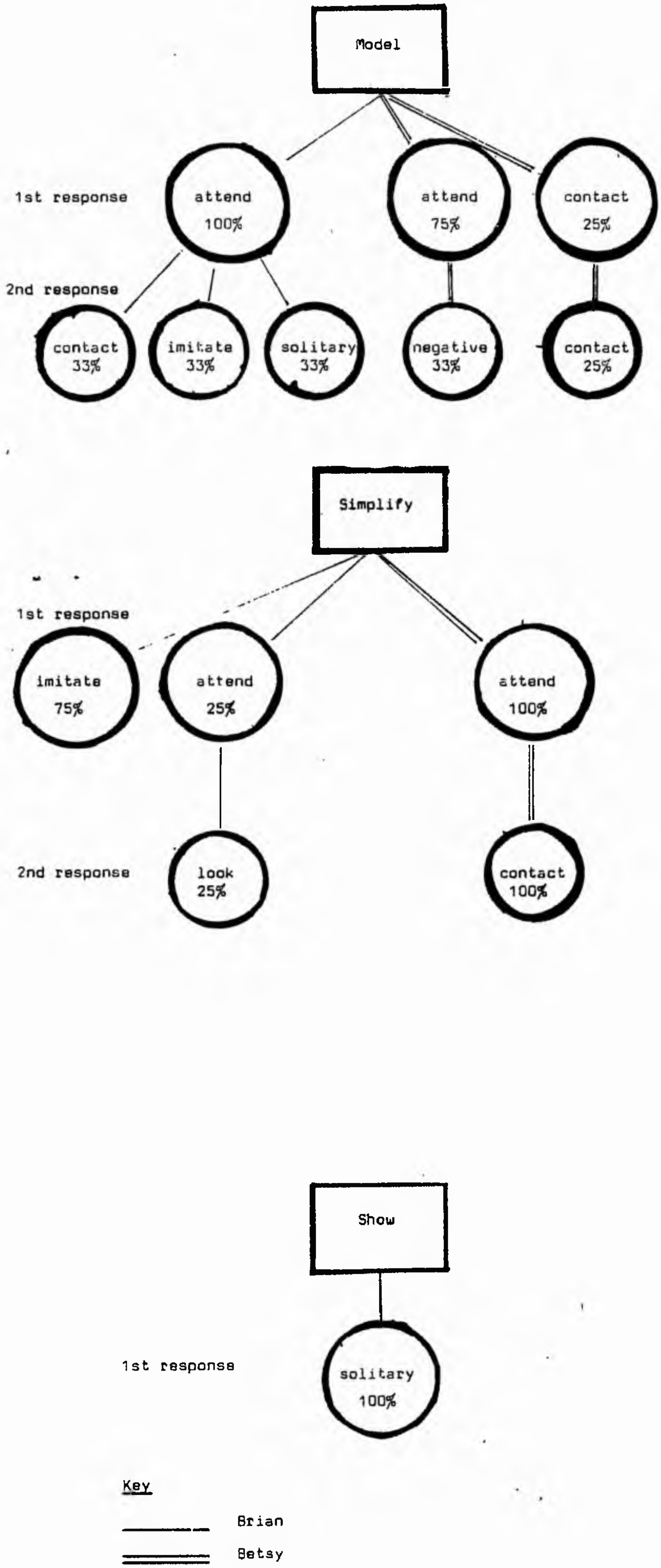


Figure 7.10 Teaching strategies and the responses to them by the 2 infants in group B

Table 7.31 Types of teaching strategies as a percentage of 'teach'

Teaching strategy	B1	B5
Model	80	38
Simplify	20	50
Show	0	12

7.4.5. Excerpts from Interactions

(i) Brian and his mother ($1\frac{1}{2}$ minutes)

Brian is sitting on the floor; he looks at the beakers out of reach and points at them. His mother looks in the direction of his pointing but instead of giving him the toy directly, she brings it nearer and then unstacks the beakers while Brian watches her. She takes one of the beakers and puts it on Brian's head. Brian raises his head in anticipation. He then touches the beaker on his head and pushes it off while his mother watches him. After that, he picks up the beaker and his mother asks, "again?". She repeats the action of putting the beaker on Brian's head and Brian responds, first by raising his head and then by pushing off the beaker. The game is repeated for two rounds and is then terminated by Brian when he stares at the experimenter. After that, Brian points at his feeding bottle on the mantlepiece while his mother watches him. He stretches his hand towards the bottle and starts gazing round in space. All the while his mother is watching him. Finally, he reaches for the beakers that are scattered on the floor. His mother responds by pushing one beaker closer to him. Brian then picks it up and hands it to his mother. She takes it and looks at Brian. Brian then averts his gaze and looks at the experimenter.

(ii) Betsy and her mother ($1\frac{1}{2}$ minutes)

Betsy is mouthing an empty, plastic bottle. Her mother leans close to her and whispers something. She then attempts to take the bottle from Betsy who holds tightly to her toy. M (mother) attempts the action again and Betsy resists her. M then interprets: "no?". Betsy looks at her mother and smiles. M repeats the action of pulling the bottle gently and Betsy pulls it back. M succeeds in taking the bottle but Betsy takes it again from her mother's hand. M then extends her palm to Betsy, while Betsy holds tighter to the toy and looks at her M. She then shakes her head. M shakes her head in imitation of Betsy. Betsy looks at the experimenter and laughs. M extends her palm to Betsy and Betsy looks up at M. She then lets the bottle touch her M's palm and quickly withdraws it again. M is watching Betsy all the while. M repeats the game but Betsy is involved in another activity of her own: poking the beaker with the bottle. She then looks at her mother and M responds by asking her to give her the bottle. Betsy shakes her head and M interprets: "no?".

Comments

These excerpts highlight the similarities as well as the differences between the two infants' interactions with their mothers. In terms of the content of the interactions, both infants engaged in a game. Brian and his mother's game involved 'innovation' in which his mother played the active role and Brian played the complementary, recipient role. Betsy's game was a 'give-and-take' where Betsy was the 'giver' and her mother was the 'receiver'. However, in this instance, the 'give-and-take' game took an unconventional form in that Betsy did not part with her toy willingly, and on the occasion when she seemed to do so, she only approximated the action of 'giving'. This was either because, according to Bruner (1977), she still had not acquired the reciprocal mode of exchange, and, therefore, did not progress beyond the stage of 'accepting offered objects', or she was deliberately violating the rules to 'tease' her mother, and, probably, prolong the game and make it more interesting. If that was the case, then Betsy's behaviour implies advanced competence, since she not only gave evidence of acquiring the rules of the game, but she was also adding to her own variations to those rules and observing their consequences. In this account the 'give-and-take' game became more complex since it did not proceed along direct exchanges of an object, but it also involved verbal and non-verbal exchanges. During these exchanges, Betsy gave evidence of her acquisition of the meaning of "no" and she practiced using it in a friendly context. Thus the game could be regarded as supportive to learning social roles and conventions as well as language acquisition. Brian's game, on the other hand, focused on learning about the unconventional properties of objects and turn-taking, without involving verbal communication or affect displays. In this respect, Betsy's 'game' was more supportive to cognitive development and was characterised by more interpersonal synchrony. In both instances the games were terminated by the infants but whereas Brian's following acts were 'negative', Betsy's were 'solitary'. Despite this, both mothers responded by 'participate from background'. Both infants showed similar competence when incorporating the experimenter in their activities with their mothers. Thus, immediately after the 'peak' of the game, both infants turned to the experimenter as if they were commenting to her on what had just happened, and communicating to her their excitement and pleasure.

The excerpts also reveal the tactics employed by the mothers when introducing new activities. In the case of Brian's mother, she took the initiative from him to introduce a game with a toy in which he had shown interest. For Betsy, her mother expanded on the infant's theme of 'mouthing' the object. The games were re-introduced when both infants gazed at their mothers and the mothers interpreted the 'gaze' as a request for repeating the game. Thus, both mothers 'timed' their activities well with the ongoing activities of their infants. However, Betsy's mother seemed to be less reactive and less synchronising than Brian's mother (e.g. attempted to take an object away from Betsy, and introduced a new round in the game when Betsy was already involved in 'solitary' play). Apart from these episodes, the behaviour of one partner led naturally to the behaviour of the other (e.g. Betsy shakes her head ⟶ M says "no?" ⟶ Betsy smiles back), and, therefore, the dialogue between Betsy and her mother was well balanced. In the case of Brian, his mother 'watched' his activities and changed this form of support only in accordance with Brian's demands. Thus, she changed from 'participate' to 'assist' (by 'bring toy nearer') when Brian reached for the toy, keeping her behaviour in synchrony with his. However, towards the end of the account, Brian's mother's passive role seemed to be less compatible with his activities: when he initiated exchanging a toy with her she did not elaborate on that by extending the activity into a game or by performing other 'modifying' acts. One gets the impression that Brian's 'negative' response which followed his mother's 'receive object' might have been averted had his mother performed a more stimulating activity with the toy. Indeed, the very act of Brian ('give toy') could have been a request for something else (e.g. a game). Thus, like the preceding analyses, the accounts seem to indicate that the cognitively more competent infant received less directive parental support than the less competent infant.

Finally, the excerpts point out what the statistical analysis had shown, namely, Brian's lack of 'solitary' manipulations. Thus, Brian only reached for the toys and picked them up once without manipulating them subsequently. His mother's responses to distal 'contact' acts reveal her attempts to make Brian take more initiatives in his play (e.g. 'bring toy nearer' rather than 'give toy'). However, such efforts were not always reciprocated by Brian and they did not elicit any 'solitary' acts. Thus it seems that both Brian and his mother were adopting a passive role for most of the time. Consequently, Brian emerged less competent than Betsy, and this difference could be attributed to differences in maternal styles.

In conclusion, these case studies show that the two infants were different in their cognitive abilities, as measured by the IPDS. However, during interpersonal play, the infant with better scores did not realise his full potential, while the infant with the poorer scores showed more competence in her spontaneous play than in the tests. Furthermore, the mother-infant interactions of the less cognitively advanced infant (according to the Scales), were characterised by more synchrony and compatibility than in the case of the more advanced infant. Such differences could be attributed to two factors:

Firstly, the less competent infant was more motivated and more interested in playing with the toys with her mother, and so she was able to acquire new cognitive skills and to exercise her already existing schemes. Evidence for this comes from the difference in the frequency of 'negative' acts where the less competent (but more motivated) infant engaged in significantly less 'negative' activities than the more competent one.

Secondly, the more competent infant probably received inadequate maternal support which may have been less motivating and less effective in terminating (or preventing) 'negative' behaviour. Such forms of support probably 'created less possibilities' for the infant's cognitive advancement.

Thus, when the infant was engaged in 'solitary' play his activities were advanced. However, his 'solitary' acts were significantly less frequent than those of the other infant. This is probably because he lacked the motivation to explore and play. In this case, 'enhance', in general, and 'participate', in particular, were not always effective in stimulating the infant to sustain long bouts of 'solitary' play. Despite the incompatibility of 'participate' and 'negative' acts, this category constituted the predominant response to the infant's 'negative' behaviour. It also preceded 70% of his 'negative' acts. On the other hand, 'modify' was more favourably related to the infant's activities: it was the most effective form of dealing with his 'negative' behaviour, and the infant seemed to reciprocate it; for example, positive correlations were found between the infants' activities ('contact' and 'sequential' acts) and the mother's 'reveal properties', 'create discovery' and 'demonstrate/teach'. The infant was also attentive to 71% of his mother's 'reveal' and only 6% of this form of support was followed by 'negative' acts.

To sum up, the more capable infant was probably performing 'below the margins of his abilities' because he was paired with a less supportive mother, while the less capable infant was able to improve her level of cognitive functioning through adequate maternal support. The differences in maternal support could be attributed to differences between the mothers along variables such as social-class and parity. The less competent infant came from a middle-class family where the environment was probably more stimulating than that of the working-class background of the infant who showed advancement on the Scales. The more advanced infant was a first-born while the less advanced infant's birth order was third, and, consequently, her mother was, probably, more experienced and more sensitive in her interactions with the infant. However, it is also possible that the sex of the child may have affected the mothers. Being a male, the infant with better scores was probably more assertive, independent and boisterous in his play and such qualities may have discouraged those forms of support that require the infant's concentration and compliance (e.g. 'modify').

7.5 Cases C1 (Clare) and C5 (Carol) : Group C infants

7.5.1 Background Information

Clare was 11 months and 3 weeks old when the study began. She was a second-born with an older brother aged 4 years. He was present during two visits and he spent the time watching television. Clare was a very active baby, very determined and she would push herself very hard to succeed in a task. She was strongly attached to her mother and could not bear to let her out of her sight. She often initiated social play with her mother and displayed affection towards her mother such as by hugging her. Later she became used to the experimenter and enjoyed playing with her so long as the play did not involve much physical contact. Her mother was about 32 years old. Clare was observed for 10 sessions and on 4 of these visits the interaction was with her father. Both parents seemed to behave naturally in front of the camera. They both adopted largely a reactive role towards Clare's play, and both tended to give her a lot of verbal encouragement and praise. Clare had the highest scores on most of the IPDS. She possessed many toys but she played with only few of them. Her favourite one was a wooden round-about in which she could slot small figures. She also enjoyed gross-motor activities such as climbing on furniture.

Carol was also a second-born; her older sister was a very quiet, $3\frac{1}{2}$ years old child. On two occasions the sister was present during the filming, and most of the time she watched her mother and younger sister play. Carol was 12 months, 2 weeks old when she was first visited. She was full of fun, quite contented and enjoyed making speech-like vocalisations. Her mother was 24 years old. The father was never present during the visits. The mother seemed unsure of her role during the observations. Her predominant theme of play was to get Carol to talk on a toy telephone to her daddy. Occasionally she also teased Carol (e.g. snatching toys away from her). Carol possessed a great number of toys and the average number of toys she played with during each visit was 13. They consisted of household objects (e.g. containers, boxes and her mother's knick-knacks), sound-emitting toys and miniature telephones, clocks and radios. She also played with social toys such as dolls and stuffed animals and hair-brushes and mirrors. Carol did not seem to be affected at all by the experimenter's presence and was neither friendly nor hostile. Although Carol's scores on the IPDS were not the worst in the group, she was selected for comparison with Clare because she had, generally, lower scores, and because she was a better match than the others since she was also a female and a second-born, with a small age gap between her and the older sibling.

7.5.2 Quantitative differences between the infants

(i) Scores on the IPDS

Figure 7.11 shows that Clare and Carol were very similar in their performance on the scale measuring 'causality' with Carol scoring slightly higher. Carol also scored better than Clare on the scale measuring 'schemes with multiple-objects'. The scores were most discrepant

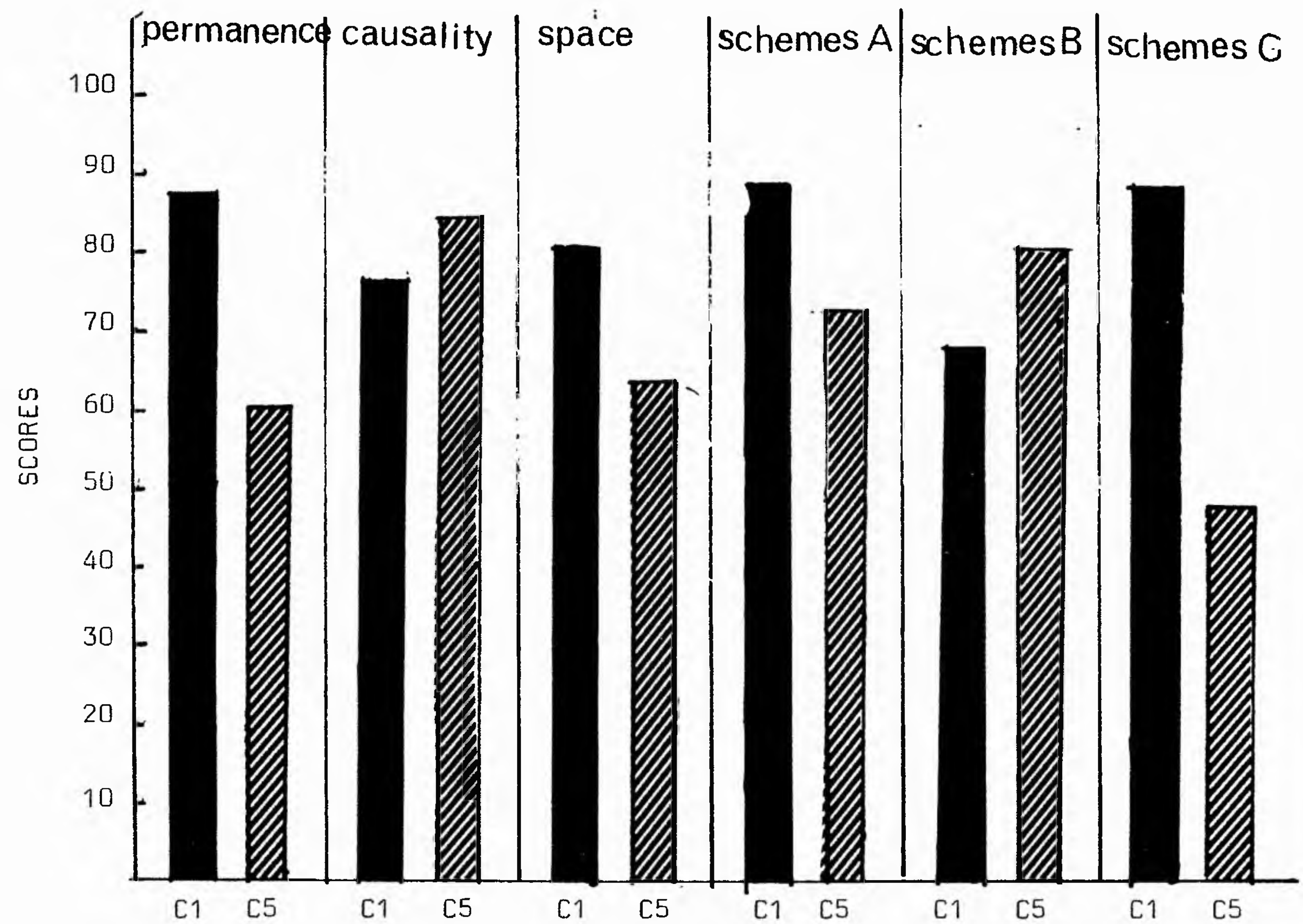


Figure 7.11 Scores on the IPDS for the two infants in group C

in relation to the scale on 'schemes with social objects', with Carol having quite a low score. This is incompatible with Carol's experiences in so far as her play involved frequent manipulation of social toys. On all the other scales Clare performed only slightly better than Carol. Thus, 'schemes with social objects' seem to differentiate the two infants most, while 'causality' differentiated them least. However, the t-test showed that the differences were not significant.

Concerning the individual items of the scales, on the scale measuring 'spatial abilities' Carol failed the last item (making a detour) while Clare attained perfect success on it. This could be attributed to Clare's mobility and boisterous play that involved chasing balls and hiding behind furniture. Compared to Clare, Carol was very inactive and tended to play quiet games that lacked gross motor movements. This may have influenced her advanced performance on the scale measuring 'schemes with multiple-objects' (e.g. she 'grouped' the beakers together, put them in their box, and built a tower with them). Clare's schemes were less advanced and consisted of 'differentiated acts', 'letting go' and making 'constructions'.

Overall, Clare and Carol's performance on the IPDS did not differentiate between their cognitive abilities to the same extent as the previous cases. Formerly the infants with the higher scores were also more advanced in their 'solitary' acts. Thus, with the present cases, the two infants would be expected to be more similar than different in their 'solitary' play. This is because solo play is similar in context to the testing situation in so far as they both involve minimal adult intervention. Any differences in the infants' other activities may more directly reflect the effects of adults' different forms of stimulation. The following section will now examine to what extent these expectations were true.

(ii) The infants' activities

Figure 7.12 shows that the two infants differed in the frequency of their various activities when with their mothers. Clare had significantly more 'object-contact' acts than Carol, but Carol's 'solitary' and 'sequential' acts were more frequent. 'Negative' acts were less frequent than the majority of the other acts and the infants were not different on these, although Clare had slightly more.

These results seem to indicate that Carol was more advanced than Clare in her spontaneous play. However, an examination of the content of the infants' major activities shows that Clare's 'solitary' play was more cognitively advanced than Carol's (Figure 7.12) since she engaged in a larger proportion of high-level 'solitary' acts and less low-level ones. Both infants were similar in terms of the frequency of their 'constructions'.

With respect to 'object-contacts' Clare could be regarded as slightly more advanced since a lesser proportion of her 'distal-contacts' consisted of passive 'looking' than in the case of Carol. More of Clare's 'contact-acts' involved active approach to toys probably because she was more mobile and more advanced in motor skills.

Both Carol and Clare were similar in their cognitive competence with respect to the sub-categories of 'sequential' acts. For both infants the majority of their 'sequential' play consisted of 'attending' to mother, followed by 'games'. For Clare, 'games' constituted a larger proportion of 'sequential' acts while Carol was more 'attentive'. These differences on the frequency of 'games' may reflect Clare's greater social competence (she also scored higher than Carol on 'schemes with social objects'). On the other hand, Clare was probably less interested in forms of play that involved concentration and attention to others (e.g. Clare was less 'attentive' and her 'solitary' play was less frequent than Carol's).

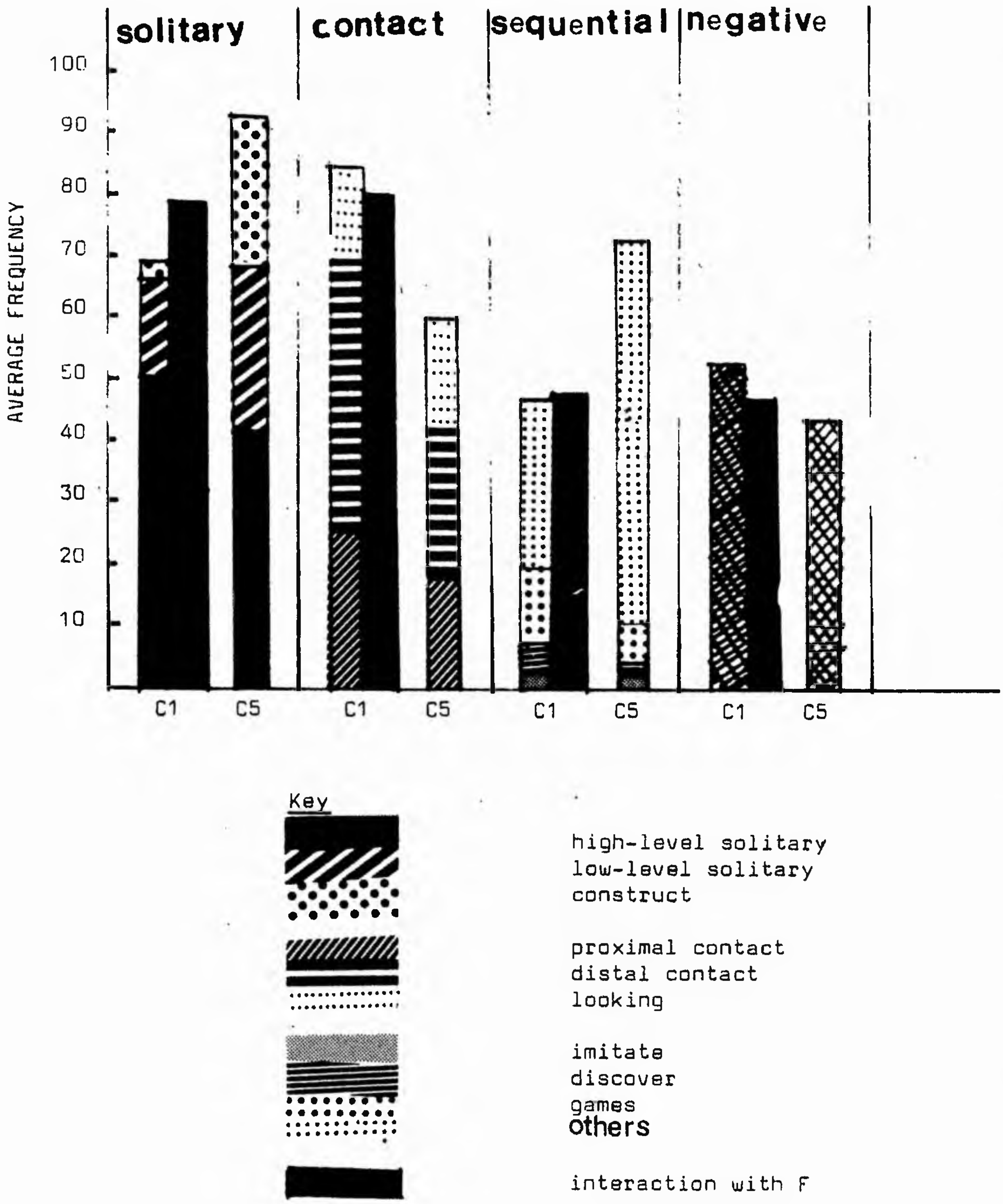


Figure 7.12 Activities of the 2 infants in group C

When with her father, Clare behaved in a similar manner as when she was with her mother and she had maintained a stable level of activities under both conditions.

The data on the infants' activities, unlike the data on the IPDS, emphasised the marked differences between these two infants. The discrepancy between the two sets of results could be explained as follows: the two infants were relatively similar in their cognitive abilities (i.e. they both had the same potential) but interpersonal play (even with minimal adult intervention) may have influenced the two infants differently. Thus, Clare was probably more advanced in her 'solitary' play because her mother's involvement had contributed to that, whereas in the case of Carol parental support was neutral, or even detrimental. Alternatively, the cognitive differences between the infants were small when measured by the IPDS but greater when expressed during interpersonal play. In other words, the scales measure different abilities from the ones that characterise the infants' spontaneous play and it is those latter abilities that differentiate between the two infants more. Evidence in favour of one or the other of these suggestions will be revealed in the course of examining the differences in the infants' experiences and the relationships between mother and infant behaviour.

(iii) Maternal activities

Figure 7.13 shows that the two mothers differed in the frequencies of their various activities. Clare's mother 'enhanced' significantly more than Carol's mother. This was also true of the two subcategories of 'enhance', with all differences being statistically significant. Thus, more frequent 'enhancing' was associated with the infant who engaged in more 'contact' acts and less 'solitary' play but one that was characterised by more advanced cognitive capacities.

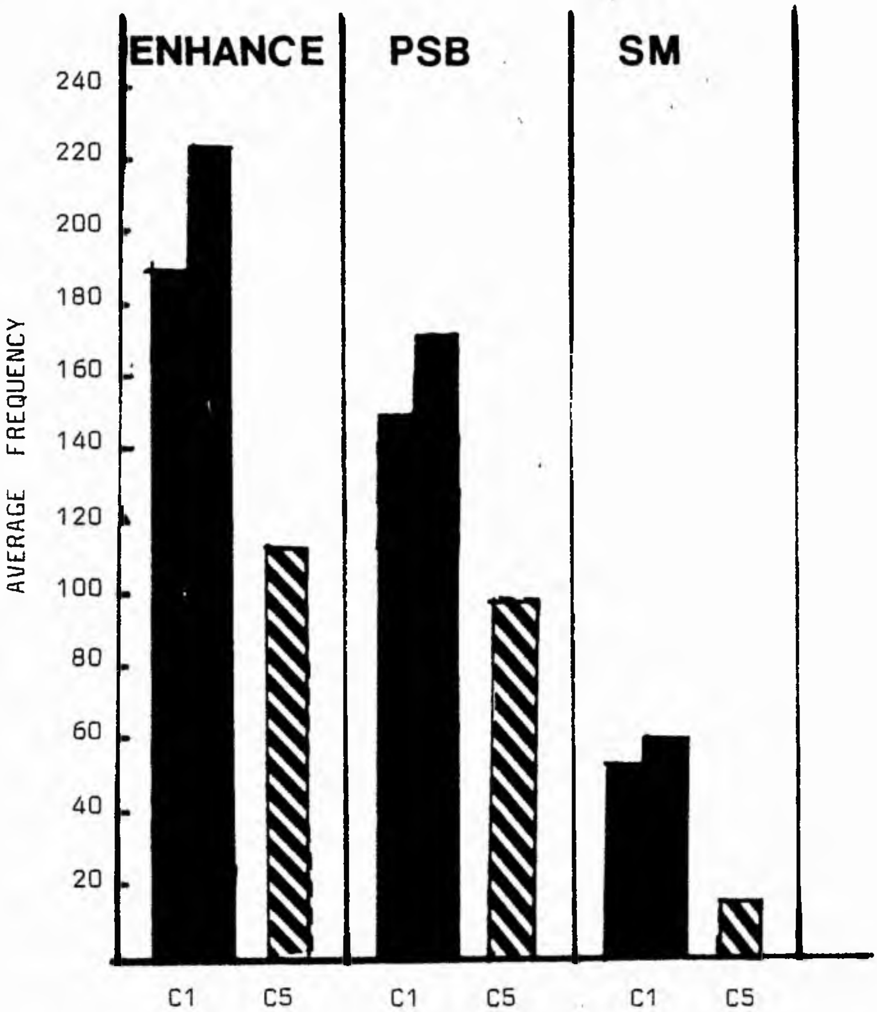


Figure 7.13 Frequency of 'enhance' and its immediate sub-categories for the 2 infants in group C

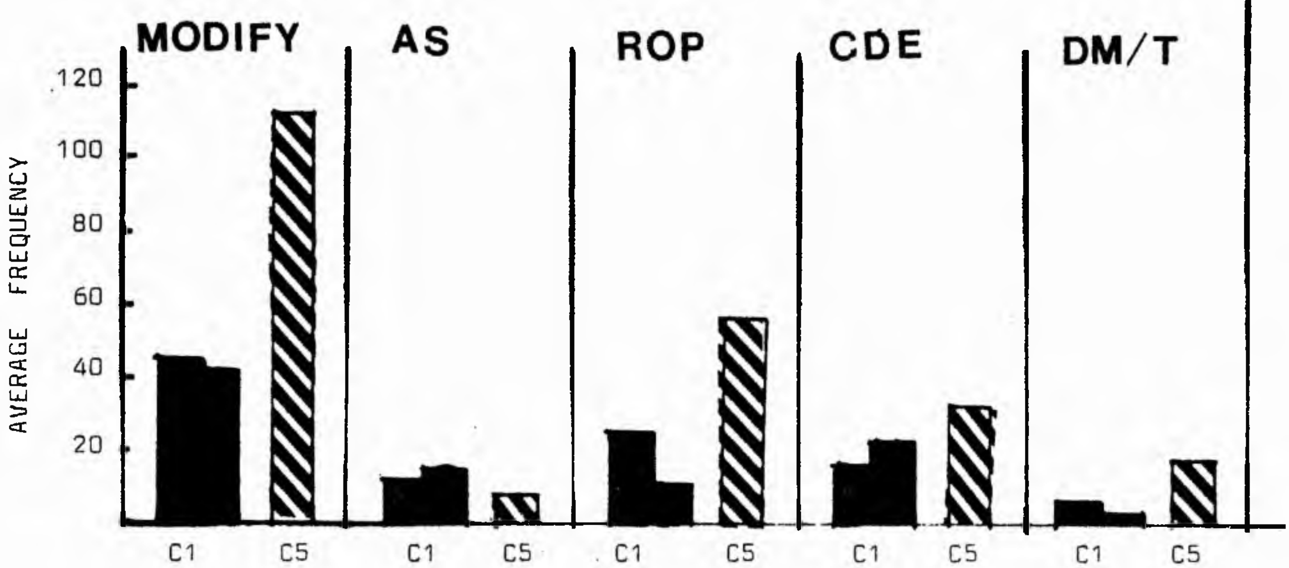


Figure 7.14 Frequency of 'modify' and its sub-categories for the 2 infants in group C

Concerning 'modify' and its sub-categories, Figure 7.14 shows that the two mothers were again different except in their 'assistance'. Overall, Carol's mother engaged in significantly more 'modifying' than Clare's mother. Therefore, more 'modifying' was associated with the infant who engaged in more 'sequential' and 'solitary' acts, and less 'contact' acts, but one who performed at a lower cognitive level than the other infant who received less 'modifying'. Furthermore, Carol's mother distributed her activities almost equally between 'enhance' and 'modify'.

Although the activities of Clare when with her mother were not different from her activities while interacting with her father, yet her parents behaved differently towards her. Her father 'enhanced' more than her mother. This was reflected in only one sub-category, 'provide stable base'. However, the parents were not different in terms of 'modify' and its sub-categories. The tendency for the father to 'provide stable base' more than the mother could be explained in two ways, either that the father encouraged autonomy more than the mother, or, having her father around made Clare less dependent and more motivated to play on her own. If we consider Clare's attachment to her mother, the latter interpretation becomes more likely. In absence of the attachment figure, Clare may have substituted her attachment responses with manipulative ones. Evidence for this comes from the slight increase in 'solitary' play when Clare was with her father and a slight decrease in 'negative' acts.

The differences in maternal activities could be explained in two ways. Firstly, that 'enhancing' was influential in encouraging advanced 'solitary' activities from Clare, while 'modifying' had an adverse effect on Carol's playing activities. Secondly, that the mothers were reactive to their infants, so that Clare's ability to pursue advanced solo play may have "led" her mother to adopt an 'enhancing' role, while Carol's lack of similar abilities may have "led" her mother to adopt a compensatory role by 'modifying interaction'. If the second explanation was true, then both mothers would be supporting their infants cognitive development by adopting the role that suits their infants' particular needs. If the first explanation was the more correct one, then Carol's mother would be less supportive since 'modify' would be detracting the infant's cognitive advancement. Further analyses are needed to decide which of the two explanations was the more likely one.

7.5.3 Relationship between mother and infant behaviour

(i) Interpersonal synchrony

Table 7.32 shows that 'participate', and, to a lesser extent, 'enhance' were more compatible with Clare's 'solitary' acts than Carol's. 'Modify' was positively related to the 'solitary' play of the two infants and more so for Carol; the correlations between 'modify' and 'sequential' acts were better for Clare. A similar relationship was manifest with regard to 'participate' and 'contact' acts. 'Participate' was positively related to Carol's 'negative' acts, and negatively related to her 'solitary', 'contact' and 'sequential' acts.

Concerning the other sub-categories of 'enhance', Table 7.32 shows that 'eliminate' was positively related to both infants 'negative' acts and more so with Clare's. Thus, both mothers seemed to have responded appropriately to their infants' 'negative' behaviour, and Clare's mother seemed to have been more responsive. 'Support manipulation' showed a low positive correlation with 'object-contacts' and the correlation was slightly greater for Carol.

Table 7.32 Correlations between the mother and infant categories that describe interpersonal synchrony

Maternal acts		Solitary	Contact	Sequential	Negative
Enhance	C1	0.34	-	0.52	-
	C5	-0.70	-	-0.54	-
Modify	C1	0.63	-	0.96**	-
	C5	0.86*	-	0.67	-
Participate	C1	0.73	0.70	0.65	0.05
	C5	-0.63	-0.63	-0.63	0.72
Eliminate	C1	-	-	-	0.93**
	C5	-	-	-	0.77
Support manipulation	C1	-	0.49	-	-
	C5	-	0.60	-	-

C1 = Clare; C5 = Carol

The correlations between 'modify' and 'attend' were 0.83 for Clare and 0.52 for Carol. Thus, both infants seemed to complement their mothers' 'modifying' acts by attending to them, although Clare seemed to increase her 'attention' with increases in 'modify' to a greater extent than Carol.

The results, so far, are more in favour of Clare and her mother since this pair seemed to synchronise their behaviours; for example, when the mother was 'participating' the infant was engaged in 'solitary', 'contact' and 'negative' acts, and when the mother was 'modifying' the infant was involved in sequential behaviour, in general, and 'attention' in particular. When the mothers were 'supporting manipulation' there seems to be more synchrony between Carol and her mother than Clare and her mother. Although

Carol's mother 'modified' more than Clare's, yet Carol complemented the 'modifying' activities less.

The temporal patterning of 'participate' and the various infants' activities (Table 7.33) reveals that a larger proportion of Clare's 'solitary' and 'contact' acts were accompanied by 'participate'. The proportion of 'negative' acts that occurred simultaneously with 'participate' was similar for the two infants, while there was a greater tendency for Clare's 'negative' acts to be preceded and followed by 'participate'. On the whole, 41% of Clare's activities were not in synchrony with her mother's 'participation', compared to 33% for Carol. Thus, the sequential analysis shows a close relationship between Clare's 'negative' acts and her mother's 'participate', although increases in one activity were not associated with increases in the other activity (Table 7.32).

Table 7.33 Percentages of infants' activities that were associated with the mothers' 'participate from background'

Infant acts		⟵ P ⟶	P ⟶	⟶ P
Solitary	C1	84	0	16
	C5	50	0	3
Contact	C1	60	0	11
	C5	37	2	2
Sequential	C1	2	0	19
	C5	4	0	3
Negative	C1	32	57	62
	C5	28	25	36

Concerning the relationship between 'support manipulation' and the infants' activities, Table 7.34 shows that Clare responded to 64% of her mother's 'support' with 'contacting' and 'receiving' ('sequential' acts) the objects. For Carol, only 44% of 'support manipulation' was reciprocated by 'contact' acts or appropriate 'sequential' acts. Overall, 83% of 'support manipulation' was in synchrony with Clare's activities compared with 68% for Carol. Although the correlational analysis showed that Carol and her mother were better at regulating the rates of the 'support manipulation' and 'contact' acts in proportion to one another, yet Carol responded by 'contact' acts to a smaller percentage of her mother's 'support'.

Table 7.34 Percentages of 'support manipulation' associated with the infants' activities

Support manipulation	←SM→				SM→				→SM			
	SO	CT	SQ	NE	SO	CT	SQ	NE	SO	CT	SQ	NE
Clare C1	4	4	0	4	4	50	14	9	4	4	3	0
Carol C5	19	6	0	0	6	25	19	6	6	6	0	6

Despite the high positive correlations between 'eliminate' and 'negative' acts (Table 7.32), the sequential analysis (Table 7.35) reveals that only 14% of Clare's 'negative' acts and 4% of Carol's were responded to by 'eliminate'. This is because the mothers changed the rate of their 'eliminate' acts in proportion to increases or decreases in their infants' 'negative' behaviour, but 'eliminate' was still less frequent than 'negative' behaviour. The majority of the infants' 'negative' acts were responded to by 'participate from background' with Clare's mother doing so more than Carol's. However, Carol's mother "ignored" her infant's 'negative' behaviour more (i.e. not responding by 'create-possibilities'). Carol's mother also tended to respond by 'modify' while Clare's mother seemed to prefer 'support manipulation'. Overall, 31% of Clare's 'negative' acts were actively dealt with; this proportion was slightly higher for Carol (39%). These results, besides showing the relative lack of maternal responsiveness to 'negative' behaviour, also highlight the differences between the two mothers. Clare's mother's style was predominantly an 'enhancing' one, regardless of what her infant was doing, while Carol's mother tended to 'modify'. Carol's mother dealt more than Clare's mother with 'negative' acts.

Table 7.35 Percentage of infants' 'negative' acts responded to by different maternal acts

Maternal responses	C1 (Clare)	C5 (Carol)
Eliminate	14	4
Support manipulation	10	6
Modify	7	30
Participate	62	36
No response	7	26

Finally, as Table 7.36 shows, only a small proportion of 'modify' activities was followed by the infants' 'attention', with Carol 'attending' to slightly more of her mother's 'modify'. This finding is incongruent with the results of the correlational analysis where 'modify' correlated well with Clare's 'attention' (0.83) while for Carol the correlation was lower but positive (0.52). For both infants, 'create discovery' elicited least 'attention'. Clare was most attentive to 'reveal' while Carol was attentive to 'teach' followed by 'reveal'.

Table 7.36 Percentages of 'modify' sub-categories that were 'attended' to by the two infants

Modify sub-categories	Attend	
	C1 (Clare)	C5 (Carol)
Reveal object's property →	54	46
Create discovery environment →	10	23
Demonstrate/teach →	40	50
Mean	34.6	39.6

The findings from the sequential analysis confirm the tendencies depicted by the correlational analysis, and which revealed that more of Clare's 'solitary' and 'contact' acts were associated with her mother's 'participate' than in the case of Carol. However, both the sequential and the correlational analyses showed that Clare's mother adopted the passive role when her infant was already engaged in 'negative' acts and that minimal support also tended to precede and follow from 'negative' behaviour. Thus, although 'participate' was in synchrony with Clare's spontaneous manipulations of objects, it contributed little to maintaining the harmony of the dialogue. The sequential analysis shows that 'participate' did not occur simultaneously with Clare's 'sequential' acts and, therefore, we can infer that the positive correlation between the two activities was not indicative of lack of synchrony. It seems here that 'participate from background' may have stimulated the infant into more play, both 'solitary' and 'sequential'.

Overall, more synchrony was achieved by Clare and her mother for besides 'participating' in response to 'solitary' and 'contact' acts, Clare's mother 'eliminated' more of her infant's 'negative' behaviour. Clare, too, contributed to interpersonal synchrony by complementing more of her mother's 'support manipulation' by 'contact' acts, and by 'receiving' objects. Both infants were similar in terms of the proportion of 'modify' to which they 'attended', although Carol was slightly better.

(ii) Cognitive Compatibility

Table 7.37 shows that 'enhance' and 'participate' were unrelated to the two infants' high-level 'solitary' acts. However, in the case of Clare, 'participate' was positively correlated with 'construct'. 'Modify' was positively related to Clare's high-level 'solitary' play and 'constructions'. For Carol, the correlation between 'modify' and 'construct' was negative, and between 'modify' and low-level 'solitary' activities they were positive. Thus, 'enhance' seems to be unrelated to the cognitive level of the infants' solo play, while 'participate' on its own was favourably related to Clare's advanced 'solitary' activities but not to Carol's. 'Modify' also seems to be supportive to Clare's 'solitary' acts but not to Carol's. This leads to the conclusion that the predominant form of support of Carol's cognitive development was mostly negatively related to her level of performance during 'solitary' play. At this stage the lack of relationship may be attributed either to the lack of effectiveness of 'modify' or to its being adopted in reaction to the infant's poor performance during 'solitary' play. For Clare, the evidence is that both roles seemed to be effective. Furthermore, 'modifying' seemed to have helped Clare's solitary 'constructions' (cf Chapter VI).

Table 7.38 shows that 'reveal object's property' was positively related to Carol's 'solitary' acts, and to both infants' 'sequential' acts.

Table 7.37 Correlations between the mothers' forms of support and the infants' activities

Pairs of correlations	C1 (Clare)	C5 (Carol)
Enhance/high-level solitary	0.15	-0.35
/low-level solitary	0.55	-0.45
/construct	0.38	-0.00
Modify/high-level solitary	0.52	0.29
/low-level solitary	0.17	0.77
/construct	0.71	-0.43
Participate/high-level solitary	0.55	-0.16
/low-level solitary	0.39	-0.63
/construct	0.73	0.18

It was also negatively related to 'negative' acts. This indicates that both infants tended to reciprocate their mothers' 'revealing' by appropriate 'sequential' acts, but for Carol more revealing was associated with more 'solitary' play, either because by watching her mother 'reveal the properties of objects' Carol had learnt how to play with these objects during 'solitary' play, or while 'revealing', Carol pursued her own themes of solo play.

'Create discovery environment' showed more positive associations with Carol's activities than the other maternal categories. It probably led to Carol 'contacting' the toys her mother had manipulated and responding to her mother's activities by appropriate 'sequential' acts. 'Create discovery environment' was also negatively correlated with Carol's 'negative' acts, that is, the more 'creating' her mother was, the less Carol rejected play. Therefore, 'create discovery environment' could be regarded as more supportive than 'reveal object's property' to Carol's cognitive development. For Clare, 'create discovery environment' correlated better with her activities than 'reveal', although the amount of correlations were smaller than those for Carol and her mother. This finding may indicate that 'create discovery environment' played a more significant role for Clare's development than the other forms of support.

Finally, 'demonstrate/teach' was similar to 'reveal object's property' in that it was positively related to Carol's 'solitary' acts. Clare seemed to be more responsive than Carol to this form of support since 'demonstrate/teach' correlated well with Clare's 'sequential' acts.

The correlational analysis indicates that 'enhance' and its subcategories (Table 7.38) may have been more compatible with Clare's activities, while more directive maternal support (e.g. 'support manipulation' and 'modify') seemed to be associated with less 'negative' behaviour from Carol and more reciprocal responses, but less advanced 'solitary' play.

7.5.4 Themes of Interactions

(i) Dealing with 'negative' behaviour

'Negative' acts were slightly more frequent from Clare than Carol. Clare's 'negative' behaviour tended to be less frequent when her mother's 'assistance' and 'create discovery environment' were more frequent. Carol's 'negative' acts were least when her mother engaged in 'support manipulation', 'reveal object's property' and 'create discovery environment' most. However, for Carol, there was a systematic increase in 'provide stable base' with increases in 'negative' acts.

Table 7.39 shows that the majority of Clare's 'negative' acts were preceded by 'enhance interaction'. This was the predominant style of

Table 7.38 Correlations between the mothers' and infants' activities that imply cognitive compatibility

Maternal Categories		Solitary	Contact	Sequential	Negative
Provide stable	C1	0.47	0.75*	0.43	0.15
base	C5	-0.70	-0.89**	-0.57	0.96***
Support	C1	-0.12	0.49	0.53	0.39
manipulation	C5	0.38	0.60	0.51	-0.67
Assist	C1	0.53	-0.11	0.58	-0.59
	C5	0.64	0.16	0.29	-0.31
Reveal object's	C1	0.06	0.01	0.58	-0.25
property	C5	0.88**	0.39	0.58	-0.58
Create discovery	C1	0.81*	0.56	0.69	-0.65
	C5	0.36	0.71	0.83*	-0.92***
Demonstrate/	C1	0.03	0.36	0.76*	0.03
teach	C5	0.72	0.24	0.24	-0.26

her mother's participation. It accounted for the majority of Clare's 'negative' acts probably because repeated 'enhancing' became monotonous to the infant and, consequently, she engaged in 'negative' behaviour out of boredom and after exhausting her own resources of solo play. For Carol, all her mother's activities preceded 'negative' acts to an equal extent, so in her case 'negative' behaviour seemed to be less related to what her mother was doing.

Both mothers responded to only a small proportion of their infants' 'negative' acts by 'eliminate' (Table 7.35). The predominant response was 'participate from background' followed by 'modify interaction' for Carol, and 'support manipulation' for Clare. As Table 7.40 reveals, responding

Table 7.39 Maternal categories that preceded the infants' 'negative' acts

Antecedents	C1 (Clare)	C5 (Carol)
External events	8	0
Non CP	8	23
Enhance	71	39
Eliminate	5	8
Modify	11	31

by 'eliminate' was ineffective especially for Clare, while 'modify' was more effective with Carol. The least effective response was 'participate' for Clare, and 'not responding' was least effective for Carol. Thus, there seems to be little relationship between the type of maternal response and the termination or continuation of 'negative' behaviour.

On the whole, Clare seemed more determined and assertive in that it was less easy to deal with her 'negative' acts. The differences between the two infants' responsivity to their mothers' attempts to deal with their 'negative' behaviour probably represent differences in the personalities of the two infants with Carol being more compliant and less assertive than Clare.

Table 7.40 Responses to 'negative' acts and their consequences

Maternal responses to 'negative' acts	Termination		Continuation		Resume play	
	C1	C5	C1	C5	C1	C5
Eliminate	17	0	50	0	33	100
Support/modify	43	56	43	22	14	22
Participate	-	-	60	44	40	56
No response	-	-	67	57	33	43

(ii) Revealing the properties of objects

The quantitative data on 'reveal object's property' and the infants' complementary activities showed that Carol's mother 'revealed' significantly more than Clare's, and, in response, Carol engaged in more 'sequential' acts in general, and 'attention', in particular. In terms of the correlations between 'reveal' and the infants' activities, the amounts of correlation were generally greater for Carol than for Clare, indicating that 'reveal object's property' was associated with increased 'solitary' acts and 'object-contacts' and a decrease in 'negative' behaviour.

From Table 7.41 it can be seen that the main sub-category of 'reveal' ('fulfil function') correlated better with the infants' visual responses than with their manipulative ones. The correlations with solitary 'constructions' were positive but low for Clare, and negative for Carol. However, 'reveal' and 'discover' were positively correlated for Carol and negatively for Clare. These results indicate that neither infant seemed to have "extrapolated" from 'revealing' activities into their 'solitary' constructions.

Table 7.41 Correlations between 'fulfil' and the infants' acts

Mother's act		Look	Attend	Construct	Discover
Fulfil	C1	0.84*	0.68	0.25	-0.34
	C5	0.54	0.69	-0.29	0.69

When we consider the timing of 'reveal' with respect to the mothers' own behaviour, as well as the infants' ongoing activities, we find that for Clare most 'revealing' was preceded by 'provide stable base' followed by 'reveal object's property', while for Carol it was the opposite. Thus for Clare, 'reveal' followed from her mother's predominant form of support. Carol's mother tended to engage in several episodes of 'reveal' that were consecutive to each other.

Table 7.42 Maternal activities that preceded 'reveal' (as percentages of 'reveal')

Mother's categories	C1 (Clare)	C5 (Carol)
Non CP	9	11
Provide stable base	42	25
Support manipulation	14	5
Reveal object's property	21	44
Recruit	5	7
Modify	9	8

'Reveal' also tended to follow from both infants' visual contact with the same toy, and to a lesser extent, from Clare's 'negative' acts and Carol's 'negative' and high-level 'solitary' acts. It seems, therefore, that both mothers were taking up the initiative to 'reveal' from the infants themselves, when they were already expressing interest in the toy ('attending') or when they began to get bored or tired as implied from 'negative' behaviour. However, both mothers, and especially Carol's, 'revealed' when the infants were already engaged in advanced 'solitary' acts, which makes 'reveal' less supportive since, on those occasions, it interfered with the infants' spontaneous expression of their cognitive abilities.

Overall, 78% of Clare's mother's 'revealing' were well timed with the infant's ongoing activities (i.e. when Clare was already in visual or manipulative 'contact' with the toy, or engaged in 'negative' or low-level 'solitary' acts), as opposed to only 56% in Carol's case. Thus,

Table 7.43 Infants' activities that 'preceded' 'reveal' (as percentages of 'reveal')

Infant categories	C1 (Clare)	C5 (Carol)
Solitary (high-level)	10	19
Solitary (low-level)	12	10
Contact (with same object)	14	1
Contact acts	0	12
Sequential acts	12	13
Attend	31	26
Negative acts	21	19

although Carol's mother 'revealed' more than Clare's, her activity was less suitable to Carol's play.

In terms of consequences, as Table 7.44 shows, less than 50% of 'reveal' was attended to by both infants, with Clare attending to slightly more of her mother's 'revealing'. 10% of 'reveal' was also imitated by Clare, compared to only 2% for Carol. Overall, Clare reciprocated 73% of her mother's 'revealing' (i.e. by 'attending', 'contacting' the same object, or engaging in 'sequential' or 'solitary' play with it); Carol reciprocated in a similar manner only 50% of her mother's 'reveal'. However, the greater frequency of 'reveal' for Carol may account to the differences in the infants' reciprocity.

The sequential analysis helps to explain further the positive correlations between 'fulfil' and visual contact, since a large proportion of 'reveal' was preceded and followed by 'attention'.

Overall, the theme of 'revealing' followed a similar pattern for both infants in terms of its antecedents, consequences and relationship to the infants' activities. However, the results indicate that 'reveal' was

Table 7.44 Infants' responses to 'reveal' (as percentages of 'reveal')

Infant activities	C1 (Clare)	C5 (Carol)
Solitary	11	23
Solitary (with same object)	5	0
Contact	5	13
Contact (with same object)	7	4
Discover	6	4
Imitate	10	2
Attend	45	40
Negative	11	14

more supportive to Clare's cognitive development than to Carol's since it was better timed with her ongoing activities, more attended to, more responded to by manipulative acts and more favourably related to her 'solitary' constructions.

(iii) Demonstrating and teaching

Although Carol's mother engaged in more 'demonstrating/teaching' than Clare's mother, yet Clare's 'imitations' were more frequent than Carol's. The correlations between 'demonstrate/teach' and the infants' 'contact' and 'sequential' acts were greater for Clare. This form of support was also positively related to Carol's 'solitary' acts, but unrelated to Clare's.

More correlations between 'demonstrate/teach' and the infants' activities are presented in Table 7.45. From this table it can be seen that 'demonstrate/teach' correlated poorly with the infants' attention, negatively with Carol's solitary 'constructions' and positively and significantly with Clare's 'imitation'. This indicates that 'demonstrate/teach' was mostly reciprocated by 'imitation' but only by Clare.

Table 7.45 Correlations between 'demonstrate/teach' and the infants' activities

Mother's act		Look	Attend	Construct	Imitate
Demonstrate/	C1	0.07	0.35	0.06	0.92**
teach	C5	-0.47	0.17	-0.77	0.26

As can be seen from Table 7.46a, the majority of 'teaching' episodes were preceded by 'provide stable base' in the case of Clare, and 'modify' in the case of Carol. This was followed by 'support manipulation' and 'modify' for Clare and 'provide stable base' for Carol. Thus, like 'revealing object's property', 'teaching' was preceded by the predominant forms of support. Table 7.46b shows that 'teaching' and 'demonstrating' seem to be relatively unrelated to the infants' ongoing activities. Thus, both mothers tended to 'demonstrate/teach' when their infants were involved in 'solitary', 'contact' and 'sequential' acts. Carol's mother also initiated teaching when her infant was engaged in 'negative' activities. In both cases 60% of the mothers' 'demonstrate/teach' could be regarded as well-timed with respect to what the infants were doing.

With regard to the 'teaching' strategies, as Table 7.47 shows, the predominant strategies for Clare were 'model' and 'instruct' and for Carol they were 'instruct' and 'model'. Both mothers 'modelled' to an equal extent. Clare's mother employed the other strategies of 'model + idealise', 'simplify' and 'show' to a greater extent than Carol's. The data, therefore, show that both mothers used mainly two strategies ('modelling' and 'instructing') when teaching their 12-15-months-old infants.

Table 7.46 (a) Maternal activities and (b) infants' activities that preceded 'demonstrate/teach' (as percentage of 'demonstrate/teach')

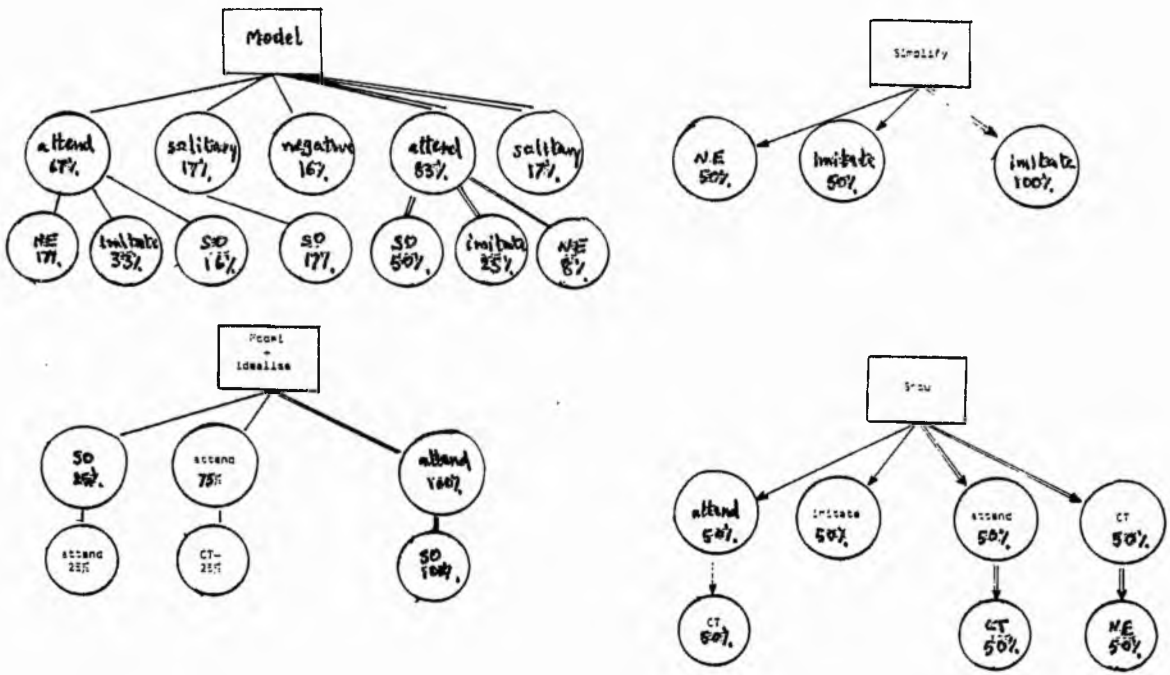
Maternal acts	Antecedents	
	C1	C5
Non CP	0	6
Recruit	14	9
Provide stable base	43	24
Support manipulation	21	15
Reveal property	0	15
Modify	21	30

Infant acts	Antecedents	
	C1	C5
Attend	21	18
High-level solitary	21	27
Low-level solitary	14	15
Contact (same object)	28	18
Sequential	14	15
Negative	7	18

Table 7.47 Types of 'teaching' strategies as a percentage of 'teach'

Teaching strategy	C1	C5
Model	33	33
Model + idealise	17	3
Simplify	11	3
Instruct	28	55
Show	11	6

Figure 7.15 shows that 'instruct' achieved immediate success with Clare on 80% of the time, and on 21% of the time for Carol. The next successful strategies for Clare were 'simplify' and 'show', and the least successful was 'model'. Neither of the infants 'imitated' their mothers' 'model + idealise'. For Carol, the most effective strategy was 'simplify', followed by 'model'. Carol did not achieve the goal after her mother's 'showing'.



Model
attend 67%
solitary 17%
negative 16%
attend 83%
solitary 17%
NE 17%
imitate 33%
SO 16%
SO 17%
SO 50%
imitate 25%
NE 8%
Simplify
N.E 50%
imitate 50%
imitate 100%
Model + idealise
SO 25%
attend 75%
attend 100%
attend 25%
CT- 25%
SO 100%
Show
attend 50%
imitate 50%
attend 50%
CT 50%
CT 50%
CT 50%
N.E 50%

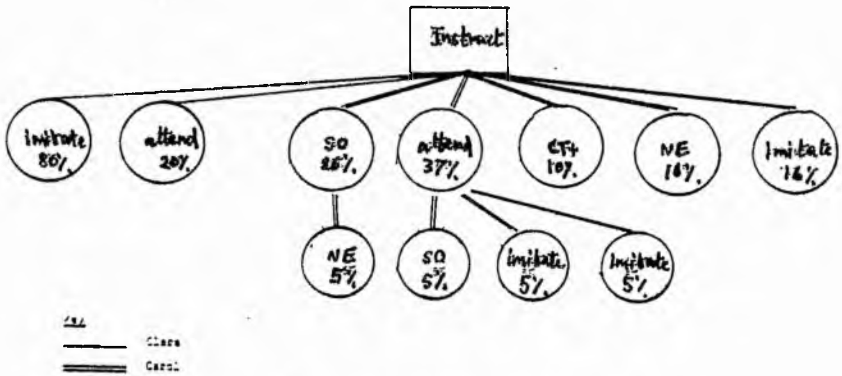


Figure 7.15 Teaching strategies and the responses to them by the 2 infants in group C

These results show that the predominant teaching strategies were not the most successful ones, and that the two infants were different in their responsivity to the same strategies. Thus, Clare's most imitations occurred with 'instructing', while Carol 'imitated' in response to all strategies except 'model + idealise' and 'show'. Both infants 'attended' to their mothers' 'modelling', 'modelling + idealising' and 'showing'. There was little or no 'attention' to 'instruct' and 'simplify'. On the whole, Carol was more attentive than Clare, although the correlational analysis showed that Clare's attention tended to increase in frequency to match the frequency of her mother's teaching, more than Carol.

The theme of 'demonstrating/teaching', like that of 'reveal object's property' showed no marked differences in its pattern between the two infants. Like 'reveal' it seemed to be more supportive to Clare's development since it achieved its immediate goals more often.

7.5.5 Excerpts from Interactions

(i) Clare and her mother ($1\frac{1}{2}$ minutes)

At this visit Clare was 12 months and 5 days old.

The excerpt is taken from the start of the session. Clare is looking at the experimenter and muttering incomprehensible words. Her mother is looking at her and smiling. Clare picks up a beaker and looks at it closely. She then puts it down and picks up the remaining set of beakers which were all nested together. She then starts to dismantle the nest one by one. All the while her mother is watching her silently. When she gets to the end of the set, Clare holds the last beaker and lets it hang on her index finger. She is pleased with her action for she laughs. She then gives it to her mother. M takes the beaker and holds it passively in her hand. Clare looks at the beaker on her mother's hand

and M hands it back to her. Clare takes the beaker and immediately puts it down on the floor. She then swipes away all the beakers with both hands and starts to fret. M watches all this quietly. Clare then rushes to her mother and buries her face in her mother's bosom. M responds to this by kissing Clare gently on the forehead, and while holding Clare close to her, she says, "let us build a big tower with the beakers." Clare then lifts up her face and looks at the beakers scattered on the floor. M starts building a tower and Clare watches her closely. After the third round Clare picks up a beaker and places it on top of the tower which her mother was building. The beaker topples off, and her mother picks it up, placing it back on top of the tower. Clare then dismantles the tower by gently removing the top beaker. In response to that, her mother utters a loud exclamation of appreciation. Clare then inspects the beaker, turning it round in her hands, while M watches her. Clare puts the beaker back on the tower, and her mother responds by saying, "well done!" Clare builds up the tower by adding another beaker and again her mother praises her. M then brings another beaker closer to Clare but Clare is looking at the tower she and her mother had built. M then builds up the tower with one more beaker. She picks the correct match for the next move and hands it to Clare. Clare takes it and puts it on top of the tower. M picks the next piece and offers it to Clare, but Clare had already picked up another piece. She puts it on top of the tower but it does not stay there, being too big. M then gives her the correct match and taps the top of the tower saying to Clare, "put it here." This time Clare does as she was told and her mother praises her.

(ii) Clare and her father ($1\frac{1}{2}$ minutes)

On this visit Clare was 13 months old.

The account begins with Clare holding a beaker and inspecting it manually and visually. The father is talking to the experimenter. Clare looks at her father briefly and then she flings the beaker away, while the father is still talking to the experimenter. Clare then looks at the experimenter and smiles, and her father looks at her. After that, Clare gazes absently into space. The father responds to this by calling her by her name and asking her to take the remaining beakers out of the box. Clare then looks at the box, as her father displays it. He then taps the box gently and Clare looks at it. Clare looks around the room and the father resumes talking to the experimenter. Clare then gets up and walks away from the toys. Her father calls her and tells her he is going to build a tower with the beakers. He then opens the box and tips it so that the beakers fall out. Clare watches him. The father then begins building a tower and Clare looks at the tower. After the third round Clare dismantles the tower by removing one piece. The father attempts to place another beaker on the tower but Clare interrupts him and places the one she had already removed. The father responds by an enthusiastic, "very good." He then taps the beaker that is the appropriate match for the next move. Clare looks at it but picks up a different one which is too big. She then places it on the tower so that it completely covers the top beaker. The father, who has been watching Clare's moves, uncovers the beaker and substitutes it with the correct match, while Clare watches him. She again dismantles the tower by removing the beaker her father had just placed, and she holds the beaker in her hand and inspects it. Then she uses it to completely cover a smaller beaker that was lying on the floor. Her father appreciates this with a laugh. Clare then puts the beaker back on top of the tower and picks up another one, adding it to the structure. Her father watches her quietly. After that, she vocalises something and, simultaneously, her father begins to talk to the experimenter. Clare then turns to the experimenter and smiles. She then gets up and attempts to move away. Her father calls her by name and asks her not to leave, but Clare had already made her way to the high-chair. The father then turns to the experimenter and comments on his daughter's 'single-mindedness'.

(iii) Carol and her mother ($1\frac{1}{2}$ minutes)

On this visit Carol was 12 months and 3 weeks old.

The mother is looking at Carol while she is offering a toy to the experimenter. There are at least 5 toys lying around. M picks up one of them (a miniature telephone), operates the dial and then offers the receiver to Carol. Carol takes it, places it against her ear and vocalises, while her mother watches her. Carol sustains this activity for 4 seconds. While Carol is engaged in "talking on the telephone" the mother starts building a tower. Carol removes the receiver away from her ear and begins pulling the wires of the telephone; meanwhile the mother goes on building the tower. Carol then resumes her theme of talking on the telephone and the mother goes on building the tower. Carol then puts the receiver in her mouth and starts sucking it. At the same time the mother stopped building the tower and she starts stacking rings on a plastic pole. Carol ceases sucking the receiver and offers it to the observer. Her mother looks at her and Carol begins scraping the receiver on the floor. Her mother then calls her name, followed by the imperative, "look." She then squeezes a rubber hammer that emits sound (the hammer also functions as a rattle being filled with grains of sand). Carol looks at the hammer as her mother activates it. M then places the hammer on the floor and picks up a drum-stick and hits the drum with the stick. Meanwhile, Carol had picked up the hammer and is shaking it vigorously. M ceases her activity and watches Carol as she first shakes the hammer and then inspects it visually. M then displays the drum to Carol and asks her to bang on it with the hammer. Carol looks at the drum and then goes on shaking the hammer. She then gives it to her mother who hits the drum with it and then gives it back to Carol. Carol takes it and shakes it, while her mother watches her. M then pushes the drum nearer to Carol and tells her to hit the drum. Carol obeys by hitting the drum once and then she resumes shaking it. Meanwhile the mother starts building another tower.

Comments

From the two excerpts of Clare it can be seen that her interaction with her mother was very similar in content to her interaction with her father. The main episode in both accounts is 'building a tower jointly with a parent'. In both instances the activity is introduced by the parents when they announce their "intentions" following from the infant's 'leaving the field of play'. In both cases the parent performs the active role ('reveal object's property'), while the infant is an onlooker. After a while, the infant joins in, and contributes to constructing the tower. From then on, the partners exchange roles, and parental support takes the form of 'participate from background', and, when appropriate, 'assist' (either by 'correcting' the infant or 'praising' her) and 'teaching' (by 'simplify' and 'instruct'). Thus both parents encouraged the development of socio-technical skills but without imposing on the infant. They 'revealed the outcome' of the activity to stimulate the infant but left it up to her to respond. Initially, they employed the least directive form of 'modify' ('reveal object's property') and only later they introduced more directive support ('teaching'). Such forms of support were probably more effective with this particular infant because she was, generally, motivated and eager to learn; for example, without being invited, she initiated cooperative construction of the tower after watching her parents perform the activity.

The excerpt from Carol's interaction with her mother also involved building a tower. However, here only the mother was performing the activity on her own, and throughout the account there is no evidence that she was performing it for the benefit of her infant (e.g. she did not initiate it by 'recruiting', nor did she time her activity when the infant was likely to be receptive). Furthermore, the activity was introduced when the infant was already engaged in an advanced 'solitary' activity ('fulfilling social function' of the telephone). Apart from that, the mother introduced four different themes, all by 'revealing the property of object'. The first theme involved a miniature telephone and was introduced through 'teaching' by 'simplifying', to which the infant responded positively. The second theme was that of stacking plastic rings onto a pole. This was abruptly introduced by the mother, for she suddenly stopped building the tower and moved to the rings but without drawing her infant's attention to the shift in themes. Thus, like the other activities, stacking the rings ran in parallel with the infant's low-level 'solitary' play (mouthing the telephone) which gave way to 'negative' behaviour (substituting interpersonal play with interaction with the experimenter). The third activity, operating a plastic hammer, was preceded by 'recruiting' but at a point when the infant was busy performing a 'differentiated' action on the telephone (scraping). Although the infant had 'attended' to her mother's activity, when given the toy she did not perform the same activity her mother had 'revealed'. Nonetheless, the episode could be regarded as successful since the infant was attentive.

Therefore, 'recruiting' the infant may have helped in gaining her co-operation. No sooner the mother had finished with the hammer than she introduced the final toys: the drum and stick. She first 'revealed' their function (while the infant was shaking the hammer), and then she 'taught' the infant how to operate it, first by 'instructing' and then by 'modelling'. The theme of building the tower was finally taken up again, at the point when the infant was reciprocating a different maternal action (hitting the drum with the stick).

This excerpt is very typical of Clare's interactions with her mother, and it points out the differences between the two infants and their experiences more graphically than the statistical analysis did. Thus, although both mothers engaged in 'reveal object's property' and 'teach', Carol's mother's support seemed to be "wasted" since it was not well synchronised with what the infant was doing at the time. One gets the impression that the mother was overstimulating her infant by rapid shifts of themes that involve different toys, and, consequently, Carol was not given enough chance to reciprocate her mother's activities. Thus, although this mother engaged in 'reveal' more frequently than Clare's mother, her activity was less supportive to her infant's cognitive development. Besides, unlike Clare's parents, Carol's mother seemed to 'enhance' when the infant was engaged in low-level activities (mouthing the telephone) and to 'modify' when the infant was engaged in advanced 'solitary' play (vocalising on the telephone). Also, in the case of Carol, directive support was introduced by less subtle means, and without considering the infant's interest or readiness. The outcome of such differences in tactics was that the activities of Carol and her mother lacked synchrony and co-operativeness whereas for Clare and her parents there was more communication between them that enabled them to perform cooperative tasks.

The excerpts also reveal considerable differences between the infants themselves. In terms of competence, Clare's activities were more advanced than Carol's in that she engaged in 'constructions' and 'innovations', even when the mother was only 'participating from background'. Carol, on the other hand, showed advanced social skills when playing with social toys, but her play consisted of larger proportion of low-level activities, than in Clare's case. Clare also showed the ability to extend familiar activities into novel ones; for example, after dismantling the nested beakers, she lets the final one "swing" on her finger, and having noticed the smaller beaker on the tower completely hidden by a bigger one which she had "accidentally" placed there, she then deliberately hides a smaller beaker that was lying on the floor by a bigger one. This could be regarded as evidence of her "accommodating" familiar actions to novel situations (Piaget, 1936). When with her father, Clare engaged in more 'negative' behaviour than when she was with her mother probably because of the frequency of her father's non-create-possibility episodes (i.e. talking to the experimenter). Even then, Clare integrated in by also focusing her attention on the experimenter!

In conclusion, the IPDS served their purpose in highlighting the differences (though only slight) in cognitive abilities between the two infants. Such differences may be partly attributed to differences in the experiences of the two infants. For example, Clare was more advanced in 'object-permanence' probably because much of her play with her mother involved hiding objects under covers. She was also more advanced on 'space' probably because she was more mobile, and, consequently, explored more; she also played with technical toys such as building bricks and posting boxes and slotting shapes. Carol, on the other hand, was more advanced on 'causality' probably because she often played with audio-visual and motion toys that were operated by winding mechanisms.

Although in the previous cases of groups A and B (and in the next cases of group D), interpersonal play helped the infants with poorer scores to improve the levels of their performance, in the present case parental support seemed to have an opposite effect. Thus, the slight cognitive differences depicted by the IPDS were magnified during interpersonal play, with regard to 'solitary' and 'contact' acts but not 'sequential' ones. Both the correlational and the sequential analyses gave evidence that 'modify' in general, and 'reveal object's property' in particular, showed less synchrony and cognitive compatibility with Carol's activities than with Clare's (e.g. positive correlation between 'reveal' and 'solitary' acts; low positive correlation between 'reveal' and 'sequential' acts and negative correlation between 'modify' and 'construct'). This lack of balance was brought about by the mother more than by the infant. For example, 44% of 'reveal' were not well-timed with the infants' ongoing play, which may have led to Carol reciprocating only 50% of 'revealing' episodes. This is not due to the infant's lack of interest, for Carol engaged in less 'negative' behaviour than Clare, and when the mother timed her 'modifying' activities in accordance with the infant's, Carol was more attentive than Clare. The excerpts revealed this point more clearly: If a 'modifying' activity was introduced when Carol was in a receptive state, she reciprocated it (e.g. vocalising on the telephone). However, most 'modifying' in that excerpt distracted Carol from her 'solitary' as well as 'sequential' activities. She was bombarded by a succession of 'reveal' and 'create discovery' without being given the chance to reciprocate them. Thus, the case of Clare and Carol offers another example of the adverse effects of parental support. Here, although there is still evidence that 'modify' was supportive to the infant with poorer scores on the IPDS, and with less advanced 'solitary' activities (i.e. its function was probably compensatory), yet it was not enough to increase its rate, as Carol's mother did. For 'modify' to be effective, it must be well synchronised with the infant's ongoing activities.

7.6
Cases D1 (Diana) and D5 (Doreen) : Group D infants

7.6.1 Background Information

Diana was the youngest of three children. The eldest was a boy aged 12 years, and the second child was a girl, 10 years old. Diana was 15 months and 3 weeks on the first visit. All the family made a great fuss of Diana, and she responded with great affection. On one session her sister played with her which was part of their daily routine. Diana enjoyed the sessions and both she and her mother were quite friendly to the experimenter. Her mother was 36 years old. She was always relaxed and cheerful. The father was sometimes present during the observations but he only watched from the background without any participation. The mother's themes of play were very diverse, and they included hiding objects for Diana to find, building towers jointly with the infant, and initiation of simple fantasy play with a doll and a pram. The average number of toys that were introduced during each visit was 10. They included dolls and a pram, toy-animals tied to strings, sea-side bucket and shovel, books and winding toys. Diana performed best on the IPDS in her group. She was also quite articulate; her speech consisted largely of "naming." She was also fond of using the phrase "I don't know."

Doreen was 15 months, 2 weeks old on the first visit. After the completion of the study her mother told the experimenter that Doreen was bone-retarded. By then, Doreen was 17 months and 2 weeks old but she was still not walking. She moved around by "shuffling" and she could stand with support. Her vocabulary was also poor and she relied on non-verbal means to make herself understood. She was shy and sensitive, but she related positively to the experimenter. She showed a great interest in the standard toy and concentrated hard on the task of play. Building towers was her favourite game. Her mother adopted mostly a reactive role and tended to encourage and praise Doreen a lot. Doreen had an older brother, aged 7 years who appeared during some of the sessions only briefly. Doreen's mother was 33 years old. The father was never present during the visits. During the observations Doreen and her mother played only with the standard toy that was provided by the experimenter. The mother seemed quite relaxed during the filming. Doreen's scores on the IPDS were very poor and, in fact, her level was like that of the infants in group B.

7.6.2 Quantitative differences between the infants

(i) Scores on the IPDS

From Figure 7.16 it can be seen that the two infants' performance was very different on most of the scales. The t-test showed that the differences were significant at 0.01 level ($t(5) = 3.91$). The two infants were very similar on 'causality' and very different on 'space' and 'object-permanence'. Thus, as in the previous cases of group C 'causality' did not differentiate the two infants. Diana achieved perfect success on 'schemes with single-objects' and near-perfect success on 'schemes with social-objects'.

On individual items of the scales, noticeable differences were seen in the scale measuring 'schemes with social-objects'. Diana's schemes included 'differentiated acts', 'showing', 'fulfilling the social function' of toys and 'accommodating' (feeding the doll with the spoon). For Doreen, the predominant responses were 'showing' and 'simple accommodation'

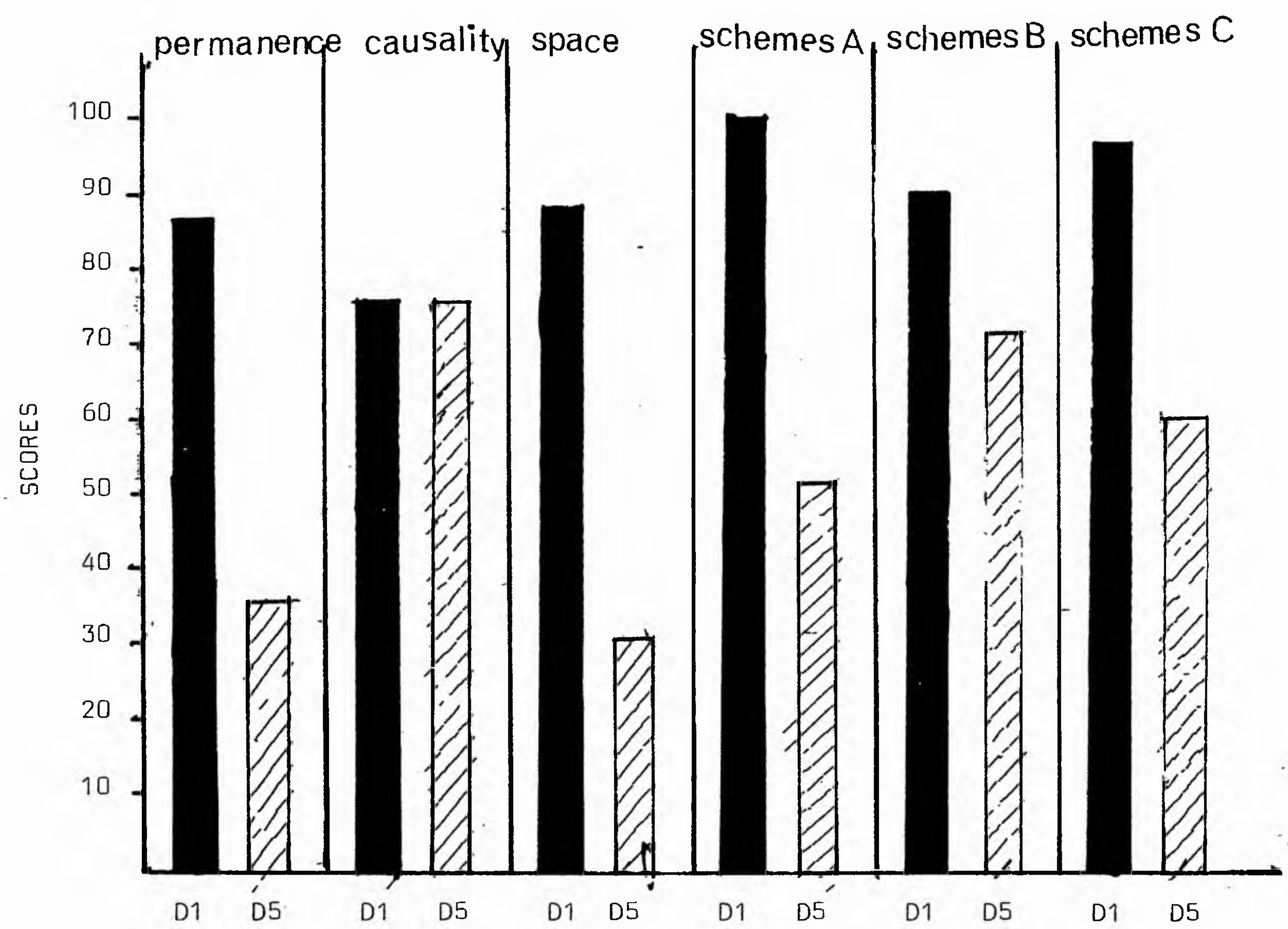


Figure 7.16 Scores on the IPDS of the two infants in group D

(poking the ball with the spoon). On two occasions, the responses were 'naming' (book and ball). Thus, Diana seemed more advanced in learning the conventional use of social objects probably because her interactions involved fantasy play.

Like groups A and B, the scales highlighted the differences in these two infants' cognitive abilities. It remains to be seen whether the infants' were also different in their spontaneous playing activities with their mothers.

(ii) The infants' major activities

From Figure 7.17 it can be seen that Diana had slightly more 'solitary' acts than Doreen. The t-test showed that this difference was not significant. Doreen had more 'contact' and 'negative' acts than Diana, and the difference in 'contact' acts was significant ($t(4) = p < 0.05$). In 'sequential' acts the two infants were very similar. Thus, despite the marked differences between the infants on the IPDS, in their spontaneous play they were quite alike.

When we consider the cognitive level of the infants' spontaneous activities, we find that the similarities are still noticeable. Thus, from Figure 7.17 it can be seen that for both infants, about 50% of their 'solitary' play consisted of high-level activities, and, in fact, the proportion of low-level ones was slightly less for Doreen. Similarly, Doreen 'constructed' slightly more than Diana.

With regard to 'object-contacts', Doreen performed slightly more 'proximal-contacts' and less 'distal-contacts', probably because she was less mobile than Diana. Diana also showed some advancement in that she engaged in less passive looking.

Similarities between the two infants are also seen with respect to the sub-categories of 'sequential' acts. Both infants 'attended' to an

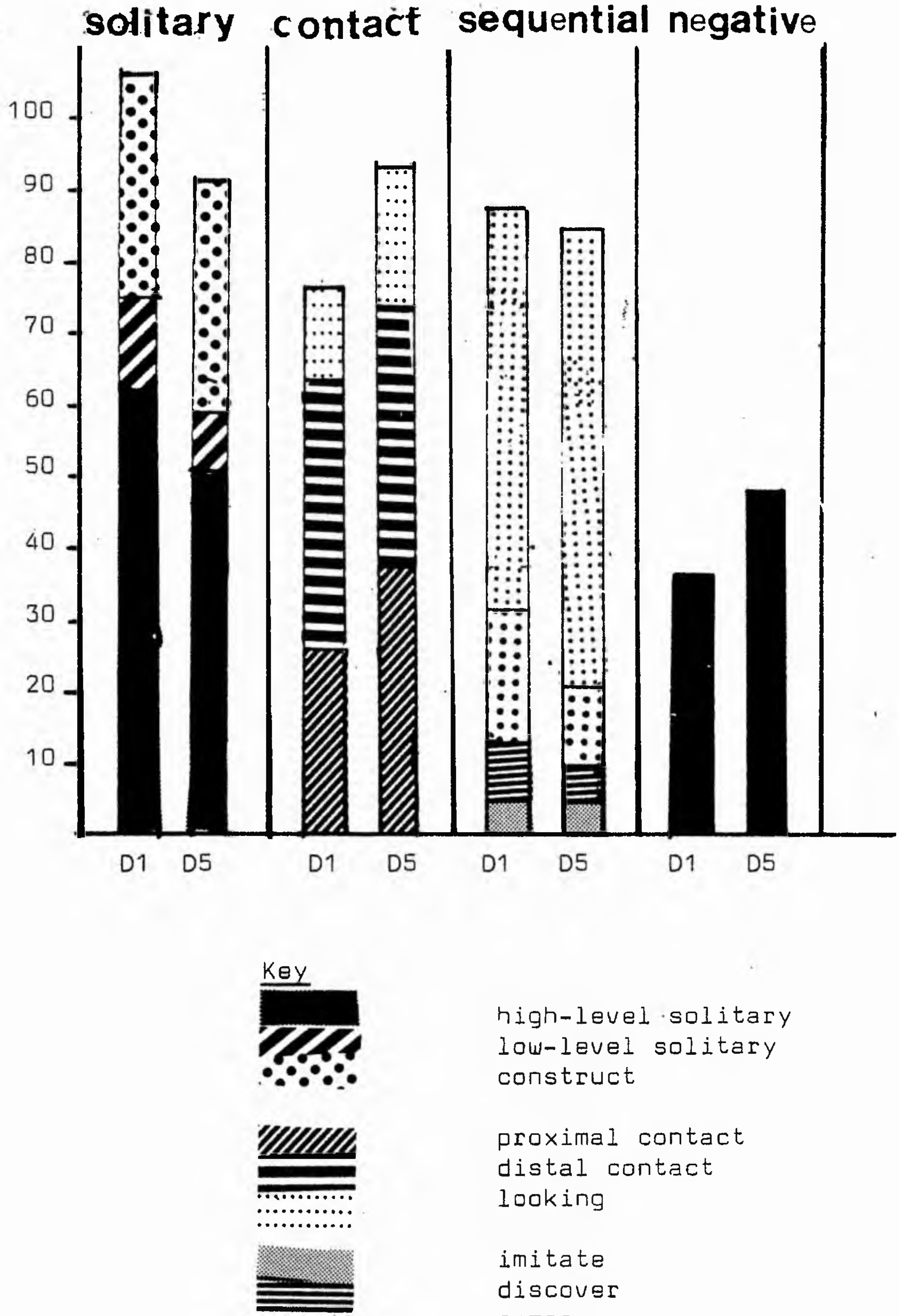


Figure 7.17 Frequency of the activities of the 2 infants in group D

equal extent (with the majority of their 'sequential' acts consisting of that form). Their episodes of 'imitation' were also similar in frequency and so were their 'games'. Diana's 'discoveries' were slightly more than Doreen's and this could be attributed to three reasons: first, the types of games Diana played with her mother always involved hiding objects; second, Diana was more advanced on the 'object-permanence' scale; third, she played with toys that encouraged discovering responses (e.g. toy-animals tied to strings that encouraged discovering about 'means and end').

The finding that the two infants were different in their cognitive competence as measured by the Piagetian scales, but similar in their cognitive abilities that underly their spontaneous play, leads to the question: "what is the reason behind these seemingly contradictory results?" Three reasons can be offered to answer this question:

1. The IPDS measure aspects of intelligence that are different from those included in the categories of interpersonal play. Accordingly, the infants are different but only with respect to those abilities which the scales measure.
2. The scales were biased against Doreen. Her performance in them did not represent her true competence probably because she was inhibited by the "strangeness" of the testing situation.
3. The scales depict true differences in cognitive competence but adequate maternal support had enabled Doreen to overcome her lack of competence during interpersonal play.

Of these three possible answers, only the third one can be verified through analysis of the available data relating to the mothers' activities and the relationships between mother and infant behaviour.

(iii) Maternal activities

A look at Figures 7.18 and 7.19 shows that both mothers were very similar in the frequencies of their various activities. Doreen's mother 'enhanced' and 'provided stable base' slightly more, while Diana's mother 'modified' more, and this was reflected in 'reveal object's property' and 'create discovery environment'. Thus, on the whole, the experiences of Diana and Doreen were very similar, although more 'enhancing' tended to be associated with poor performance on the IPDS and vice versa. This is contrary to the pattern that was observed with the previous cases.

From these findings it seems that Doreen's mother did not perceive her infant's condition as one that requires forms of support (e.g. 'modify' as in Adrian's case). This is probably because Doreen was competent enough during her spontaneous activities. Thus, the results so far seem to indicate that the IPDS have probably exaggerated the cognitive differences between the two infants, whereas in their daily experiences the infants were very similar.

7.6.3 Relationships between mother and infant behaviour

(i) Interpersonal synchrony

Table 7.48 shows that 'enhance' and 'participate' were positively related to Diana's 'solitary' acts and negatively to Doreen's, while 'modify' showed the expected positive correlation with 'sequential' acts for Diana, and, to a lesser extent, for Doreen. The correlations between 'modify' and 'solitary' acts were negative for both infants, but more so for Diana. 'Enhance' and 'participate' showed a high, negative correlation with Diana's 'sequential' acts, but a high and positive correlation with Doreen's 'sequential' acts. These results indicate that the complementary activities of Diana and her mother were in proportion to one another; for

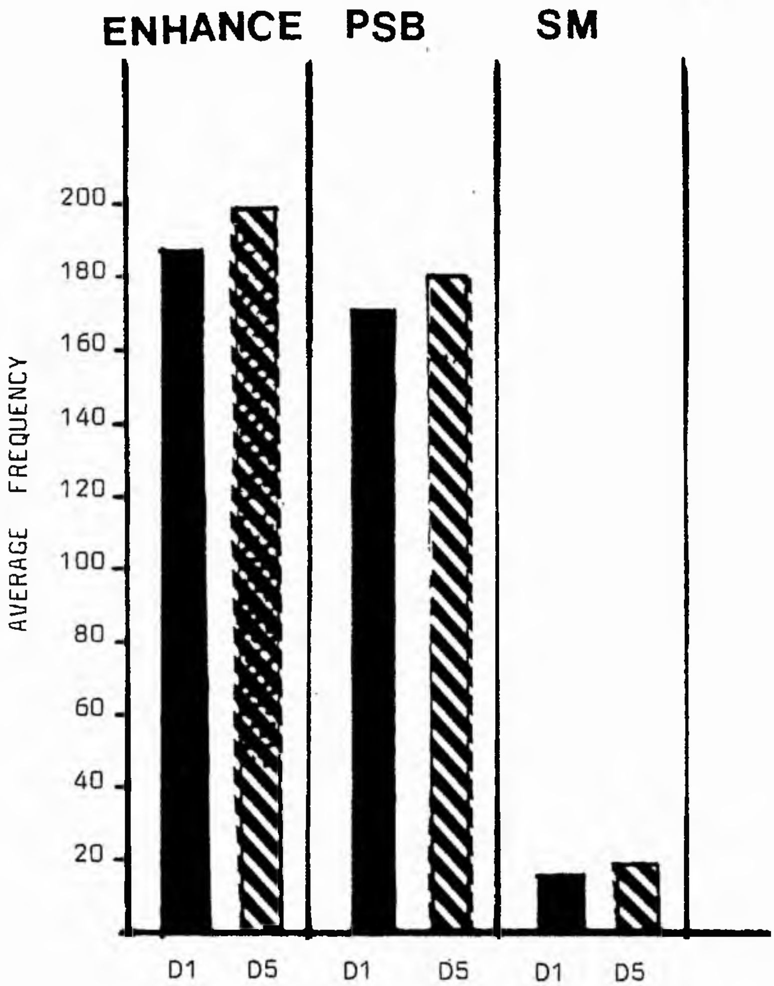


Figure 7.18 Frequency of 'enhance' and its immediate sub-categories for the 2 infants in group D

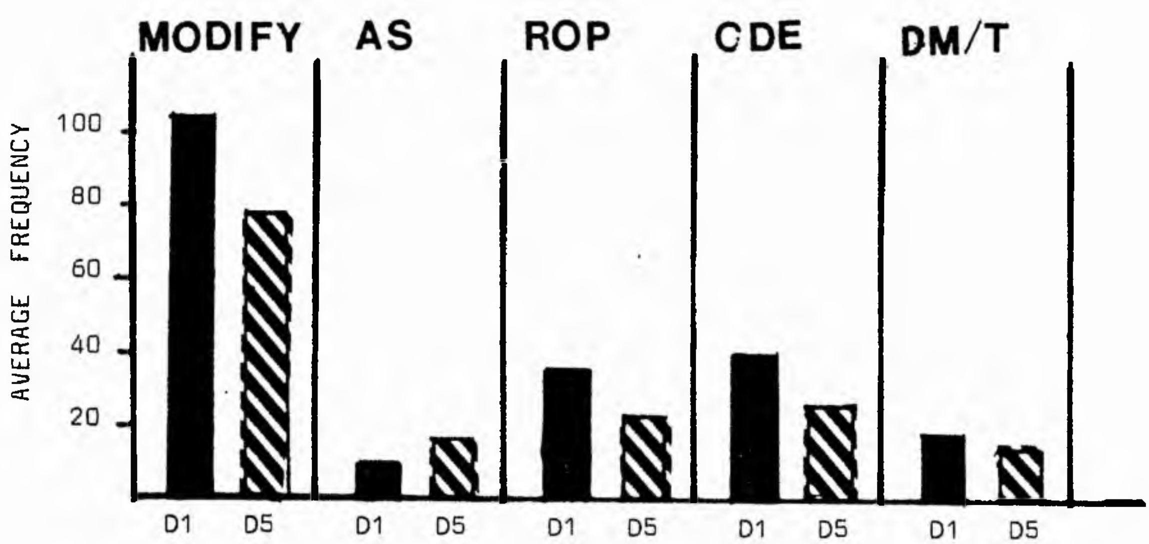


Figure 7.19 Frequency of 'modify' and its immediate sub-categories for the 2 infants in group D

example, when Diana increased her 'solitary' acts the mother also increased 'participate from background', and when Diana increased her 'sequential' acts the mother decreased her 'enhance' and increased her 'modify'. This was not the case for Doreen and her mother. They seemed to synchronise their activities only with regard to 'modify' and 'sequential' acts.

'Participate from background' seemed to be more related to Diana's 'contact' acts than Doreen's. In other words, Diana's mother probably responded to more of her infant's 'contact' acts by 'participate'. The positive correlation between 'participate' and Doreen's 'negative' acts indicate that her mother may have responded to 'negative' acts by 'participate'. These findings also indicate that there was more synchrony between Diana and her mother than between Doreen and her mother.

Table 7.48 also reveals that in both cases there was a low, positive correlation between 'eliminate undesirable behaviour' and 'negative' acts; the amount of correlation being slightly bigger for Diana. Thus, there was a tendency for the two mothers to vary the rate of 'eliminating' in accordance with similar variations in their infants' 'negative' acts.

In both cases, 'support manipulation' was negatively related to 'contact' acts which indicates that, probably, both mothers increased 'support' when the infants 'contacted' objects least in order to encourage them to do so more. When the infants' 'contacts' were most frequent, 'support manipulation' was not so necessary and so its frequency may have dropped.

The correlations between 'modify' and 'attend' were positive for both infants, although the amount of correlation was higher and significant for Diana ($r = 0.97$; $p < 0.01$) than for Doreen ($r = 0.37$). This indicates that Diana's attention matched, in rate, her mother's 'modifying' to a greater extent than Doreen.

Table 7.48 Correlations between the mother and infant categories that describe interpersonal synchrony

Maternal acts		Solitary	Contact	Sequential	Negative
Enhance	D1	0.75	-	-0.96**	-
interaction	D5	-0.84*	-	0.88*	-
Modify	D1	-0.78	-	0.93**	-
interaction	D5	-0.32	-	0.48	-
Participate	D1	0.74	0.87*	-0.98***	-0.02
	D5	-0.73	0.68	0.74	0.71
Eliminate	D1	-	-	-	0.59
	D5	-	-	-	0.45
Support	D1	-	-0.71	-	-
manipulation	D5	-	-0.69	-	-

* D1 = Diana; D5 = Doreen

The correlational analysis indicate that the mother and infant activities were more synchronised in the case of Diana and her mother than in the case of Doreen and her mother. Such differences could be largely attributed to the mothers; for Doreen the maternal reactive categories of 'enhance' and 'participate' correlated negatively with 'solitary' acts (when they should have correlated positively) and positively to 'negative' acts (when they should have been unrelated, or correlated negatively). Doreen, too, contributed less than Diana to interpersonal synchrony for her responsive categories of 'sequential' acts and 'attend' correlated poorly with 'modify'. However, these conclusions can also be assessed by the following sequential analysis.

From Table 7.49 it can be seen that more of Diana's 'solitary' and 'contact' acts were accompanied by her mother's 'participate' than in the case of Doreen. Doreen's mother tended to 'participate' simultaneously with 'negative' acts to a greater extent than Diana's mother. More of Doreen's 'sequential' acts were followed by 'participate' probably because Doreen engaged in more object-exchanges with her mother. Diana's mother also tended to respond to more of her infant's 'negative' behaviour by 'participate' than Doreen's mother. Overall, more of the infant's activities were in synchrony with the mother's 'participate' in the case of Doreen. Incidents that indicate lack of synchrony (e.g. responding to 'negative' acts by 'participate' and responding to 'participate' by 'negative' behaviour) were due to the mothers rather than the infants, with Diana's mother being responsible for more such incidents than Doreen's.

Table 7.49 Percentages of infants' activities that are associated with the mothers' 'participate from background'

Infant acts		⟵ p ⟶	p ⟶	⟶ p
Solitary	D1	78	0	7
	D5	64	0	13
Contact	D1	53	1	4
	D5	52	0	0
Sequential	D1	6	1	9
	D5	7	0	27
Negative	D1	32	47	54
	D5	44	41	34

Table 7.50 shows that Doreen responded more than Diana to 'support manipulation' by 'contact' acts, while Diana responded more by 'sequential'

acts. Overall, Diana reciprocated 61% of her mother's 'support', compared to 55% for Doreen. However, Doreen's activities were in synchrony with 84% of her mother's 'support', while Diana's activities were in synchrony with 77% of her mother's 'support'. Thus, like the correlational analysis, the sequential data reveal little differences between the interactions of the two infants in terms of synchrony between 'support manipulation' and the infants' major activities. Here, slightly less synchrony was achieved between Diana and her mother. This is because Diana followed 7% of the mother's 'support' with her own, independent 'solitary' activities. Thus, the small difference in synchrony can be directly attributed to the differences in the infants' responses and not to differences in the mothers' timing of their 'support'.

Table 7.50 Percentages of 'support manipulation' associated with the infants' activities

Support manipulation	← SM →				SM →				→ SM			
	SO	CT	SQ	NE	SO	CT	SQ	NE	SO	CT	SQ	NE
Diana D1	8	8	0	0	7	38	23	8	0	0	8	0
Doreen D5	8	4	0	8	0	42	13	8	4	4	4	5

Concerning the mothers' responses to 'negative' acts, as Table 7.51 shows, only a small proportion of this behaviour was responded to by 'eliminate', but Doreen's mother 'eliminated' a larger proportion of her infant's 'negative' acts than Diana's. Diana's mother responded more by 'modify' and 'support manipulation'. Differences in maternal responses could be attributed to differences in the personalities of the two infants: the less outgoing infant (Doreen) needed a more specific and direct form of dealing with 'negative' behaviour than Diana who was more independent and interested in play. However, Doreen's mother "ignored" more of her infant's 'negative' acts than Diana's mother, probably because Doreen engaged in more 'negative' activities. Overall, Diana's mother dealt with 47% of her infant's 'negative' behaviour, while Doreen's mother dealt with only 39%. Thus, Diana's mother probably contributed more to the harmony of interpersonal play than Doreen's mother. This is in line with the correlational analysis which showed that 'eliminate' correlated better with Diana's 'negative' acts than with Doreen's.

Table 7.51 Percentages of infants' 'negative' acts responded to by different maternal acts

Maternal response	D1 (Diana)	D5 (Doreen)
Eliminate	7	26
Modify	27	10
Support manipulation	13	3
Participate	47	41
No response	6	19

Both infants attended to less than 50% of their mothers' 'modify' (Table 7.52), with Doreen being more attentive than Diana. Thus, although the correlational analysis showed that the rate of Diana's 'attention' was in proportion to her mother's 'modifying', yet she actually attended less than Doreen. Doreen attended mostly to her mother's 'reveal' and least to 'create discovery'. For Diana, most attention was in response to 'reveal' and 'demonstrate/teach'. Thus, in both cases, 'attention' was less related to 'create discovery environment'.

Table 7.52 Percentages of 'modify' sub-categories that were attended to by the two infants

Modify sub-categories	Attend	
	D1 (Diana)	D5 (Doreen)
Reveal object's property →	34	61
Create discovery →	23	20
Demonstrate/teach →	33	45
Mean	30	42

The correlational analysis as well as the sequential one, reveals that the mother-infant interactions were more synchronised in the case of Diana, when the mother was 'participating' and the infant was engaged in spontaneous play. For Doreen, increases in 'participate' were associated with increases in 'negative' behaviour and the two activities tended to occur simultaneously. However, Diana's mother adopted a passive response towards more of her infant's 'negative' acts than Doreen's, thereby contributing less to the harmony of their dialogues. When the mothers were 'supporting manipulation' and 'modifying', Doreen's activities were more complementary to the mother's forms of support than Diana's. Thus, overall, there seems to be more synchrony between Doreen and her mother than Diana and her mother, with Diana reciprocating less of her mother's activities than Doreen.

(ii) Cognitive compatibility

From Table 7.53 it can be seen that 'enhance' and 'participate' were related positively to all types of Diana's 'solitary' acts, and 'negatively' to all types of Doreen's 'solitary' play. These results indicate that 'enhance' and 'participate' were adopted by the mothers irrespective of the cognitive level of the infants' solo play and of its frequency. It seems then that for these two infants passive maternal support was neutral to cognitive development. Similarly, the negative correlations between 'modify' and the three types of 'solitary' acts indicate that directive support was unrelated to solo play.

Table 7.53 Correlations between the mothers' forms of support and the infants' 'solitary' activities

Pairs of correlations	D1 (Diana)	D5 (Doreen)
Enhance/high-level solitary	0.73	-0.73
/low-level solitary	0.77	-0.73
/construct	0.45	-0.53
Modify/high-level solitary	-0.47	-0.33
/low-level solitary	-0.55	-0.11
/construct	-0.14	-0.28
Participate/high-level solitary	0.71	-0.52
/low-level solitary	0.80*	-0.81*
/construct	0.46	-0.26

Concerning the sub-categories of 'enhance', as Table 7.54 shows, 'provide stable base' was positively related to Diana's 'solitary' and 'contact' acts, negatively related to her 'sequential' acts and unrelated to her 'negative' acts. Thus, 'provide stable base' was compatible to Diana's activities in that it was responsive to her spontaneous play ('solitary' and 'contact') and to her 'negative' behaviour. For Doreen, 'provide stable base' was less compatible for it correlated negatively with her 'solitary' play and positively with 'sequential' and 'negative' acts. This leads to the conclusion that 'provide stable base' was non-supportive to Doreen probably because she was not so motivated or competent as Diana in pursuing her own 'solitary' themes with minimal adult intervention. When her mother remained passive, Doreen was probabaly engaged in minimal contact with objects as evidenced from the low, positive correlation with 'contact' acts, and she was more likely to abandon play altogether.

'Support manipulation' was compatible with both infant's 'sequential' acts, especially Diana's. However, for Doreen, increases in 'support manipulation' were associated with increases in 'negative' acts. From the sequential analysis it was revealed that 13% of 'support manipulation' represented Doreen's mother's attempts to deal with 'negative' acts, while 5% of 'support' was responded to by 'negative' behaviour. Thus, the positive correlation between 'support' and 'negative' acts was partly brought about by the mother's attempts to deal with 'negative' behaviour through 'support manipulation'. The negative correlation between 'support' and 'solitary' and 'sequential' acts could be due to the mothers' efforts to initiate contact between infant and toy whenever the infants' 'contacts' and 'solitary' manipulation was infrequent.

'Assist' was more compatible with Doreen's activities than with Diana's. Thus, more 'assistance' was associated with more 'solitary' play, more 'contact' acts and less 'negative' behaviour. However, 'assist' was negatively related to Doreen's 'sequential' acts but positively related to Diana's. These findings seem to indicate that Doreen not only needed more 'assistance' (Figure 7.17) but she also probably benefited more from that form of support especially during solo play. 'Assist' was relatively unrelated to Diana's activities except 'sequential' ones which may lead to the conclusion that Diana was more competent and, consequently, she needed less 'assistance' when playing on her own.

'Reveal object's property' correlated well with Doreen's 'sequential' acts, which indicates that the infant may have reciprocated this form of support. However, the positive correlation between 'reveal' and Doreen's 'negative' acts may also indicate that the infant responded negatively to this form of support. For Diana, 'reveal' correlated poorly with her play, but it was negatively related to her 'negative' acts.

'Create discovery environment' correlated better with Diana's 'sequential' acts than with Doreen's. Thus, 'reveal' was associated with the 'sequential' activities of the infant with poorer scores on the IPDS, while 'create discovery' was favourably related to the 'sequential' acts of the infant who scored better on the IPDS. As mentioned previously, this may be attributed to the level of complexity of 'reveal' and 'create', where 'create' requires more complex responses from the infant and, consequently, it is a form of parental support that is more suitable for more competent infants.

'Demonstrate/teach' correlated poorly with Diana's activities, although there was a low, positive correlation between it and 'sequential' acts. For Doreen, the pattern of correlation between this form of support and the infant's activities was very similar to 'reveal object's properties' which indicates that both maternal categories may have been very similar in terms of their supportive function.

The correlational analysis between the cognitively related categories indicates that Diana's cognitive development was less dependent on her mother's support than Doreen's. This is because the correlations between the mother's forms of support and Diana's activities were generally low. However, parental support seemed to influence the infant's 'sequential' acts more than her 'solitary' play. Thus, 'support manipulation', 'assist' and 'create discovery' were associated with increases in 'sequential' acts and 'assist', 'reveal' and 'demonstrate/teach' were associated with

Table 7.54 Correlations between the mothers' and infants' activities that imply cognitive compatibility

Maternal categories		Solitary	Contact	Sequential	Negative
Provide stable base	D1	0.72	0.67	-0.98***	0.00
	D5	-0.77	0.58	0.79	0.69
Support manipulation	D1	-0.61	-0.71	0.99***	-0.20
	D5	-0.59	-0.69	0.68	0.82*
Assist	D1	-0.06	-0.07	0.72	-0.59
	D5	0.75	0.62	-0.80	-0.76
Reveal object's property	D1	0.35	0.32	0.37	-0.78
	D5	-0.87*	0.32	0.92**	0.88*
Create discovery environment	D1	-0.98***	-0.91**	0.81*	0.48
	D5	-0.10	-0.17	0.29	0.64
Demonstrate/ teach	D1	-0.00	0.05	0.64	-0.56
	D5	-0.76	0.07	0.86*	0.96**

decreases in 'negative' behaviour. 'Enhance' and 'participate' were more related to the quantity of 'solitary' play rather than its cognitive qualities. In the case of Doreen, 'provide stable base' was compatible with her 'contact', 'sequential' and 'negative' acts, while 'support manipulation', 'reveal' and 'demonstrate/teach' seemed to have been adopted by the mother to encourage 'solitary' play and discourage 'negative' behaviour. All forms of maternal support, with the exception of 'create discovery' were associated with increases in Doreen's 'sequential' acts. These findings indicate that the two infants were different in their cognitive needs, and, consequently, they required different forms of support.

7.6.4 Themes of Interactions

(i) Dealing with 'negative' behaviour

The data on 'negative' behaviour, so far, revealed the following: Negative acts were the least frequent of the two infants' major activities; Doreen showed slightly more 'negative' behaviour than Diana. The correlations between 'eliminate' and 'negative' acts were positive but low for both infants. Doreen's mother responded to less of her infant's 'negative' acts by more directive forms of support, than Diana's mother did. However, for both mothers, the predominant response to 'negative' behaviour was 'participate from background'. For Diana, 'negative' acts correlated negatively to all forms of maternal support (represented on level 3 of the Hierarchy), except 'create discovery' and 'provide stable base'. For Doreen it was the opposite: 'negative' acts showed high, positive correlations with level-3-maternal categories except 'assist'.

Concerning the antecedents of 'negative' behaviour, as Table 7.55 shows, the majority of both infants' 'negative' acts were preceded by 'enhance' followed by 'modify' for Diana, and 'non-create-possibility' for Doreen. This indicates that with minimal adult intervention the infants did not sustain solo play without getting bored, fatigued or unable to expand their abilities. Doreen seemed to need more directive forms of support to decrease the likelihood of 'negative' behaviour. Thus, 23% of Doreen's 'negative' acts were probably brought about by her mother's lack of involvement, and only 6% was preceded by 'modify'. These results emphasise the differences between the two infants, showing Doreen's greater need for attention and directive support. This may have stemmed from cognitive and/or personality differences between the two infants.

Concerning the effects of the mothers' responses to 'negative'behaviour, 'eliminate' achieved 100% success with Diana, whereas for Doreen,

Table 7.55 Maternal categories that preceded the infants 'negative' acts (as percentages of 'negative' acts)

Antecedents	D1 (Diana)	D5 (Doreen)
Non CP	0	23
Enhance	61	55
Eliminate	7	16
Modify	32	6

'modify' was more successful than 'eliminate' (Table 7.56). The least effective maternal reaction was 'no response' especially for Doreen. Overall, Diana was more likely to resume play on her own accord than Doreen. These results also highlight the differences between the infants in that Doreen was more likely to terminate 'negative' behaviour in response to directive maternal intervention, rather than passive responding.

Table 7.56 Responses to 'negative' acts and their consequences (as percentages of 'negative' acts)

Maternal responses	Termination		Continuation		Resume play	
	D1	D5	D1	D5	D1	D5
Eliminate	100	38	0	50	0	12
Modify/support	50	50	17	25	33	0
Participate	-	-	28	45	72	55
No response	-	-	50	100	50	0

(ii) Revealing the properties of objects

The data on the theme of 'reveal object's property' presented so far, showed that although Diana's mother 'revealed' slightly more than Doreen's, yet 'reveal object's property' may have been more supportive to Doreen's cognitive development than to Diana's. This is because 'reveal' was probably more reciprocated by Doreen (e.g. positive correlation with her 'sequential' acts) and it was probably compensatory for reduced 'solitary' play (negative correlation with 'solitary' acts). Also, it may have been adopted by Doreen's mother as one way of dealing with 'negative' behaviour (positive correlation with 'negative' acts).

If we consider 'fulfil function' on its own, we find that this form of support was favourably related to Diana's 'solitary' constructions (Table 7.57). This may indicate Diana's ability to advance her 'solitary' play through extrapolating from 'reveal' to 'solitary' activities. For Doreen the correlations between 'reveal' and 'construct' and 'discover' were negative, which may be attributed to the mother's attempts to advance solitary and sequential constructions through more 'revealing'. For Doreen, 'reveal' was also associated with passive looking which adds support to the suggestion that this form of support was to compensate for Doreen's incapacities.

Table 7.57 <u>Correlations between 'fulfil' and the infants' acts</u>

Mother's act		Look	Attend	Construct	Discover
Fulfil	D1	-0.76	0.05	0.79	-0.02
	D5	0.63	-0.02	-0.55	-0.79

Tables 7.58 and 7.59 show at what points in the interactions did the mothers 'reveal object's properties'. For Diana, the majority of 'reveal' was preceded by previous 'revealing' episodes; 29% of 'reveal' were also preceded by 'provide stable base'. For Doreen, 'provide stable base' preceded 42% of 'reveal' and 28% was preceded by previous 'reveal-

ing'. Thus both mothers seemed to be similar in the timing of 'reveal' with respect to their own behaviour. For both infants, and especially for Diana, 'revealing' was sustained over extended periods of time. Doreen's mother resorted to more 'recruiting' than Diana's mother. The results also indicate that Doreen's mother introduced directive support following from passive support ('provide stable base') probably because, for this infant, prolonged passive support would be less stimulating.

Table 7.58 Maternal activities that preceded 'reveal' (as percentages of 'reveal'

Mother categories	D1 (Diana)	D5 (Doreen)
Non CP	1	0
Provide stable base	29	42
Support manipulation	9	13
Reveal object's property	56	28
Recruit	4	13
Modify	9	5

The mothers were similar in timing an equal proportion of their 'revealing' when the infants were already attending to the toy. The infants' attention was probably accompanying the mothers' previous 'revealing' episodes. However, as Table 7.59 shows, the two mothers were different in that Diana's mother "ill-timed" more of her 'revealing' than Doreen's mother. Thus, 29% of 'reveal' was preceded by Diana's high-level 'solitary' acts, compared with 11% for Doreen. Overall, 58% of 'reveal' was well timed with Diana's ongoing activities, and 49% were well timed with Doreen's activities. Thus, Diana's mother was slightly better than Doreen's mother in integrating her 'revealing' with the infant's appropriate activities.

Table 7.59 Infants' activities that 'preceded' 'reveal' (as percentages of 'reveal')

Infant categories	D1 (Diana)	D5 (Doreen)
Solitary (high-level)	29	11
Solitary (low-level)	19	7
Contact (with same object)	2	6
Contact acts	8	16
Sequential acts	5	24
Attend	28	20
Negative acts	9	16

In terms of consequences, as Table 7.60 shows, there were more complementary responses to 'reveal' from Doreen. Overall, 84% of reveal was complemented by Doreen, while Diana complemented only 50% of her mother's 'reveal'. Thus, Doreen attended more and engaged in more manipulative acts with the same object. She also engaged in less 'negative' acts, and ignored less of her mother's 'reveal' by pursuing her own independent 'solitary' or 'contact' acts. Both infants were similar in their 'discovering' and 'imitations' in response to 'reveal'. Hardly any 'revealing' activities were 'imitated' by the infants.

(iii) Demonstrating and Teaching

As mentioned earlier, (section 7.6.7), 'demonstrate/teach' was very similar to 'reveal object's property' in its relationship to Doreen's activities. It was probably compensatory for her infrequent solo play (negative correlation with 'solitary' acts), and also it was probably adopted to counteract her 'negative' behaviour (positive correlation with 'negative' acts). Doreen probably reciprocated her mother's 'demonstrating/teaching' more than Diana since the amount of positive

Table 7.60 Infants' responses to 'reveal' (as percentages of 'reveal')

Infant activities	D1 (Diana)	D5 (Doreen)
Solitary	34	10
Solitary (with same object)	4	8
Contact	10	2
Contact (with same object)	4	10
Sequential	7	8
Imitate	1	2
Attend	34	56
Negative	7	4

correlation between 'demonstrate/teach' and 'sequential' acts was greater for Doreen. 'Demonstrate/teach' probably "reduced" Diana's 'negative' acts, since the two activities were negatively related.

Further associations between the infants' activities and 'demonstrate/teach' are presented in Table 7.61. Both infants seemed to have 'attended' to their mothers' 'demonstrate/teach' to an equal extent, as implied from the similarities in the correlations. Further similarities between the infants are seen in 'imitation'. Unlike 'reveal', 'demonstrate/teach' seemed not to have influenced Diana's 'solitary' constructions, while for Doreen the negative correlation between 'demonstrate/teach' and 'construct' may represent the mother's efforts to advance Doreen's solitary play by increasing her 'constructions'. This form of support seemed to have benefited Diana in that more teaching was associated with less passive looking at toys.

Like 'reveal object's property', 'demonstrate/teach' was preceded by the mothers' 'provide stable base' and 'modify'. Diana's mother preceded 29% of 'teaching' by 'revealing' which indicates that 'reveal'

Table 7.61 Correlations between 'demonstrate/teach' and the infants' activities

Mother's act		Look	Attend	Construct	Imitate
Demonstrate/	D1	-0.94**	0.50	0.37	0.97***
teach	D5	0.39	0.56	-0.89*	0.91**

was extended into 'teaching'. For Doreen, a small proportion of 'demonstrate/teach' was preceded by 'recruiting' (Table 7.62a).

As Table 7.62b shows, the two mothers timed their 'teaching' differently in relation to the infants' activities. Thus, Diana's mother tended to 'teach' following from her infant's 'sequential' acts (probably in response to the mother's own 'modify' that preceded 'teaching'). Doreen's mother timed her 'teaching' when the infant was already showing interest in the toys, either by 'attending' to them, or by 'contacting' them. 81% of 'demonstrate/teach' were appropriately timed with Diana's activities, and 89% with Doreen's activities. Thus, both mothers well-timed their 'teaching' episodes to suit their infants' activities and increase the likelihood of their learning the skills the mothers were teaching them.

Table 7.63 shows that 'instruct' was the predominant strategy that was used by both mothers when 'teaching' their infants. Diana's mother used more 'instructing' than Doreen's. Doreen's mother also relied on 'modelling' and 'modelling + idealising'. She also used 'simplify', while Diana's mother did not use it. For both mothers the least used strategy was'showing'. These results point out the similarities between the two infants. However, the more competent infant on the IPDS received more 'instructing' while the less competent infant was also'taught' by

Table 7.62 (a) Maternal activities and (b) infants' activities that preceded 'demonstrate/teach' (as percentages of 'demonstrate/teach')

Maternal acts	Antecedents D1	Antecedents D5
Non CP	0	4
Recruit	0	12
Provide stable base	33	27
Support manipulation	10	15
Reveal property	29	15
Modify	28	35

Infant acts	Antecedents D1	Antecedents D5
Attend	10	35
High-level solitary	19	11
Low-level solitary	0	8
Contact (same object)	19	39
Sequential	33	0
Negative	19	7

'modelling' and 'modelling + idealising'.

Table 7.63 Types of 'teaching' strategies as a percentage of 'teach'

Teaching strategy	D1	D5
Model	19	19
Model + idealise	0	15
Simplify	0	8
Instruct	71	54
Show	10	8

Figure 7.20 shows that the predominant strategy of 'instruct' was the one mostly complemented by the two infants by appropriate responses. Thus, Diana obeyed 73% of her mother's 'instructions' and Doreen obeyed 71%. The 'modelling' and 'showing' strategies were more effective with Doreen than with Diana, although Diana was more attentive to 'showing' than Doreen. 'Model + idealise' and 'simplify' were not imitated by Doreen, although she

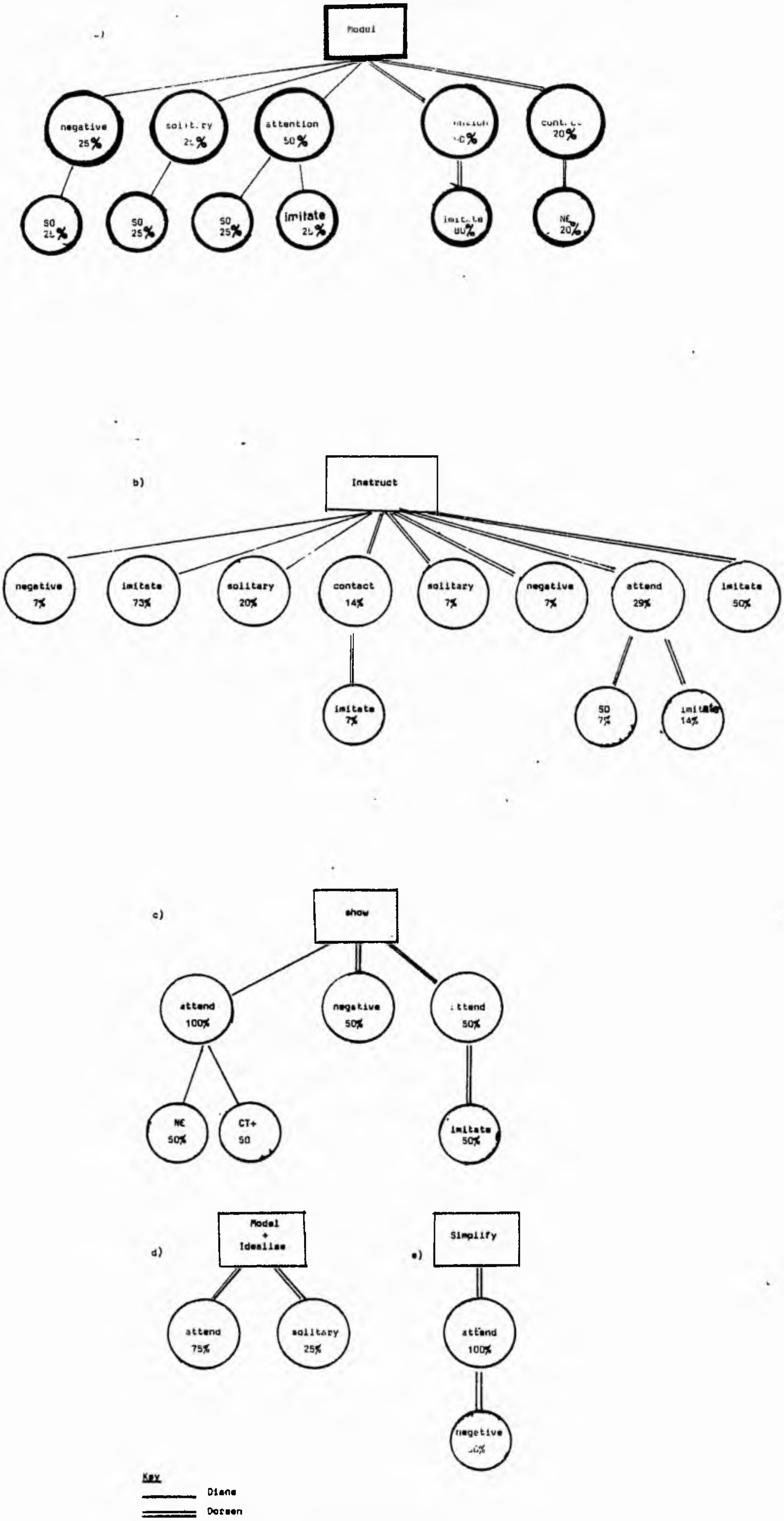


Figure 7.20 Teaching strategies and the responses of the 2 infants in group D

attended to them. These results show that Doreen complemented her mother's 'teaching' more than Diana and that in both cases only a small proportion of 'teaching' was responded to by 'negative' acts.

7.6.5 Excerpts from Interactions

(i) Diana and her mother ($1\frac{1}{2}$ minutes)

Diana was aged 16 months, 2 weeks at the time of this visit.

The account begins with Diana taking a polythene bag out of the video cassette case which she always liked to use as a toy during the experimenter's visits. Her mother is watching her. M then places a small piece of crumpled paper on top of a half-built tower and then covers it with the next piece in the tower. At the beginning of this activity Diana ceases her play and looks at her mother. When the mother finishes the hiding Diana screams "no, no, no!" M removes the beaker from the top of the tower to reveal the piece of paper. Diana sees the paper appear, she then looks up at her mother and the two engage in momentary eye-to-eye contact. This is terminated by Diana when she removes the beaker under which the piece of paper was hidden. M goes on building another tower with a different set of beakers. Diana looks inside the beaker and then drops it. Diana picks up the piece of paper that had fallen as she picked the beaker. She inspects it while her mother watches her. Diana's mother then says, "shall we build a tower?" Diana looks up at her and then goes on inspecting the paper. Her mother inverts a sea-side bucket, and then goes on building a tower using the bucket as a base. Diana drops the paper and watches her mother. When the tower is completed Diana knocks it over with her hand and laughs. M exclaims and laughs. Diana then turns to the experimenter, still laughing. Her mother tickles her with the beaker. M begins to rebuild the tower and Diana watches her. Half-way, Diana swipes off the tower, picks up the paper and engages in manual-visual exploration of it. Meanwhile, her mother covers one of the beakers completely with the bucket. Diana picks up the cassette case and is trying to put the paper inside it and close the case. Her mother is engaged in building a tower using the bucket as a base (with the beaker hidden underneath). M, having built the tower, watches Diana as she opens and closes the lid of the case. This goes on for 9 seconds. The mother then asks Diana, "where is the beaker?" Diana looks at her and her mother repeats the question, to which Diana replies, "I don't know" Her mother laughs loudly while Diana is attempting to put the paper inside the case and close it. M requests her to find the beaker but Diana continues with her activity.

(ii) <u>Doreen and her mother</u> (1½ minutes)

At the time of this visit, Doreen was 17 months old.

Doreen is watching her mother build a tower. After the second round her mother picks up the correct match and offers it to Doreen indicating with her other hand where the beaker should be placed (on the tower). Meanwhile, Doreen had got hold of another beaker and she places that on the tower, but being too big, it completely covers the smaller beaker underneath it. Doreen is pleased with the results, she uncovers the beaker, covers it again, and then uncovers it. M watches her quietly. Doreen then picks the correct match and attempts to build the tower but cannot place the beaker firmly. She then offers it to her mother and vocalises. M does not take the beaker; instead, she taps the top of the tower where the beaker should be placed. Doreen attempts the action while her mother holds the tower to prevent it from toppling. Doreen succeeds in placing the beaker firmly on top. She then attempts another round but uses an incorrect match. M points at the correct match and tells Doreen, "this is the one" but Doreen insists on using her own beaker and after placing it on the top it falls down. M laughs. Doreen fusses, picks it up and offers it to her mother. M points at the correct match and tells her, "use this one." Doreen looks at the correct match; her mother shows her where the beaker should go while handing her the correct match. Doreen takes it and builds the tower. M praises her for her achievement. She then points at the next matching beaker and at the top of the tower, saying "that one, here." Doreen picks up the match and builds up the tower. Again her mother praises her. The same sequence of activities is repeated for another three rounds, with the mother stabilising the tower as Doreen adds to it.

Comments

Like the previous two accounts, the main topic that runs through these excerpts is "building towers." In the case of Diana, building a tower is incorporated within another theme, hiding objects within the tower for Diana to find. The mother also engages in variation of the theme of building when she uses novel objects for structuring the tower (e.g. sea-side bucket). Thus, in the case of Diana and her mother, building towers involved finding hidden objects and a joint game of the mother building the tower and the infant knocking it down. In the case of Doreen and her mother, building towers took a more conventional form, for it started with the mother 'modelling' the activity and then inviting Doreen to re-enact it. However, during the process of constructing the tower, Doreen discovers that smaller beakers could be hidden under bigger ones, and she gets diverted into this new activity for a while. After the mother's initial 'teaching' Doreen adopts the active role of constructing the tower while the mother 'watches' and 'praises' her, and when necessary, 'assists' or 'instructs' her, or 'simplifies' the task when Doreen encounters a problem. Thus, although the theme of play was the same for the two infants, the mothers pursued it differently with Diana's mother taking a more active role, engaging in more diverse activities and focusing on the development of cognitive skills that pertain to social and technical competence (e.g. build tower/knock down tower), and that helps the infant's acquisition of the concept of object-permanence. Doreen's mother focused on cooperative play that enables the infant to acquire technical skills. She also encouraged autonomy by 'deferring' to the infant the solution of problems for which she requested help. Thus, in the case of Doreen and her mother, the interaction may be described as task-oriented while in the case of Diana and her mother, the interaction did not only focus on the achievement of joint tasks but also on promoting communication between mother and infant and the learning of social rules via objects (e.g. joint game of build tower/knock down tower).

In terms of tactics for introducing new topics, Diana's mother did not signal to the infant the nature of the task or its onset in 3 out of 4 cases. Thus, initially, the mother's activities ran in parallel to Diana's 'solitary' play. However, on each occasion, and at the exact moment of the completion of an act by the mother, the infant suddenly looked at what the mother had done and responded appropriately. Thus, both mother and infant regulated their turn-takings but there were no obvious cues for that, and which an observer could identify.

The excerpts also highlight some differences in the personalities and cognitive capacities of the two infants. In terms of personality, Diana seemed more assertive (she protested against her mother hiding the paper under the beaker) and more fun-loving and sociable (e.g. she enjoyed knocking down the tower, and communicated her pleasure to the experimenter).

Doreen, on the other hand, seemed to be more serious (she concentrated hard on the task of building the tower); she was more dependent (e.g. resorted to her mother for help quite often) and easily frustrated (e.g. she fussed when unable to fix the beaker onto the tower). In terms of competence, Diana seemed to be more competent than Doreen in expressing herself verbally and also in maintaining long bouts of solo play which involved fine-motor skills, coordination of objects sharing similar properties (e.g. putting the polythene bag in the case, which was extended to putting the crumpled paper into the case), and activities that promote the acquisition of concepts of space and object-permanence; she also needed less 'assistance' from her mother. Doreen's activities also involved sensory-motor coordinations and spatial representation of objects (e.g. building towers) as well as activities that pertained to the concept of object-permanence. However, Diana's activities were more diverse than Doreen's which probably gave her a wider scope of knowledge.

According to the IPDS, these two infants were very different in their sensorimotor capacities especially 'object-permanence' and 'space'. This may be partly due to the differences in the infants' styles of play. Thus, like Clare, Diana often played with hidden objects and moved around a lot, which may have helped her to score high on the scales that are related to such activities.

The cognitive differences between these infants almost disappeared when they were playing with their mothers. This may be attributed to the efficacy of parental support to the less competent infant. However, unlike the previous cases, the infant with the poorer scores did not receive more 'modifying'; in fact, there were no significant differences between the two mothers in terms of the frequency of their various forms of support. The real difference seems to lie in the mothers' choice of the forms of support that were most suitable to their infants' needs. For example, while 'support manipulation', 'reveal object's property' and 'demonstrate/teach' may have been compensatory to Doreen's infrequent 'solitary' play, they were associated with increases in 'sequential' responses and decreases in 'negative' acts. The sequential analysis showed that 'modify' was effective for Doreen because it was less likely to provoke 'negative' behaviour than the other forms of support, and more likely to terminate it when the mother deals with 'negative' acts by 'modifying interaction'. 'Modifying' activities, and especially 'reveal' and 'demonstrate/teach' also elicited more complementary responses from Doreen (e.g. 'contact' acts, 'attention' and 'imitation') and they were likely to be effective because they were initiated by the mother when Doreen was in a receptive state, and because the mother selected strategies of 'teaching' that were within her infant's abilities (e.g. 'model' as opposed to 'show' or 'instruct').

'Enhancing' was more compatible with Diana's activities because she was the more capable of the two infants, and, consequently, she only needed minimal adult intervention. However, 'enhancing interaction', mainly by 'provide stable base' may have still been helpful to Doreen in that it enabled her to exercise already existing schemes so as to expand them into more complex ones.

7.7 Conclusions

From the case studies presented in this chapter, three main conclusions emerge with regard to parental support to cognitive development in infancy. First, it differentiated certain ways in which mothers' structuring of their infants' play may or may not facilitate cognitive growth. Second, parental support assumes different forms depending on the infants' abilities. Third, developmental patterns can be detected in relation to the infants' cognitive abilities and in the associations of these abilities with forms of parental support.

Concerning the efficacy of parental support, cases A1, A4, B5, C1, D1 and D5 represent examples of maternal responsivity whereby each mother adopted the role that constituted a good match to the infant's abilities, and which would have the potential of either accelerating these abilities (cases A4, B5 and D5) or pacing them (cases A1, C1 and D1), by enabling the infants to perform within the margins of their abilities. Although all these mothers 'enhanced' to a greater extent than they 'modified' (with the exception of case A4), yet in their support some could be described as 'modifiers'. This distinction is based on whether or not 'modify' was more frequent for one mother than the other in a matching pair, or whether or not the rate of her 'modifying' was above the average rate for her group (cf Chapter III, Figure 3.12). According to these two criteria, A1, C1 and D5 would qualify as 'enhancers' while A4, C5 and D1 would qualify as 'modifiers'. B5 could be described as both. Generally, the mothers who 'enhanced' had infants who were advanced in their 'solitary' play and in their scores on the IPDS, while the infants who were less advanced in solo play and the IPDS were paired with 'modifying' mothers. Also for the infants with better scores and more advanced 'solitary' acts the ratio between 'enhance' and 'modify' was greater than for the bottom scorers in groups A, B and C. Thus it seems that in adopting one role or the other, the mothers were guided by their infants' abilities. Less competent infants needed more directive support while the more competent ones needed less specific guidance; for the latter group of infants the mothers' background 'participation' and 'encouragement' was sufficient for most of the time. Similar findings were also reported by White (1971) and Wenar (1976), who observed that mothers of competent infants spent less amounts of time in structuring the infants' experiences in a directive manner similar to 'modify interaction'.

The efficacy of parental support is further seen in the way the maternal roles matched the infants' ongoing activities, as well as the level of their performance. Thus, in terms of interpersonal synchrony, for the 'enhancing' group of mothers, 'enhance' and 'participate' correlated well with the infants' 'solitary' and 'contact' acts. For the 'modifying' group the correlations of 'modify' with 'solitary' acts were generally negative (i.e. they indicate that 'modify' may be compensatory), while the correlations between 'modify' and 'sequential' acts and 'attention' were generally high and positive. When the 'enhancing' mothers 'participated from background' their infants were engaged mostly in spontaneous activities such as 'solitary' and 'contact' acts. On the whole, the amount of correlations between 'enhance' and the infants' categories that indicate cognitive compatibility were greater for the 'enhancing' mothers, while 'modify' and its sub-categories, 'reveal object's property' and 'create discovery environment' correlated better with the 'sequential' acts of the infants of the 'modifying' mothers. The infants, too, were instrumental in bringing about interpersonal synchrony and cognitive compatibility, although one infant (A4) seemed to be very lacking in this respect. Cases B1 and C5 provide examples of responsive infants whose experiences were less supportive to their cognitive development.

Beside the general association of 'enhance' with competence and 'modify' with less competence, the type of maternal response to 'negative' acts tended to be different for the two types of infants. With regard to 'negative' behaviour, for the more advanced infants, a larger proportion of their 'negative' acts was responded to by 'participate from background' than in the case of the less advanced infants, while in 3 out of 4 cases the less competent infants received more 'modifying' in response to 'negative' behaviour than the more competent ones. This indicates that mothers of the more competent infants were more tolerant to their infants' 'negative' behaviour; the mothers of the less competent infants may have perceived 'negative' acts as a drawback to their infants' advancement, and, consequently, they may have felt the necessity to deal with 'negative' acts more effectively, and with more directive measures which have the potential of re-channelling 'negative' acts into manipulative ones, more than 'eliminate'. Next to 'modify', 3 of the less competent infants (A4, B5 and D5) received more 'eliminate undesirable behaviour' than their competent peers. Thus, the type of response to 'negative' acts maximises the less competent infant's opportunities to benefit from maternal support. It is worth noting here that C5 was the odd case where the mother 'eliminated' less than C1, and she was one of the two less supportive mothers.

Mothers of the less competent infants were also different from the ones with more advanced infants in that when 'teaching' and 'demonstrating' they used the 'simplifying' strategy more. This is with the exception of case C5. 'Simplify' may increase the likelihood of the less able infant's imitation of his mother's actions since it is the least complex and cognitively demanding strategy. For the more advanced infants (A1, B1 and C1) the predominant teaching strategy was 'modelling' or 'modelling + idealising'.

Similar trends were also observed with the infants' responses to their mothers' support. There were more 'negative' respondents to 'eliminate' among the competent infants, but less negative responses to 'support manipulation/modify'. This indicates that the more competent the infant was, the more stimulation he needed in the form of active parental participation to divert him away from his own 'negative' behaviour, back to play.

Finally, the case studies revealed certain developmental patterns in relation to the infants' cognitive performance and the mothers' forms of support, as well as the relationship between mother and infant activities. For example, on the IPDS at 6-12 months cognitive differences were least noticeable in 'object-permanence', while at 12-18 months the scores on 'causality' were very similar for the infants who were otherwise very different in their cognitive capacities. There was also a tendency for the worst performer in group B to be on the same level as the best performer in group A (both were best on causality and worst on 'permanence'), while the worst performer in group C (C5) was like the best performer in group B (both were best on 'causality'). However, the best performer in group D was like the best performer in C (both were best on single-object and social-object schemes). These findings indicate that cognitive differences, as measured by the scales, are more noticeable among younger infants (below 12 months) than among older ones.

In interpersonal synchrony, with respect to 'enhance' and 'solitary', 'participate' and 'solitary', 'modify' and 'sequential' and 'eliminate' and 'negative' acts, the amounts of the correlations for the best performer in group A was similar to the amount of correlation for the worst performer in group B. This pattern was manifest for B1 and C5 but only in relation to 'support manipulation' and 'contact' acts. In group C the better and worse performers were similar on 'enhance'/'solitary' and 'modify/'sequential', while in group D they were similar on 'eliminate'/'negative' and 'support manipulation'/'contact' acts. Similarities between the two top performers in groups C and D were seen with respect to 'participate'/ 'solitary' and 'modify'/'attention', while similarities below the two bottom performers in groups C and D were seen on 'enhance'/'solitary' and 'participate'/'solitary'.

Similar patterns were also seen with the categories that imply cognitive compatibility, namely, 'enhance' and high-level 'solitary', 'participate' and high-level 'solitary', 'enhance' and low-level 'solitary', 'enhance' and 'construct', 'provide stable base' and 'solitary', 'create discovery' and 'contact' acts, 'create discovery' and 'sequential' acts where at an early age, worse performers in one group are similar to best performers in the younger group (A1 = B5, B1 = C5). However, at a later age, the worse performers in a younger group are similar to the worse performers in the older group and vice versa (C1 = D1 and C5 = D5). With respect to 'reveal' and 'sequential' acts, however, the better and worse performers in the youngest group were similar to better and worse in the older group (A1 = B1 and A4 = B5).

These results indicate that between the period 6-9 months and 9-12 months cognitive development proceeds at a faster rate and that the specificity of parental support becomes more accentuated. In other words, the less advanced 9-months-old infant could be regarded as more "retarded" in his cognitive abilities than the less advanced 12 or 15 months-old-infant. These results are in line with the previous quantitative differences that were found between groups A and B but not between groups B and C and C and D, in terms of infant and maternal activities (cf Chapters III and IV). Thus, the evidence is that after 9 months, cognitive development proceeds at a more uniform rate and age becomes less important in highlighting cognitive differences between individual infants. Parental support seemed to be tuned to these variations in the rate of cognitive growth, so that mothers of 12-15 months-old competent infants synchronise their behaviours with their infants' activities in a similar manner as mothers of 15-18 months-old competent infants.

Finally, mothers seem to follow a developmental pattern in their teaching strategies. Here, the two periods 6-9 months and 9-12 months were similar in the predominance of 'modelling' and 'simplifying' strategies while at 12-15 months and 15-18 months 'instruction' becomes prominant. There is evidence also that after 15 months there is probably a shift in the form of support where 'modify' assumes more importance than previously. Evidence for this comes from case D1 who was described as a 'modifier' although her infant was more advanced than D5 whose mother was an 'enhancer'.

CHAPTER VIII

GENERAL CONCLUSIONS

CHAPTER VIII

CONTENTS:

8.1 Cognitive Development in Infancy

Examination of the infants' activities when playing with their mothers, with toys, showed a tendency for the infants' manipulative acts not to be always pursued in collaboration with the mother. Thus, if we collapse the ages of all infants we find that 'sequential' play accounted for only 23% of all infants' activities, while 'solitary', 'contact' and 'negative' acts accounted for slightly more than that, with the exception of 'negative' acts (29.4%, 25.4% and 22.2%, respectively). Since the discrepancy between the rate of 'sequential' acts and each of the other activities was not great, we can conclude that in a semi-structured situation the infants' orientation to objects took diverse forms that involved technical as well as non-technical tasks with a tendency for technical tasks, such as those that characterise 'solitary' play, to slightly exceed socio-technical ones, such as those characteristic of 'sequential' acts. Similar findings were reported by White et al (1973) where children aged 1-2 years were found to spend more time interacting with the physical environment than trying to affect people (82% - 89% versus 10.6% - 17.7%). However, in White et al's study the children were observed in a different setting, one where the mother was accessible to the infant but not always in close proximity to him. This may account for the greater discrepancy between the two forms of orientation to objects and people which was observed in White et al's study. In other words, proximity to the mother made it more likely for the infant to distribute his activities almost equally between joint and solo play.

The data on the infants' activities revealed certain developmental patterns. Some activities not only increased in frequency with increases in the infants' age, but also different developmental periods were characterised by the predominance of some activities over others. This tendency was not manifested by group-A infants since they engaged in the four types of activities to an equal extent. The predominance of certain activities at some periods can be explained partly in terms of achievements that are characteristic of each period, which involve maturation of physical and cognitive structures. In the following each period will be considered separately in order to examine the significance of various achievements for the type of play most characteristic of the period:

6-9 months. As already mentioned, this period is characterised by uniformity in the rate of 'solitary', 'contact', 'sequential' and 'negative' acts. During this period the visual system is already fully developed and this enables the infants to spend a considerable amount of time in visual exploration of the environment (Bower, 1977; Moss and Robson, 1968; Schaffer, 1971; White et al, 1973). Consequently, distal-contact acts in the form of 'looking' at toys, and non-manipulative, 'responsive-sequential' acts in the form of watching mothers perform activities on the toys were made possible for the infants in this group. However, since at this age the infants' span of attention is limited, these visual responses were maintained for only short durations. Furthermore, at this age, 'contact' and 'sequential' acts seem not to be related to competent responses to the environment. This is inferred from the negative correlations between each of these two categories of behaviour and the infants' scores on the scale measuring their schemes with multiple objects. It seems then that looking at toys or watching others act on them did not enable the infant to coordinate objects together and to manipulate them in appropriate manner.

With regard to motor development, two infants in the group were crawling by the end of the period of study, while the other two could barely sit upright without support. This may account for the predominance of proximal contact with the toys. The group also showed the lowest frequency in active, distal contact. Moreover, since the infants could not maintain an upright posture for a long time, they could not engage in 'solitary' manipulations that required flexibility in movements and appropriate bodily orientation to toys. However, a more important factor that may explain the low frequency of 'solitary' play and its dependence on more rudimentary schemes is the absence of complex cognitive structures at this period (Piaget, 1936): for example, some of the 'solitary' activities of these infants stem from the 'secondary, circular reactions' which involve the repetition of familiar schemes with objects, but only ones that were accidentally discovered, thereby making solitary play relatively unintentional and lacking in goal-directed activities and consequently of limited range and complexity. Furthermore, some of these infants may have still been at stage 2 of sensorimotor development which is characterised by the 'primary circular reactions' which are even more primitive than the secondary reactions. Despite this, 'solitary' play represents quite an achievement at this age, and the more 'solitary' acts the infants performed, the more varied were their schemes for relating to objects. Evidence for this comes from the positive correlation between 'schemes with multiple-objects' and 'solitary' acts. Furthermore, from the case-studies, the infant with higher scores on the IPDS engaged in significantly more 'solitary' play than the infant with the lowest scores in the group. In other words, the rate of 'solitary' acts appeared to be an index of competence which distinguished slow-developing infants from fast-developing ones.

'Negative' acts were less frequent during this period probably because of a constraint on the infant's mobility through motor immaturity; also the infants had few schemes of their own to exercise, and this made it less likely for them to be distracted from the task of joint play. Thus, 'abandon play' and 'substitute' were hardly observed with this group. When the infants wandered away from the task of play it was through the visual system; that is, they were 'distracted', focusing their gaze on stimuli other than the mother or the toys. When bored or fatigued, these infants resorted to crying, a form of behaviour which was less common among the older infants probably because they had within their disposal the ability to leave the field of play physically.

<u>9-12 months</u>. This period was characterised by the predominance of 'negative' acts. Instances when the infant rejected play with the toys or substituted it by other activities of his own choice were considered 'negative' since they broke the link between the triangular relationship of mother, infant and object. However, to some extent these instances could indicate competence since they coincide with, and may be a reflection of, newly developing motor skills as well as new cognitive structures. Most infants in this group were able to stand upright at the beginning of the study period and by the end of the third month they were able to walk and move around when supported by the mother or by external aids such as furniture or baby-walkers. Since the infants were in the process of mastering the skill of walking, they could not (or would not) focus their attention on the toys, or direct their efforts into performing skilled actions with them. Instead, all effort went in practicing 'walking around'; hence the increase in 'substitute' and 'abandon'. At this stage, too, the infant's curiosity extends to the world of people other than the mother and he begins to make overtures for social contact that range from smiling (Wolff, 1963) to active approach (Anderson and Messick, 1974) and sharing of topics of communication and of objects (Ross et al, 1972). Thus, the 9-12 month-olds had the highest rate of 'distraction' which was largely in the form of 'looking at the observer'. These infants also

approached the observer and initiated play with her more often than the infants in the other groups. It is possible, then, that such 'negative' behaviour marked the competence of the infants in this group, especially since in the case-studies the infant with the highest scores on the IPDS engaged in significantly more 'negative' acts than the infant with the lowest scores. Further links between competence and 'negative' acts were seen in their positive association with schemes with multiple-objects. This is in contrast to 'solitary' and 'contact' acts which were negatively related to the scale.

The period of 9-12 months was also characterised by an increase in 'solitary' and 'contact' acts. The increase in 'solitary' acts involved an increase in activities with multiple objects and a slight increase in differentiated acts with a single object. The slight advancement in the quantity and quality of 'solitary' play could be attributed to the secondary circular reactions that begin to govern the infant's interactions with the physical world in a more definite manner than previously. Thus, through circular reactions, the infant perceived the toy as a familiar goal since interesting events ensued from it in the past. At this period there was no evidence for the association of solitary play with competence since the correlation between 'solitary' acts and the scores on schemes with multiple objects was negative.

The increase in object-contacts involved all three types of 'contact' acts: proximal, passive, distal (looking) and active distal, with the greatest increase taking place in active distal contacts. This trend reflects the infant's increased motor skills, for example, the ability to reach objects and retrieve them from various sources and an increase in curiosity and exploration that leads to more looking at toys and proximal contacts with them.

12-15 months. The most important developmental landmark of this period is the considerable increase in the rate of 'solitary' acts and their predominance over all other acts. Sharp increases in 'solitary' play especially with multiple objects, distinguish group C infants from those in groups A and B. Although playing with a single object decreased only slightly the quality of that play showed a considerable advancement since there were fewer undifferentiated acts, more differentiated ones and social, unconventional, mechanical and symbolic uses of objects emerged. Thus, play with multiple objects differentiated the two age bands (6-12 months versus 12-18 months) not only in terms of increases in its rate but also in terms of what was done with the objects. The younger infants simply banged two objects together, or poked one with the other, while the older ones showed an advancement in their perception of relations in that they related two objects together according to their functional attributes, both technical and social. Similar findings were also reported by Rosenblatt (1977) and White et al (1973). Rosenblatt observed a significant change in the infants' spontaneous manipulations of objects between the twelfth and thirteenth months of life. These infants began to combine two objects together in appropriate manners. In White et al's study 'mastery play' ('practicing simple skills such as putting small objects in and out of receptacles, putting lids on and off containers, etc.') which is the equivalent of 'solitary' play with multiple-objects was observed to increase in rate with increases in the infants' age, thereby representing a more mature form of behaviour typical of children above two years. However, in the present study the critical change was observed to take place at an earlier age (after 12 months) and to continue at a relatively stable rate throughout the period of 12-18 months.

The change in 'solitary' acts may be attributed to the emergence of the 'tertiary circular reactions' which allows the infant's orientation to toys to be more objective; that is, the infant at this age sees the toys as separate entities existing in their own right. Consequently, his efforts focus on learning about the qualities and utilities of the various objects. 'Solitary' acts that are guided by the 'tertiary circular reactions' unlike those that are guided by the 'secondary circular reactions' are intentional, directed towards specific goals and are characterised by variations in the repetition of original acts that produced a certain event which entail variations in the event itself.

The 'solitary' play of the 12-15 month-old infant is an asset to his competence since it correlated positively with the scale measuring 'schemes with multiple objects'. Furthermore, both the quantity and quality of 'solitary' acts distinguished the less competent infant from the more competent one who were represented in the case studies for this group. This finding confirms a similar one by White et al (1973) which showed that mastery play (explained earlier), was a distinguishing criterion between the intellectually well developing and poorly developing infants who were observed in their longitudinal study.

15-18 months. While group D infants showed great similarities to group C infants in terms of the rates and forms of 'solitary', 'contact' and 'negative' acts, they showed a considerable advancement over group C infants in terms of 'sequential' acts. During the period 12-18 months, beside the predominance of 'responsive', 'sequential' acts such as 'attention' and 'games', new responses emerged such as accepting offered objects, imitating and completing a technical task that was started by the mother. However, it was only during the period of 15-18 months that the infants showed a sharp increase in 'initiative', 'sequential' acts. Thus, the infants of all ages were more reactive than spontaneous in their joint-play, but their spontaneity became most apparent at 15-18 months when they showed the capacity to direct others' attention and collaboration to their own themes. When the younger infants initiated sequences of play with their mothers, they focused mostly on 'secondary-object manipulation', that is, they used objects as means for joint-reference and other communicative exchanges (e.g. 'offer' and 'declare'). Only group D infants were more concerned with primary-object manipulation when they used their mothers as a source of help for achieving a goal with objects (e.g. 'imperatives'). Thus, as the infants got older their cooperative play seemed to have become more technical in nature.

The predominance of 'sequential' acts during this period coincides with the development of communicative skills such as joint reference (Bruner, 1975) and language, especially 'naming' (McShane, 1980). This indicates that the cognitive competence of the 15-18 month-old infant is closely linked to social competence that is represented by communicative skills. Each facilitates the development of the other, as well as expresses it. At this stage the 'tertiary circular reactions' are centred around objects that exist in a social world and that are of common interest and utility to self and others. Thus, during this period competence resides in 'sequential' acts that involve self, others and objects. In evidence of this, the competent infant in the case studies engaged in 'sequential' behaviour more often than the less competent one; also 'sequential' acts showed a positive correlation with schemes with multiple objects.

Finally, the negative acts of these infants showed an increase in 'seeking contact with the experimenter' thereby indicating advancement in social abilities through the infant's expression of interest in others and the desire to incorporate them into his play.

Explaining developmental increases of the infants' activities in terms of physical maturation and the growth of cognitive structures emphasises that the infant is a growing organism, and that infants at one period of time are different from the same infants or from different ones at another period in terms of the quantity and quality of their play. Such a view of competence is one-sided since it does not take into account the context in which development takes place. In other words, besides being a developing organism, the infant is also an adapting one, in the sense that infancy is a state of existence characterised not just by the processes of growth that prepare the infant for an adult-life, but also by his formation of relationships with adults and the sharing of their interests and objectives. Such a state of affairs can affect the rate of development. Development of competence may proceed at a faster or slower rate depending on environmental pressures and the types of stimulation the environment makes available. Besides, new developments may be utilized by the infant to influence his environment or they may enable the infant to occupy a different social status. Changes in any of the four types of the infants' orientation to interpersonal-object play can be viewed as instances of development as well as adaptation. In the latter case, changes may be brought about by stimulation from the parents and they may lead to further changes in the relationship between the infant and environment. The following section reviews the evidence of the effectiveness of parental support which demonstrates the interpersonal aspects of 'solitary', 'contact', 'sequential' and 'negative' acts.

8.2 Parental Support of Cognitive Development in Infancy

The most striking quality of parental support is its diversity. The mothers' activities covered a wide range, but some of these tended to occur more often than others. For the mothers of this sample, the most common activity was watching their babies as they played. On occasions, this was accompanied by commenting on such activities. When an infant was not handling objects the mothers pushed them closer to him, or handed them over to him. The mothers' participation also took a less passive form when they structured the infant's activities for them such as by revealing the properties of a toy, or by starting a task or a game with an object and getting the infant to reciprocate it. On very few occasions the mothers helped the infant to achieve a goal, or they taught him in an explicit manner how to perform a certain task.

Overall, minimal intervention in the form of 'enhancing interaction' with objects was the common experience for all infants. Directive intervention in the form of 'modify' interaction also occurred but its occurrence was subject to certain conditions such as the infant's age and his level of competence. Examination of the patterns of distribution of these two forms of support with reference to each developmental period will clarify the specific function of each form of intervention at each period.

6-9 months. During this period mothers 'created possibilities' to a lesser extent than the mothers with older infants. This is in agreement with Bradley et al's finding that the more competent infants elicit more stimulation from their care-givers (Bradley et al, 1979).

Unlike the other groups, for group A there was no significant difference between the frequencies of 'enhance' and 'modify'. Thus, at this age the infants probably needed both forms of stimulation equally. 'Enhance' encouraged the infant to practice the few skills they had already developed (e.g. simple, 'solitary' play and 'proximal contacts').

while 'modify' may enable the infant to improve established skills and to add new ones to them.

The pattern of the frequency of 'enhance' and 'modify' mirrors that of the uniform distribution of the infants' 'solitary' and 'sequential' acts. Thus, the behaviours of the mother and infant were complementary. However, when the 'solitary' acts of each individual infant were correlated with his mother's 'enhance' and 'participate', the group showed a negative correlation between the mothers' activities and the infants'. 'Enhance' and 'participate' were positively related to 'contact', 'sequential' and 'negative' acts. Like 'enhance', 'modify' was negatively related to 'solitary' acts. While the negative correlation between 'modify' and 'solitary' may be compensatory, that between 'enhance' and 'solitary' could indicate that 'enhance' was an inappropriate form of support at this age.

Passive participation was cognitively compatible with the infants' 'solitary' and 'contact' acts since they correlated positively with the more advanced forms of these activities (high-level solitary and proximal contact) and negatively or not at all to the less advanced activities (low-level 'solitary' and 'look at toy'). At this stage 'enhance' was also negatively related to 'construct', while 'modify' correlated negatively with all levels of 'solitary' acts. This is probably because of the mothers' tendency to modify when the infants' 'solitary' play was infrequent or lacking in complexity. The positive association between 'modify' and 'contact' acts indicates that the infants probably responded by manipulative and visual contact of the toys that their mothers had acted on. 'Modify' correlated well with all types and levels of sequential acts (initiative and responsive; manipulative and visual) thereby indicating the compatibility of the infants' responses to this form of support.

These results indicate that both 'enhance' and 'modify' were supportive to the young infant's play, with 'enhance' being reactive to his spontaneity and competence, while 'modify' was associated with less competence. The data on the case studies adds weight to this interpretation: the more competent infant had more 'provide stable base', less 'support manipulation' and less 'modify'. Furthermore, 'participate' correlated better with the activities of the infant with the highest scores and was more in synchrony with his ongoing activities.

Supporting the infants' manipulation of toys had the highest rate during this period and it consisted of relatively high episodes of 'support approach'. This tendency may be a reflection of the mothers' attempts to accelerate motor development using toys as means and in the course of this manipulative skills may also be influenced. However, the infants reciprocated their mothers' 'support manipulation' by appropriate 'contact' or 'sequential' acts on only 50% of the time.

The fact that 'provide stable base' correlated positively with the six measures of intellectual functioning (the Uzgiris and Hunt Scales), while 'support manipulation' and the majority of the sub-categories of 'modify' correlated negatively, leads to two alternative hypotheses regarding cognitive growth during this period. It may be that directive support is compensatory or that cognitive development is less dependent on adults' direct participation.

Mothers in this group and in group B assisted least. This is probably because their infants' solo play was less frequent and less goal-directed. Further evidence for this is that most assistance was related to 'contact' acts ('facilitate contact') rather than 'solving' a problem for the infant, 'correcting' him or 'providing him with 'feedback'.

The data on 'reveal object's property' show that the youngest infants received more of this form of support than group B infants. However, mothers hardly revealed by verbally describing the object or its qualities to the infant; they mainly fulfilled its proper or imaginative function. This, in turn, was compatible with the high frequency of the infants' sequential acts which consisted of 'attention' and 'appreciate spectacle'. The sequential analysis showed that 55% of 'reveal' was followed by or accompanied with 'attention' and 11% was reciprocated by manipulative acts. Thus, on the whole, these infants were well responsive to this form of maternal support.

Like 'support manipulation', 'reveal' was associated with inabilities to engage in brief or prolonged spontaneous manipulations of objects, as is evident from its higher incidence for the least competent infant in the group. For this infant 'reveal' was positively related to his 'sequential' behaviour but not to his solo play. For the infant with the highest scores 'reveal' showed a tendency to positively influence his solitary constructions. Thus, this form of directive support had different effects that were dependent on the infant's level of competence; for the more competent infant it had a favourable effect on 'solitary' as well as 'sequential' activities, while for the less competent infant 'reveal' seemed to influence only his joint activities with mother.

The rate of 'create discovery environment' was high during this period and it consisted mainly of 'games' and 'elicit'. Like 'reveal object's property', 'create discovery' correlated positively with 'contact', 'sequential' and 'negative' acts and was negatively related to 'solitary' acts. Thus, it seems that at this age mothers employed 'reveal' and 'create' to compensate for the infrequency of solitary play and to control their infants' 'negative' behaviour. These forms of support were reciprocated by the infants through 'contact' and 'sequential' acts.

Generally, the infants' reciprocation was better when the mothers were 'creating discovery' than when they were 'revealing'. There was a tendency for these forms of support to be favourably associated with the infants' schemes with social objects as measured by the IPDS. These results seem to indicate that the two major sub-categories of 'modify' were influential to the infants' competence that was more related to social aspects and relatively unrelated to technical abilities.

Although the infants in this group had a very low rate of imitation episodes, their mothers engaged in 'demonstrate' and 'teach' at a greater rate than 'imitation'. This form of support rated highest during this period when compared with other periods. Thus, it seems that even when the infants were incapable of imitating their mothers' actions with objects, the mothers still used this form of support.

Like 'assist', 'reveal' and 'create discovery', 'demonstrate/teach' seemed to fulfil a compensatory function since it was negatively related to the infants' 'solitary' acts, and to their performance in the IPDS, except the scale measuring schemes with social objects. At this age the main teaching strategies were 'model and idealise' and 'simplify'. Of these two, 'simplify' was more successful in eliciting 'imitation'. The case studies also show that the more competent infant could, on very few occasions, achieve the goal which his mother had modelled in an idealised manner.

9-12 months. During this period 'enhance' showed a significant increase from the previous period, while 'modify' decreased. In fact, this group had the lowest rate of 'modify'. Thus, the changes in the frequencies of 'enhance' and 'modify' matched the changes in the frequencies of the infants' acts. It is possible that the sudden increase in 'enhance' reflects the increase in the infants' 'solitary' and 'negative' acts since both 'participate' and 'eliminate' also increased. In other words, 'negative' behaviour was partly eliminated but mostly tolerated.

The pattern of correlation of the two maternal roles with the infants' activities was very similar to that of group A. Thus, 'enhance' was unrelated to the infants' activities while 'modify' correlated positively with 'contact' and 'sequential' acts. In terms of cognitive compatibility, 'enhance' was positively related to high-level solitary acts, but not to 'construct'. It was unrelated to low-level solitary acts and was negatively related to passive looking. 'Modify' showed a positive correlation with construct and passive looking and was unrelated to high-level and low-level 'solitary' acts. Once more, 'enhance' was adopted when the infants' solitary play was well advanced, while 'modify' was adopted when 'solitary' play was less common or less complex. However, 'modify' seemed to have had a favourable effect not only on sequential activities but also on 'solitary' constructions. This provides evidence for the beginning of cognitive competence to be affected by the environment. Previously, when the mothers intervened in their infants' play in a directive manner, they still did not influence their infants' solitary performance. However, during this period 'modify' was still associated with less competence because of its negative correlation with the IPDS and because of its greater frequency in the case of the infant with the poorest scores in the IPDS.

As to the major sub-categories of 'modify', 'reveal' seemed to be compensatory for it was negatively associated with the IPDS, and there was more of it for the least competent infant in the group. The infants' responses were favourable to 79% of 'revealing' acts. 'Create discovery environment' was also positively related to 'construct' and its function also seemed to be compensatory because of its negative correlation with the IPDS and its lower frequency in the case of the infant with the highest scores on the scales. However, the infants in this group reciprocated only 65% of their mothers' 'create discovery'. 'Demonstrate/teach' could also be regarded as compensatory for those infants due to its negative correlation with 'solitary' acts and the object-permanence scale. Of all the sub-categories of 'modify' this form of support seemed to be the most effective at this period in eliciting reciprocal activities from the infants (imitate, attend, manipulative, sequential acts). Such positive reciprocation to demonstrate/teach was 100%. Teaching also seemed to be effective in enhancing technical abilities with motivational components and ones that are dependent on interactions with others (e.g. causality and schemes with multiple objects). Its role seems to be less compensatory than 'reveal' or 'create' because both infants representing the case studies received an equal amount of teaching and because only one scale was negatively related to it. The mothers employed the five teaching strategies (model, model/idealise, simplify, instruct and show) to an almost equal extent with 'showing' and 'simplifying' being the least frequent. However, from the case studies it seems that 'simplify' still elicited most imitation, although the more competent infant imitated his mother's 'modelling'.

In summary, the data for group B show that 'enhance' was still compatible with, and reactive to, the infants' competence. 'Modify' was compensatory but to a lesser extent than during the period 6-9 months. Both technical and socio-technical abilities probably began to benefit from 'modify' and especially from 'demonstrate/teach'.

<u>12-15 months</u>. For this group there was no increase in 'enhance', rather a slight decrease. However, 'modify' increased considerably. With regard to the sub-categories of 'enhance', only 'support manipulation'

decreased, which accounts for the decrease in 'enhance'. Thus, it seems that mothers decreased their 'support manipulation' once the infants were mobile and able to reach and obtain toys independently of the mother. However, the data supports the proposition made earlier that cognitive development, by this age, was more dependent on others because passive participation was positively related to negative acts and minimal contact and was negatively related to 'solitary' and 'sequential' play. The more directive role, on the other hand, was more favourably related to competence in that correlations between it and 'solitary' acts, 'construct' and 'sequential' acts were positive, while the correlations between it and 'contact', 'negative' and low-level 'solitary' acts were negative. However, 'modify' may still have fulfilled a compensatory function in that it was positively related to passive looking.

Passive participation was favourably related to the scales on Object-permanence and Schemes with a single object probably because these scales were less dependent on social experiences than the scales on Causality and Schemes with multiple objects which were negatively related to 'participate'. 'Modify' was negatively related to performance in the IPDS. Thus 'enhance' and its sub-categories was more closely associated with competent performance while 'modify' was not. This becomes more apparent when we consider the differential frequencies of these two roles for the two infants who represent the case studies. More frequent 'enhancing' and less frequent 'modifying' were associated with the more advanced infant in the scales.

'Reveal object's property', 'create discovery environment' and 'demonstrate/teach' all showed an increase during this period. In the case of 'reveal property' the increase was brought about by increases in 'describe' and 'fulfil'. Thus, verbal exchanges between mother and infant become increasingly noticeable. These forms of intervention seem to influence both 'solitary' and 'sequential' behaviour; they were also positively related to schemes with single and multiple objects. However, responsivity to these 'modifying' activities was less than during the previous period; the infants reciprocated 68% of their mothers' reveal, 71% of 'create discovery' and 69% of 'teach'. These activities seem to be used in a compensatory fashion with regard to the infant with poorer scores on the IPDS. Teaching was conducted largely through 'instruct' followed by 'model'. The least common strategy at this period was 'simplify'. The case studies reveal that all strategies were equally effective, although the more capable infant was more able to follow instructions correctly.

'Assistance' increased during this period. This is probably due to an increase in 'solitary' acts and in the change of the degree of dependency on the mother to direct cognitive activities.

The data on this group indicate that 'enhance' became less supportive than previously, while 'modify' was favourably related to 'sequential' as well as 'solitary constructions'.

<u>15-18 months</u>. This period followed the same trend as the previous one in terms of the increases in 'provide stable base'. However, the period is different from the previous one in terms of the decrease in 'modify'. 'Enhance' continued to be less supportive to all infants' activities, while 'modify' was supportive to 'solitary', 'sequential' and 'negative' acts.

A further advancement of this period is perceived in the positive relationship between 'modify' and initiative, 'sequential' behaviour. Furthermore, 'modify' became more frequent in the case of the infant with the highest scores on the IPDS than the infant with the lowest scores.

'Assistance' continued to increase and was positively related to the infants' minimal handling of objects as well as more involved manipulations during 'solitary' play. However, more 'assistance' was given to the infant with the poorer scores on the IPDS.

Concerning the other sub-categories of 'modify', they all decreased during this period. Decreases in 'reveal object's property' was brought about by a decrease in 'fulfil function', while 'describe' increased. Positive correlations were found between these forms of 'modify' and the infants' 'solitary' and 'sequential' activities, as well as their performance in the scales measuring 'causality', 'schemes with multiple objects' and 'space'.

The infants in this group showed an improvement in reciprocation of the mothers' 'modifying' behaviour. Thus, 71% of 'reveal' was responded to appropriately. The figures are 72% and 86% for 'create discovery' and 'demonstrate/teach' respectively. The mothers employed the 'instruct' and 'model + idealise' strategies and on very few occasions they 'simplified'. The 15-18 month-old infant complemented his mother's 'instructions' more than her 'modelling and idealising'.

In summary, for group D the rate of 'modify' decreased but its supportive function remained unchanged; rather it extended to 'initiative, sequential' acts and more of the IPDS. The increase in the frequency of 'enhance' may have been partly due to increases in the infants' 'initiative, sequential' acts to which the mothers responded by 'provide stable base' ('receive object').

Examinations of the nature and patterns of relationships between the mothers' behaviour and the infants' activities and performance on the IPDS, made it clear that the infants' cognitive abilities were not just the result of maturation of physical and cognitive structures, but they derived their significance from the interpersonal setting in which they occurred. Thus, parental involvement in the infants' play made it possible for cognitive potentials to be actualised either through encouraging the infants' spontaneous expression of competence or through structuring the infants' experiences in such a way that would lead to the emergence of these competences. If we consider 'solitary' acts we find that the results emphasise their dependence on interactions with the mother, even though solo play may give the impression of being the sole responsibility of the infant and of self-reward only. From the present data it is not possible to state conclusively whether the mothers' 'enhancing' was responsible for the occurrence of 'solitary' play, or whether solo play influenced the mother and stimulated her to 'enhance' rather than 'modify'. Nonetheless, it is more likely that for the present sample of infants 'enhance' was reactive to 'solitary', 'contact' and 'negative' acts since the mothers increased or decreased this form of support relative to similar changes in the quantity and the quality of the infants' activities. However, from other studies it had been reported that infants increase the rate and efficiency of their exploratory and manipulative activities when with their mothers than when they are alone (Ainsworth and Bell, 1973) and that securely attached infants show more competence in a problem-solving situation than children with insecure attachments (Matas et al, 1978). The tendency for increased play to occur in the company of the mothers was attributed by these authors to the infant's feeling of security derived from proximity to the attachment figure in a strange situation. However, at least in the present finding, 'solitary' play may have been facilitated by the mother's presence not only for the security she provides for her infant but also through stimulating him to engage in cognitively advanced activities with the objects. Solo play may have been facilitated by feelings of efficacy through maternal exclamations, praise and other appreciative vocalisations. Furthermore, looking at the infant while he played may have made the infant feel that his activities were directed to an audience and an appreciative spectator. This interpretation is supported by the observations that, on occasions, when the mothers initiated conversation with the experimenter or directed their attention to other features of the environment, such as the television (i.e. the mothers were engaged in non CP behaviour), the infants' 'solitary' play ceased and 'negative', non-play behaviour took over. Some infants even 'protested' when the mothers diverted their attention away from them. It is possible, then, that in the absence of care-giver 'solitary' play may become very infrequent or of a less advanced level, characterised by ritualised activities such as banging a toy on a surface rhythmically and by a lack of goal-directed tasks. This possibility could be examined in future through a structured observational study that compares the infants' 'solitary' play under two conditions, alone and with the mother, with the fear of the strange eliminated.

Another facilitatory effect of parental participation on solitary play relates to the content of that play. The data revealed that solitary constructions may be learnt through observing the parent performing similar complex activities with the objects. Evidence for this comes from the positive correlation between 'modify' and 'construct' at 9-12 months and which increases after 12 months.

Besides being affected by the parent, 'solitary' play also affected the mothers since they increased their 'enhance' and 'participate' from one period to the next, to match similar increases in their infants' 'solitary' acts. Moreover, when the infants' solitary play was lacking in cognitive complexity it evoked less enhancing from the mothers.

'Contact' acts could also be regarded as interpersonal since they were responsive to the mothers' 'support manipulation' especially during the periods of 6-9 months and 9-12 months. They were also responsive to 'modify'. They affected the mother in that when absent or minimal, the mothers engaged in 'support manipulation', or 'modify' as is evidenced from the negative correlations between 'contact' acts especially 'looking' and 'modify' at 12-15 months and 'contact' acts and 'support manipulation' at 12-18 months.

'Sequential' acts are, by definition, interpersonal. However, at an earlier period (6-15 months) they were characterised by lack of mutuality in the sense that one partner played the same role all the time since the mother was always the initiator of a sequence and the infant was only responsive. Later, both partners played reciprocal roles when the oldest infants (15-18 months) initiated more sequences for their mothers to reciprocate. When the infants were responsive, 'sequential' acts were influenced by 'modify'; when he was an initiator 'sequential' acts influenced 'provide stable base' ('receive objects') or 'modify' ('assist' or 'reciprocate game').

'Negative' acts such as 'distract' and 'abandon' are not interactive, although others are designed to signal something to the mother ('distress' and 'protest') or to express a preference for something or someone else ('substitute'). Such acts may be influenced by inappropriate parental support (e.g. 'reveal' in case C1 which was not well timed with the infant's ongoing activities) or by its lack (e.g. episodes of non CP that were followed by 'negative' acts). They also influenced the parents' behaviour through eliciting specific responses (e.g. 'eliminate'). The type of response may be influenced by the type of 'negative' behaviour; for example, the mothers may tolerate (i.e. 'participate') 'substitute' and 'abandon' but 'eliminate' 'distress' or 'distraction'.

In this study, 'negative' behaviour was also utilised to measure the observer's effect. In doing so, the category of 'substitute' provided a good measure that could be used in future research for examining a certain developmental phenomenon, namely, the infant's orientation to strangers and the development of social interaction with unfamiliar persons. Studies of infancy and early childhood that focus on the frequency of social exchanges between mother and infant have found that 1-2 year olds are more interested in objects than people (White et al, 1973). However, if unfamiliar people were to compete with objects, the marked difference between social and technical exchanges may decrease.

Observed changes in the frequency of some forms of support and the distribution of 'modifying' activities relative to 'enhancing' ones is a reflection of maternal sensitivity. The essence of parental support is the variation of its forms to suit the infants' particular needs, which may be related to the infants' age (such as in the developmental increase of 'enhance') or to peculiarities of the infant (such as in 'modifying' the behaviour of a less competent infant to a greater extent than that of a competent infant of a similar age).

A further index of sensitivity is revealed in the way the mothers synchronised their behaviour to match that of the infant and in the way the supportive mothers in the case studies timed their directive interventions to coincide with the infant's attention or lack of involvement in competitive themes, thereby maximising the opportunities for his learning from their behaviour. The choice between a number of directive techniques was also characterised by maternal sensitivity; for example, for the younger infants the mothers 'revealed' the properties of objects while for the older ones the mothers used the more demanding form of 'create discovery environment'. Thus, the cognitive status of the infant determined which forms of stimulation are likely to be received and complemented by the infants. Similar findings were also reported by other researchers. Schaffer and Crook (1979), for example, found that the stage of development may evoke certain maternal behaviour (e.g. non-verbal controls at a younger age) and inhibit others (e.g. verbal controls). Crawley et al (1978) suggested that the infants' level of sensorimotor skills constrains maternal play behaviour. Thus, in their study, the behaviour of mothers of 4-month-old infants focused on playing games that elicited positive affects (e.g. laughter) but that required minimal motoric participation from the infant. This was in contrast with the types of games played with 8-month-olds which relied on both affective and motoric participation from the infant (e.g. Peek-a-boo). In both instances, the mothers' goal was to 'encourage an optimal level of infant participation during play'.

Among all the behaviours specified by the Hierarchy, the mothers focused mostly on the one that involved their minimal participation ('participation from background'). This finding raises the question of whether these mothers were providing their infants with adequate experiences that foster the growth of cognitive competence. The data relating to the whole sample reveal that minimal participation was a valuable experience especially during the period 6-12 months. Supporting evidence for this comes from several sources such as the positive correlation of 'participate' with the complementary infants' activities, the positive correlations of 'enhance' with the IPDS and the temporal patterning of 'participate' and the infants' complementary activities which indicated synchrony between the two partners. However, when we consider the case-studies we find that in one case (B1) 'enhance' was not supportive to that particular infant and it is possible that he would have benefited from more directive support and less passive participation.

The adequacy of parental support was more dependent on the patterning of 'modify' relative to 'enhance' rather than their frequencies per se. Thus, had 'modify' been more frequent or predominant over 'enhance' it would probably have been less effective. Mothers of young children know too well that not all attempts to direct their offsprings' activities into specific channels meet with compliance. In this study, 'modify' was occasionally followed by 'negative' acts. The important criterion for the success of 'modify', as Schaffer and Crook (1979) also found, is its administration when the infant is in a receptive state. Furthermore, as Goldberg (1977) points out, development is facilitated by feelings of efficacy achieved through the provision of 'contingency experiences' during mother-infant interactions. Thus, parental support must take into account the infant's readiness, his emotional and affective states and must make play a 'relaxing', pressure-free and predictable experience. Over-stimulation, such as too frequent, ill-timed or less goal-structured 'modifying' may lead later in life to poor performance in cognitive tasks, impulsivity or low-threshold for frustration (Wachs, 1976). The data on the case studies bear evidence to the futility of 'modify' when administered in a haphazard fashion such as in case C5.

Such considerations are especially applicable to the most didactic form of 'modify', namely, teaching the infant a new skill. This aspect of mother-infant interaction was the focus of several studies which made valuable contribution to our knowledge of the role of parent in a tutoring situation (Kaye, 1975; Middleton et al, 1976), the development of cooperative understanding (Hubely and Trevarthen, 1979) and social-class variables that affect the nature of teaching strategies and their effectiveness

(Hess and Shipman, 1965). However, these studies have not assessed whether explicit teaching is a valuable experience for the development of competence in infancy and how representative is it of the mother-infant interaction. The present findings revealed that explicit tutoring is a rare event during free-play sessions between the mother and her infant. However, when it was observed it involved directive techniques (teaching strategies) similar to those observed in the laboratory-structured, interactions in the studies already cited. Moreover, since this study covered a wide age range it was possible to trace the developmental changes of these strategies. This revealed that 'simplifying' the task and modelling it in an idealised manner were common among the mothers of the youngest group. For the 12-18 months old 'instruction' was the predominant form of teaching, followed by 'modelling' with or without idealising. At an intermediate stage 'modelling' declines. Hubely and Trevarthen also found a very similar developmental pattern. They suggested that the predominance of modelling at an early age despite the lack of its imitation by the infants, serves to highlight to the infant the relationships between objects as well as lure him to handle them subsequently. The present data give some support to this suggestion in that 27% of maternal teaching at 6-9 months was followed by the infants' manipulations of the same object(s). A more likely function of modelling, to use Middleton et al's analogy, is that it helps the infant to 'recognise' the solution to the problem even before he can produce it. Thus, it may not be sheer coincidence that 'simplify' was equally common at this time and that it was complementary to 'model + idealise' since it allowed the reproduction of the simplified task.

Since 'teaching' is one of the least representative modes of interaction between mother and infant, any conclusions concerning the processes or outcomes of such interactions should not be generalised to explain the significance of parental involvement in the infants' play; for example, in Wood et al's study (1975b) the 'contingency' strategy (make use of all possible methods of tutoring contingent on the child's success or failure) may be an artifact of the laboratory situation since the mother was specifically asked to try and get the child to succeed in the task. Thus the strategy may represent the persistence of the mother that was evoked by the experimenter's demands. In the home situation, on the other hand, most teaching may involve one discrete episode rather than the continuation of several attempts. Thus, the mother may embark on a teaching sequence and on the infant's failure, or more often, lack of responding, she may abandon the task altogether, rather than shift to a simpler strategy. Alternatively, she may change the topic into a related activity (e.g. a game involving the same toy(s)), or she may engage in momentary social play or affect display and then resume teaching. In this study, observed persistence by the mothers to teach their shifting from one strategy to another, was the exception and not the rule. Consequently, the ways mothers teach their children at home may be different from the way they would teach them in a formal situation. This makes it difficult to decide which of the two should provide a guide to those who want to structure formal education along the same principles that govern informal teaching of the young children by their mothers.

Since the study highlighted the importance of social experiences to early cognitive functioning, its implications to pre-school education within the home ought to be considered. From the case studies it was seen that in two instances the mothers did not always provide adequate support. This implies that guide-lines should be made available to parents on the developmental functions of play and on their role in that play. If necessary, explicit recommendations should be given on when to 'enhance' and when and how to 'modify' the infant's interaction with the inanimate world. More important, mothers should create opportunities for the infants' play by setting time aside for the purpose of participating in play. They should be sensitive to their infant's individuality, thus adopting the approach that matches his level of competence and his personality.

Concerning intervention programs, if these are to be modelled on home experiences, they ought to be designed along similar principles that focus on the emotional aspects as well as the educational ones, while didactic teaching should be minimal, subtle, motivating and allowing the infant full autonomy. Ritualised activities, since they are overtly interactive, may be more effective; consequently, complex tasks may be made simpler and more enjoyable if they are introduced and achieved in a game-like manner that involve both adult and child. Finally, intervention must cover a wide spectrum of skills and ensures adequate growth on all these rather than its limitation to one area. However, as Whiten and Milner (1980) pointed out, skills are subject to cultural relativity; for example, the skill of comprehending representations on two-dimensions (e.g. recognising pictures in a book) may be more valuable for an infant in a technological and highly literate society than for an infant who lives among an agricultural and relatively illiterate community. This implies that efforts at 'educating' other cultures should foster those abilities that are most adaptive to an individual within a particular background. However, whether the infant lives in a highly technological society or a developing one, there is pressure on him to compete as an adult with technology either within a rapidly changing culture, or by exposure to other cultures.

Perhaps the real issue is not whether or not one culture should receive technologically-oriented upbringing while another should not, but rather how to incorporate a technological mode of interaction which is becoming universal and inevitable, within a particular society without destroying its values. In more concrete terms, interpersonal play with objects that was described in this research, could be regarded as fostering autonomy (e.g. prevalence of 'enhance' and the little occurrence of 'assist') and task-oriented. This may be necessary for the achievement of goals, for allowing the infant self-sufficiency in his current and subsequent encounters with the inanimate environment and ensures his social survival within this culture. In a different society, early interactions with adults may prepare the infant for a collective mode of living but fail to equip him with the necessary strategies for coping with more abstract and object-oriented situations. On the other hand, parents may have at their disposal the means of incorporating technological education within their repertoire when interacting with their infants, without losing their cultural identity. To ascertain this, the author intends to conduct a cross-cultural study replicating the present one in a non-Western, under-developed country.

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APPENDIX A

List of categories and their definitions:

Code	Category	Symbol	Definition
1	Create Possibilities	CP	M's various activities during interaction with infant and toys have the potential for enhancement of infant's cognitive development in relation to knowing more about objects in his environment and acquiring new skills with them.
11	Enhance Interaction	EN	M's actions could be responsible for making possible infant's contact with toys to be initiated and/or maintained, but without influencing what the infant may learn.
12	Modify Interaction	MD	M's actions have the potential of re-channelling B's activities from the theme he is already pursuing, or the outcome he is likely to produce, to a different and more complex one.
111	Provide Stable Base	PSB	M provides conditions which may make the infant more willing to manipulate toys, but not influence what he may learn.
112	Support Manipulation	SM	M's actions have the potential of enabling B to come into contact with toys, but not to influence what he may learn from them.
121	Assist	AS	M's behaviour is likely to influence what B may learn when she helps him to achieve a goal he is incapable of pursuing on his own.
122	Recruit (i)	=R?	M controls B's behaviour to make it more likely that he would follow her activity of revealing the properties of an object.
123	Reveal Object's Properties	ROP	M may influence what B learns and how he manipulates the toys when she exposes to B the various properties of objects.
124	Recruit (ii)	=R	M controls B's behaviour to make it more likely that he would follow her activity of creating discovery environment.
125	Create Discovery Environment	CDE	M may influence what B learns by engaging in activities that enable him to discover for himself the potentials of an object.

Code	Category	Symbol	Definition
126	Provide Feedback	FDB	M gives B information regarding his performance in a task.
127	Recruit (iii)	=R/	M controls B's behaviour to make it more likely that he would follow her demonstration of a task.
128	Demonstrate	DM	M may influence how B may learn to perform a particular task by giving him information on how to perform it.
129	Teach	T	M provides B with information on how to perform a task and requires him to re-enact it, following her instructions or imitating her model.
1111	Eliminate Undesirable Behaviour	-EL	M's actions deal with B's behaviour that breaks or threatens to break the link between B and toys.
1112	Participate From Background	-PB	M's actions focus on allowing the progression of B's ongoing play without herself manipulating the objects of his play.
1113	Respond to External Interference	-RI	M's actions focus on dealing with aspects of the enviornment that may disturb B's play.
1121	Support Contact	+SC	M's actions focus on initiating or maintaining B's contact with toys, when B is in proximity to them.
1122	Support Approach	+SA	M's actions focus on initiating and maintaining B's contact with toys, when they are out of B's reach.
1211	Facilitate Manipulation	*FM	M's actions focus on making it easier for B to achieve his goal by enabling him to have access to the appropriate objects.
1212	Provide Solution	*PS	M helps B to solve the problems he may encounter when attempting a task with toys.
1213	Correct	*CO	M makes it possible for B to continue his goal and/or achieve it successfully, by correcting his errors.
1214	Provide Feedback	*FD	M gives B information on the progress or outcome of his activity with toys.
1231	Describe	"DE	M provides B with information about objects.
1232	Relate	"RE	M groups together several objects.
1233	Fulfil Function	"FF	M reveals to B the ways in which an object can be used.
1251	Trigger	?TR	M elicits from B a familiar behaviour.

Code	Category	Symbol	Definition
1252	Defer	?DF	M persuades B to perform an activity by himself after he had requested it from her.
1253	Elicit Response	?EL	M performs an act with objects for B to complement.
1254	Invite	?W?	M requests B to reciprocate her action.
1254	Expand B's Theme	?EX	M's actions focus on elaborating B's theme or topic of play, thereby introducing him to a new activity.
1255	Play Joint Games	?JG	M plays a game with B which is governed by rules about what social or sequential acts are permissible.
1281	Model + Idealise	/MD	M performs a task with toys in a manner that would make it likely for B to learn how to perform it.
1282	Show	/SH	M shows B how to perform a task, partly by modelling, partly by instructing.
1283	Simplify	/SI	M shows B how to perform a task by making it less complex.
1291	Recruit (iv)	=R	M controls B's behaviour to make him more likely to follow her teaching behaviour.
1292	Demonstrate	DM	M reveals to B how to perform a task so that he can repeat it after her.
1293	Reset	RS	M puts back the objects to the state they were in before she demonstrated an action with them.
1294	Allow Imitation	AL	M requires from B to perform a task she had taught him.
1295	Assist Imitation	AS	M helps B to imitate a task which she had taught him.
111.11	Maintain in Field	-=F	M counteracts B's attempts to physically leave the field of play.
11112	Cope with Distress	-=D	M comforts B when he is fussing or crying.
11113	Restore Attention	-=A	M regains B's interest in the play activities.
11121	Accept Offered Objects	-=C	M accepts from B the objects he offers her.
11122	Maintain Proximity	-=P	M keeps close to B while he is playing.
11123	Watch B's Play	-=L	M constantly looks at B while he is playing.
11124	Comment	-=V	M comments on B's play.

Code	Category	Symbol	Definition
11131	Incorporate into Situation	- C	M widens the scope of the infant's play to include a si ling.
11211	Support B	++B	M helps B into a bodily posture which could facilitate contact with toys.
11212	Provide Objects	++T	M makes objects physically obtainable for B which could lead to B initiating a sequence of interaction with them.
11221	Support Locomotion	++M	M supports B into locomoting closer to objects which could lead to B initiating a sequence of interaction with them.
11222	Lure to Objects	++L	M leads to B's establishing contact with objects by using the object as a bait to lure B.
12111	Facilitate Contact	*=F	M makes it easier for B to contact and manipulate the objects with which he is attempting to attain his goal.
12112	Provide Correct Match	*=M	M makes it easy for B to proceed with his goal by making available the objects that are appropriate for his goal.
12121	Perform Part	*=P	M may enable B to achieve his goal by performing a component of it.
12122	Perform Whole	*=W	M may enable B to achieve his goal by performing the whole of the task herself.
12123	Guide Hand	*=G	M may enable B to achieve his goal by holding his hand and guiding him to perform the task.
12131	Substitute Object	*=T	M may enable B to achieve his goal successfully by replacing an incorrect object, which he used, by a correct one.
12132	Substitute Position	*=N	M may enable B to achieve his goal successfully by moving an object from the incorrect position in which he placed it, to a correct one.
12133	Remove Incorrect Match	*=R	M removes an incorrect object so that B has the possibility of continuing his goal with a correct one.
12134	Re-orient Object	*=O	M may enable B to achieve his goal successfully by correcting the orientation of an object.
12141	Prompt to Error	*=E	M provides B with information on his unsuccessful performance.
12142	Prompt to Success	*=S	M provides B with information on his successful performance.

Code	Category	Symbol	Definition
12311	Label Object	"/N	M gives a verbal description of an object.
12312	Expand Reference	"/E	M describes an object or its attribute by naming more than one instance of it.
12313	Indicate Attribute	"/I	M describes an object to B by highlighting its attributes.
12321	Relate by Similar Properties	"/S	M groups together objects that share similar attributes.
12322	Relate by Contrasting Properties	"/O	M groups together objects with opposite characteristics.
12323	Relate by Complementary Properties	"/C	M groups together objects that bear complementary relationships to each other.
12331	Activate Object	"/A	M sets into motion a mechanical toy.
12332	Use Socially	"/S	M performs a social activity with an object appropriate for that purpose.
12333	Construct	"/T	M combines together objects in a functional relationship.
12334	Innovate	"/N	M improvises on the uses of an object.
12511	Trigger Speech Act	??S	M requests from B the name of an object.
12512	Trigger Manual Act	??M	M requests from B a familiar manipulative action with object.
12521	Defer Action Verbally	??V	M tells B to perform an act by himself.
12522	Defer Action non-Verbally	??N	M gestures to B in order to perform an act by himself.
12531	Elicit Searching	??F	M creates a situation where B can learn about finding hidden objects.
12532	Elicit use of Container	??C	M creates a situation where B can learn about using an object as a container for others.
12533	Elicit use of Means for Ends	??E	M creates a situation where B may learn about cause and effect relationships, and/or how to use certain objects as means for achieving goals with others.
12534	Elicit Equilibrium	??Q	M creates a situation where B may learn about objects being balanced together when building a tower.
12541	Expand Theme to New Action	??A	M creates a situation where B may learn that an object which he has been using for a certain action can be extended to other actions (e.g. tapping box can be extended to putting objects inside the box and shaking it to rattle).

Code	Category	Symbol	Definition
12542	Expand Theme to New Object	??T	M creates a situation where B may learn that an action performed with one object can also be performed with another object (e.g. building tower with beakers can be extended to building tower with bricks).
12551	Initiate Joint Game	??I	M performs an initial move marking the onset of the game.
12552	Reciprocate Game	??R	M performs an act that complements that of B by which he initiated a game (e.g. B covers his face with a cloth, is followed by M exclaiming, "Bo!").
12811	Supplement with Vocal Marking	/+V	M highlights the modelling process by vocalising so that her vocalisations match the tempo of her activities.
12812	Exaggerate Movement	/+M	M highlights the modelling process by slowing down her movements.
12821	Instruct + Model		M shows B how to perform a task by explaining to B the steps that lead to its achievement, while she is enacting the task.
12831	Break up Task	//K	M breaks a task into two or more constituents, which reduce the original task and make it less complex.
12832	Shadow	//W	M shows B how to perform a task without making direct contact with the toys.
12911	Eliminate Negative Behaviour	= E	M deals with B's behaviour which may prevent the infant from attending to her teaching (or revealing object's property, or creating discovery environment, or demonstrating).
12912	Establish Interest	= I	M gets B interested in the objects which may make him more ready to attend to her teaching (or the other modifying activities).
12913	Request Attention	= A	M directs B's attention to her teaching (or the other modifying activities).
12914	Pacify	= Y	M gives way to B's wishes to make him more willing to attend to her teaching (or the other modifying activities).
12915	Expand Theme	= X	M elaborates B's theme of play by introducing new aspects to it which would draw B's attention to them, and which could be used as a task to be taught to B.
12921	Idealise Model	/I	M performs a task with toys in a manner that would make it likely for B to imitate her actions.

Code	Category	Symbol	Definition
12922	Model	/MD	M performs a task with toys so that B may imitate her actions.
12923	Show	/H	M shows B how to perform a task after she had modelled it to him and explained the process.
12924	Instruct	/N	M explains to B how to perform a task she requires of him.
12925	Simplify	/S	M makes a task less complex for B to imitate.
12931	Dismantle	-T	M takes apart a structure which she had assembled so that B may reassemble it.
12932	Lay out Options	-P	M spreads out objects which form a structure she had assembled, so that B may reassemble them.
12941	Wait	+W	M pauses after modelling a structure and looks at B expectantly.
12942	Prompt	+P	M attempts to elicit imitation from B.
12951	Enable Manipulation	*M	As in 1211, but here within a teaching sequence.
12952	Solve Problem	*S	As in 1212, but here within a teaching sequence.
12953	Re-enact	*R	As in 1213, but here within a teaching sequence.
111111	Restrict Locomotion	RL-	M restrains B's attempts to move away from the field of play.
111112	Get back to Field	GB-	M prevents B permanently leaving the field of play by acting on him when he has moved away.
111121	Soothe by Physical Contact	SP-	M comforts B by giving him physical contact with her.
111122	Soothe by Objects	ST-	M comforts B by providing him with toys.
111123	Soothe by Vocalising	SV-	M comforts B by talking softly to him.
111131	Terminate B's Competitive Behaviour	TE-	M directly prevents B's interest in competing objects.
111132	Offer Alternatives	OA-	M diverts B's interest away from competing objects or activities by offering him other forms of stimulation.
111211	Take Object	RC-	M takes from B an object he is offering her.

Code	Category	Symbol	Definition
111212	Thank B	TA-	M says "thank you" to B in response to his offering her an object.
111221	Change Position of Self	PS-	M may promote closer proximity between her and B by changing her posture.
111222	Express Affection	AF-	M may highlight her proximity to infant by physical expressions of affection towards him.
111231	Look at Baby	LB-	M looks at Baby while he is playing.
111232	Look at Object	LT-	M looks at the objects B is playing with.
111233	Co-orient	OR-	M re-directs her gaze to follow that of her infant.
111241	Interpret	IT-	M gives verbal interpretation about B's activitied with toys.
111243	Praise	PR-	M praises the progression or outcome of B's activities.
111242	Inquire	IQ-	M asks B about his activities with toys.
111244	Appreciate	AP-	M expresses her appreciation of B's activities with toys.
111311	Allow B's Participation	PB-	M allows B to participate in play activities controlled by an older sibling.
111312	Allow C's Participation	PC-	M incorporates sibling with infant's activities with toys.
112111	Hold Baby	HB+	M holds B from part of his body to sustain him in an upright posture, which may facilitate B's contact with objects.
112112	Change B's Posture	CB+	M changes B's posture from one orientation to another, closer to objects.
112113	Position Baby	PB+	M sets B down by objects.
112114	Orient Baby	OB+	M carries, or lifts up, or leans B to a position closer to objects.
112115	Seat Baby on Lap	SB+	M seats B on her lap, closer to objects.
112121	Put O in B s Hand	PH+	M puts a toy in B's hand.
112122	Offer Object	GI+	M presents B with an object.
112123	Bring Object Near	BT+	M brings an object nearer to B.
112124	Lay out Options	LO+	M spreads out objects in front of B.
112125	Make Objects Available	MV+	M fetches objects for B to play with.
112126	Direct Attention to Objects	AT+	M emits signals that direct B's attention to specific object(s).
112127	Encourage to Manipulate O	EM+	M tries to entice B to play with an object within reach.

Code	Category	Symbol	Definition
112128	Stabilise Object	ST+	M holds out object steadily to B.
1112211	Support B Physically	PP+	M provides direct physical support to B to induce locomotion towards objects.
1112212	Remove Barrier	EX+	M removes obstacles that block B's path towards toys, to facilitate his locomotion towards them.
112221	Signal Attention to Object	SA+	M attracts B's attention to an object by way of luring him towards it.
112222	Encourage to Obtain	EO+	B entices B to approach an object out of reach.
121111	Re-orient B	OB*	M helps B to shift the orientation of his body to facilitate his contact with the toys he is manipulating.
121112	Advance Object Near	BT*	As 112123, to facilitate B's contact with the toys he is manipulating.
121113	Make Object Stable	ST*	M balances T for B so that he can continue his goal with it.
121114	Orient Object	OT*	M turns an object round so that its position becomes more suitable for B to act on.
121122	Indicate Match	PM*	M points to the object by which B can achieve his goal.
121123	Show Location	LO*	M indicates to B the location for fitting a match correctly (e.g. "Put it here").
121411	Inform of Error	IR*	M informs B that he has made an error but provides no information on the nature of the error or how to correct it (e.g. "This is wrong").
121412	Compare Results	CR*	M shows B his error by pointing out the incongruity or lack of similarity between the results he achieved, and a correct model.

Code	Category	Symbol	Definition
121413	Explain Error	ER*	M explains to B the source and nature of his error, (e.g. "This is too big and it won't go here").
121414	Point out Error	PE*	M points to the error but nothing more.
121421	Praise Verbally	PV*	M tells B he has done well.
121422	Praise non-Verbally	VV*	M rewards B for his success, non-verbally.
123111	Name Object	NT"	M tells B an object's name (e.g. "This is a book).
123112	Name Quality	NQ"	M desribes to B an object (e.g. "This is big").
123121	Refer to Similar Properties	NS"	M makes reference to objects with similar properties, (e.g. "This is big and that is big").
123122	Refer to Contrasting Properties	NO"	M makes reference to objects with opposite characteristics (e.g. "This is big and that is small").
123123	Refer to Complementary Properties	NC"	M makes reference to objects with complementary relations (e.g. "This is a cup and that is a saucer").
123131	Show Attribute	ST"	M highlights an object's attribute for B (e.g. Picture of animal at base of beaker).
123134	Point Attribute	PT"	M points at a certain feature of an object.
123133	Build Associations	AS"	M indicates to B the relationship between two or more attributes of an object. (e.g. On a posting box, she may indicate a triangular slot and then indicate the triangular shape that is posted through it).
123211	Group by Colours	GA"	M puts together objects of the same colour.
123212	Group by Shape	GB"	M puts together objects of the same shape.
123213	Group by Size	GC"	M puts together objects of the same size.
123214	Group by Function	GD"	M puts together objects that serve the same function (e.g. all cups together).
123221	Group by Opposite Colours	GE"	M puts together objects that have contrasting colours, (e.g. black and white).
123222	Group by Opposite Size	GF"	M puts together objects that have contrasting sizes (e.g. a big beaker and a small beaker).

Code	Category	Symbol	Definition
123223	Group by Opposite Shapes	GG"	M puts together objects that have a contrasting shape (e.g. a triangle and a circle).
123231	Accommodate Social Properties	RS"	M puts together objects that are related by their social functions (e.g. comb and mirror).
123232	Accommodate Technical Properties	RT"	M puts together objects that are related by their technical functions (e.g. box and beakers).
123331	Use container and contained	IN"	M uses one object as a container for others.
123332	Make a Stack	TK"	M stacks rings on a pole.
123333	Cover	CC"	M covers an object completely but without inviting B to search for the hidden object.
123334	Connect	XX"	M joins together several objects in an appropriate manner (e.g. threading beads on a string).
123335	Build Tower	TW"	M builds a tower with bricks.
123336	Slot	PO"	M posts shapes through holes.
123341	Innovate on Relationships	NR"	M uses an object in an unconventional manner with relation to B or to herself (e.g. placing a beaker on B's head as a hat).
123342	Innovate on Aspects	NU"	M relates objects together in an unconventional manner.
125121	Request Pointing	PN?	M requests B to point at an object she names.
125122	Request Locating	LC?	M requests B to locate and/or find an object she names.
125123	Request Familiar Gesture	RG?	M requests B to enact a gesture he has learnt to perform with objects (e.g. kiss the doll).
125221	Structure Task	SK?	M initiates a theme of play for B to pursue, other than one in which she requires B to perform a complementary response (e.g. give B dolly and ask him to feed it with the spoon).
125222	Indicate Relevant Feature	PF?	M points out to B the toys which are relevant to a specific task.
125311	Hide Infant	HB?	M hides B under a cover.
125312	Hide Self	HS?	M hides herself under a cover.
125313	Hide Object	HT?	M hides an object under a cover.
125321	Produce Receptacle	CN?	M gives B a container to fill with other objects.

Code	Category	Symbol	Definition
125322	Produce Filling Items	IT?	M gives B objects to put in a container.
125323	Produce Full Container	IC?	M gives B a full container to take objects out of.
125331	Give Support	SU?	M gives B a support on which an object out of his reach has been placed.
125332	Give Stick	SK?	M gives B a stick to rake an object out of reach.
125333	Give String	SG?	M gives B a string to pull in order to obtain an object tied at its end.
125331	Elicit Maintaining	TW?	M persuades B to build a tower.
125332	Elicit Disrupting	KK?	M persuades B to knock down a tower.
125333	Play Initial Move	IG?	M performs an act which invites B to play a particular game, but does not constitute a part of the game itself and would not be necessary in playing the game.
125512	Build Up	PG?	M performs the first part in a game up to a point where B may reciprocate.
125513	Prepare Next Round	R??	M initiates another round in the game, after one round has been terminated.
125514	Take Turn	TT?	M takes a turn in a game.
125521	Complement	CG?	M takes a turn in a game and this turn is complementary to B's.
125522	Appreciate Turn	AP?	M expresses delight or amusement on B's acts in a game.
125523	Synchronise	SY?	M performs a turn in a game simultaneously and of the same form as B's.
125524	Give Attention	AT?	M watches B perform his round in a game.
128211	Describe Process	JP/	M explains to B how to perform a task.
128212	Enact	EN/	M performs a task to B so that he may learn how to perform it.
128311	Enact Sub-Component 1	SA/	M performs one constituent part of a task so that B may learn how to perform it.
128312	Enact Sub-Component 2	SB/	M performs a second constituent part of a task so that B may learn how to perform it.
128313	Integrate	AB/	M combines together the two constituent parts of a task (e.g. to build a big tower M may first build a small tower, then she builds another similar tower and lastly she joins the two towers together).

Code	Category	Symbol	Definition
128321	Perform Orally	PO/	M performs the actions that lead to the achievement of a task by gesticulating them in the air.
128322	Perform With B	PB/	M holds B's hand and makes him perform the steps towards achieving a task.
129111	Keep in Field	TF=	M keeps B close to toys.
129112	Comfort	TD=	M comforts B when in distress.
129113	Regain Attention	TA=	M directs B's attention to toys.
129121	Holds out Objects	TH=	M displays an object for B to see.
129122	Reveal Outcome	TO=	M tells B what she is going to do with the toys.
129131	Tap Object	TT=	M creates noise by hitting a toy gently with her finger or with an object.
129132	Nudge Baby	TB=	M touches B which may make him attentive to her.
129133	Tell to Attend	TV=	M tells B to attend to her activities with the toys.
129141	Give Dummy	TP=	M pacifies B by giving him his dummy.
129151	Expand Theme to new Action	TC=	As 12542, but here in order to teach B how to expand his theme to new actions.
129152	Expand Theme to new Object	TX=	As 12542, but here in order to teach B how to expand his theme to new objects.
129211	Supplement with Vocal Markings	VM	As 12811, but here in order to get B to imitate M's actions.
129212	Exaggerate Movement	XM	As 12812, but here in order to get B to imitate M's actions.
129221	Enact	EN	As 128212, but here in order to get B to imitate M's model.
129231	Instruct + Model	MM	As 12821, but here in order to get B to perform the activity immediately after M's instructions.
129232	Describe Process	JP	As 128211, but here in order to get B to perform the activity M had described.
129242	Issue Imperatives	CM	M tells B what to do in order to achieve a task.
129251	Break up Task	BK	As 12831, but here in order to get B to imitate M's actions.
129252	Shadow	SW	As 12832, but here in order to get B to imitate M's actions.
129411	Focus Gaze	FG	M looks at B expectantly.
129412	Alternate Gaze	AG	M looks from B to the toys with which she expects him to perform a task.

Code	Category	Symbol	Definition
129421	Invite	VM	M tells B to imitate her actions with objects.
129422	Nudge Baby	NB	M touches B so that his attention may be directed to the objects with which she wants him to achieve a task.
129423	Tempt by Display	DY	M holds out object to B to tempt him to imitate her activities with it.
129511	Facilitate Contact	HB	As 12111 but here to assist B's imitation of M's activities.
129512	Provide Match	GT	As 11212 but here to assist B's imitation of M's activities.
129521	Solve Part	PP	As 12122 but here to assist B's imitation of M's activities.
129522	Solve Whole	PW	As 12123 but here to assist B's imitation of M's activities.
129523	Guide Hand	GU	As 12131 but here to assist B's imitation of M's activities.
129531	Change Object	CH	As 12131 but here to correct B's imitation of M's activities.
129532	Change Position	CP	As 12132 but here to correct B's imitation of M's activities.
129533	Change Orientation	OR	As 12134 but here to correct B's imitation of M's activities.
129541	Inform of Success	FS	As 12142 but here to inform B about the outcome of his imitation of M's activities.
129542	Inform of Error	FF	As 12141 but here to inform B about the outcome of his imiation of M's activities.
1111111	Hold back Baby	-H-	M physically restrains B from wandering away from toys.
1111112	Place Barriers	-B-	M places an obstacle such as a piece of furniture in front of B to restrict his movements away from toys.
1111121	Guide Back	-U-	M holds B from his hand and walks with him back to the toys.
1111122	Call Back	-C-	M tells B to come back to the toys.
1111123	Lure Back	-L-	M persuades B to come back to the toys.
1111211	Change B's Position	-P-	M places B in a different orientation.
1111212	Rock Baby	-R-	M places B on her lap and rocks him rhythmically.
1111213	Cuddle Baby	-D-	M hugs B firmly to her.
1111211	Re-position B	-P-	M removes B from one position to another closer to her.

Code	Category	Symbol	Definition
1111221	Display O	-Y-	M holds out O to B to tempt him with it.
1111222	Give O	-G-	M gives B an object.
1111223	Vary Aspects of Stimulus	-V-	M makes an object more attractive to B by introducing changes in its characteristics.
1111311	Remove Baby	-W-	M picks up B to remove him from competing stimuli.
1111312	Remove Object	-T-	M removes the competing stimuli away from B.
1111313	Prohibit	-O-	M forbids B to engage in behaviours other than that of playing with the toys she provides.
1111321	Propose a new Activity	-A-	M puts forward a new activity as an alternative to the one in which B is involved.
1111322	Propose a new Object	-J-	M offers B an object as an alternative to the one which he is already manipulating.
1112211	Leans Towards Baby	-F-	M leans forward so that the distance between her and B is reduced.
1112212	Sit Closer to B	-S-	M sits in a new location which reduces the distance between her and B.
1112221	Kiss	-K-	M kisses B.
1112222	Stroke B	-Q-	M strokes part of B's body.
1112441	Laugh/Smile	-M-	M laughs or smiles in appreciation of something B has done.
1112442	Exclaim	-X-	M exclaims in appreciation of something B has done.
1121261	Nudge B	+B+	M touches B which may make him attentive to her.
1121262	Tap Object	+T+	M hits an object gently which may direct B's attention to it.
1121263	Tell to Attend	+V+	M tells B to attend to objects.
1121271	Encourage Verbally	+E+	M vocalises to B encouraging him to manipulate objects.
1121272	Place Object out of Reach	+R+	M places an object at a distance from B to tempt him to reach it.
1122111	Support Crawling	+K+	M induces B's crawling movements towards objects, thereby facilitating his contact with them as well as his motor development.
1122112	Support Walking	+W+	M induces B's walking towards objects.
1122211	Nudge B	+N+	M touches B to encourage him to locomote towards an object out of reach.
1122212	Tap T	+Y+	M hits object gently to encourage B to locomote towards it.

Code	Category	Symbol	Definition
1122213	Tell to Attend	+A+	M tells B to attend to an object as a way of encouraging his locomotion towards it.
1122221	Encourage Verbally	+I+	M vocalises to B to encourage him to locomote towards an object out of reach.
1122222	Highlight Object	+H+	M holds out an object to B to encourage him to locomote towards it.
1211131	Hold Steady	*S*	M holds object steady to enable B to achieve his goal with it.
1211132	Fit Properly	*F*	M fixes an object in a location firmly, to enable B to proceed with his goal.
1214221	Give Reward	*R*	M gives B a material reward (e.g. sweets for succeeding in his goal).
1214222	Kiss	*K*	M kisses B for succeeding in his goal.
1231111	Name Object from Environment	"A"	M tells B the name of an object he sees in his surroundings.
1231112	Name Object from a Picture	"B"	M tells B the name of an object he sees in a picture.
1231113	Imitate Sound	"P"	M imitates the sound of an object B is looking at.
1231121	Name Colour	"C"	M tells B the colour of an object.
1231122	Name Shape	"D"	M tells B the shape of an object.
1231123	Name Size	"E"	M tells B the size of an object.
1231211	Name Similar Items	"F"	M tells B the names of objects sharing the same characteristics (e.g. "This is a book and that is a book.")
1231212	Name Similar Shapes	"G"	M makes reference to objects of similar shapes (e.g. "This is a circle and that is a circle.")
1231213	Name Similar Sizes	"H"	M makes reference to objects of similar sizes (e.g. "This is a big beaker and that is a big cup."
1231214	Name Similar Colours	"I"	M makes reference to objects of the same colour (e.g. "This is a red beaker and that is a red ball.")
1231221	Name Different Identities	"J"	M tells B the names of objects of different identities (e.g. "This is a cat and that is a dog.")
1231222	Name Different Shapes	"K"	M makes reference to objects with different shapes (e.g. "This is a square and that is a circle.")
1231223	Name Different Colours	"L"	M makes reference to objects with different colours (e.g. "This is a black shoe and that is a white shoe.")

Code	Category	Symbol	Definition
1231224	Name Opposite Sizes	"M"	M makes reference to objects of different sizes (e.g. "This is a big beaker and that is a small beaker.")
1231231	Name Social Properties	"N"	M makes reference to social objects that are related to each other (e.g. "This is a spoon and that is a cup.")
1232232	Name Technical Properties	"O"	M makes reference to objects that are technologically related to each other (e.g. "This is a shape and that is a posting box.")
1233311	Put In	"P"	M puts objects inside a container, one by one.
1233312	Heap	"Q"	M puts several objects at once inside a container.
1233313	Nest	"R"	M nests smaller objects inside a bigger one.
1233314	Take Out	"S"	M takes objects out of a container.
1233315	Tip Out	"T"	M inverts a container to get out its contents.
1233316	Dismantle Nest	"U"	M takes off an object that was nested inside another.
1233317	Transfer	"V"	M transfers objects from one container to another.
1233321	Stack On	"W"	M stacks an object through a pole.
1233322	Unstack	"X"	M removes objects off a stacking pole.
1233331	Cover Partially	"Y"	M hides part of an object under a cover.
1233332	Cover Completely	"Z"	M completely hides an object under a cover.
1233333	Uncover	"A=	M removes a cover from an object to reveal it.
1233341	Connect Object	"B=	M connects one object to another.
1233342	Disconnect	"C=	M disconnects one object from another.
1233351	Build Tower	"D=	M builds a tower with bricks.
1233352	Duplicate Tower	"E=	M builds two towers.
1233353	Join Two Towers	"F=	M joins one tower with another.
1233354	Dismantle Tower	"G=	M pulls down the tower by removing the bricks one at a time.
1233411	Relate Object to Object	"H=	M uses one object with another in an unconventional manner (e.g. put beaker on Teddy's head.)
1233412	Relate Object to Baby	"I=	M uses an object in combination with B in an unconventional manner (e.g. put beaker on Baby's head).

Code	Category	Symbol	Definition
1233413	Relate Object to Self	"J=	M uses an object in combination with herself in an unconventional manner (e.g. put beaker on her head).
1233421	Create Spectacle	"K=	M assembles or activates objects in such a way as to produce an interesting spectacle.
1233422	Vary Aspects of Spectacle	"L=	M makes variations on an interesting spectacle.
1252221	Give Relevant Object	?G?	M gives B the object relevant to the task she wants him to perform.
1252222	Point at Object	?P?	M points with her finger at the object which is relevant to the task she wants him to perform.
1252223	Show Location	?L?	M points at the location where B should fit an object relevant to the task she wants him to perform.
1253131	Hide Partially	?H?	M covers part of an object for B to find.
1253132	Hide Completely	?C?	M covers the entire object for B to find.
1253311	Tell to Maintain	?V?	M requests B to build a tower.
1253312	Entice to Maintain	?N?	M induces B to build a tower.
1253321	Tell to Disrupt	?K?	M requests B to knock down a tower.
1253322	Entice to Disrupt	?E?	M induces B to knock down a tower.
1282111	Describe Steps	/J/	M explains to B the steps towards the achievement of a task.
1282112	Build Associations	/S/	M shows B how to perform a task by highlighting the features of one object and the complementary ones of another, telling B how to link the two together (e.g. "Put the round shape through the round hole.")
1292311	Describe Process	A	As 128211, but here to teach B in order that he may perform a task.
1292312	Issue Imperatives	B	M tells B what to do in order to achieve a task.
1292321	Enact	C	As 128212, but here to teach B in order that he may perform a task.
129241	Describe Steps	E	As 1282111, but here to teach B how to perform the task, following M's instructions.

Code	Category	Symbol	Definition
1292412	Form Associations	F	As 1282112 but here to teach B how to perform the task, following M's instructions.
1292511	Enact sub-component 1	I	As 128311 but here in order to get B to imitate M's actions.
1292512	Enact sub-component 2	J	As 128312 but here in order to get B to imitate M's actions.
1292513	Integrate	K	As 128313 but here to teach B in order that he may imitate M's actions.
1292521	Perform Orally	L	As 128321 but here to teach B in order that he may imitate M's actions.
1292522	Perform with Baby	M	As 128322 but here to teach B in order that he may imitate M's actions.
1294211	Invite Verbally	N	M tells B to imitate her activities.
1294212	Invite non-Verbally	O	M gestures to B so that he may imitate her activities.
1295111	Change B's Orientation	P	As 121111 but here to help B in his imitation of her activities.
1295112	Advance Object Near	Q	As 121112 but here to help B in his imitation of her activities.
1295113	Stabilise	R	As 121113 but here to help B in his imitation of her activities.
1295114	Re-orient Object	S	As 121114 but here to help B in his imitation of her activities.
1295121	Offer	T	As 121121 but here to help B in his imitation of her activities.
1295122	Point	U	As 121122 but here to help B in his imitation of her activities.
1295123	Show Location	V	As 121123 but here to help B in his imitation of her activities.
1295411	Give Verbal Praise	W	As 121421 but here in response to B's imitation of M's activities.
1295412	Give non-Verbal Praise	X	As 121422 but here in response to B's imitation of M's activities.
1295421	Tell Error	Y	As 121411 but here in response to B's imitation of M's activities.
1295422	Compare Models	Z	As 121412 but here in response to B's imitation of M's activities.
1295423	Explain Error	A=	As 121413 but here in response to B's imitation of M's activities.
1295424	Point at Error	B=	As 121414 but here in response to B's imitation of M's activities.
11111221	Call B's name	N-B	M calls B by his name when he is away from the field of play.

Code	Category	Symbol	Definition
11111222	Request Return	R-R	M tells B to come back to the field of play.
11111231	Direct Attention	R-A	M directs B's attention to a toy.
11111232	Highlight Object	H-T	M displays an object to B which may make him interested in it.
11112231	Create Visual Spectacle	V-S	M highlights the visual attractiveness of an object to B (e.g. a toy dog with a tail is made to wag it vigorously).
11112232	Create Rhythm	C-R	M highlights the musical qualities of an object to B (e.g. a squeaking toy is made to emit noise in a rhythmic fashion).
11113121	Take Away	T-A	M takes an object away from B to terminate his activity with it.
11113122	Place out of Reach	O-R	M takes an object away from B and places it out of his reach to terminate his activity with it.
11113123	Hide Away	H-O	M takes an object away from B and hides it out of his sight to terminate his activity with it.
11113124	Ask for Object	R-T	M requests B to give her an object to terminate his activity with that object.
11212711	Command	V+C	M tells B to manipulate an object.
11212712	Exclaim	V+X	M makes an exaggerated sound in reference to an object to encourage B to manipulate it.
11221111	Place B on Floor	B+F	M places B on the floor in sight of objects thus allowing him to crawl towards them.
11221112	Push B's Feet	P+F	M pushes B's feet while he is in a prone position, thus allowing him to crawl towards objects.
11221121	Stand Baby	D+B	M lifts B to a standing position thus allowing him to walk towards objects.
11221122	Hold Baby's Hand	H+H	M holds B's hand while he is standing and walks with him towards objects.
11221123	Provide Cart	C+A	M provides a mobile support, e.g. cart, for B to use thus enabling him to walk towards objects.
11222211	Make an Imperative	I+M	As 8010 b but here to support B's approach to toys.
11222212	Exclaim	E+X	As 8011 b but here to support B's approach to toys.
11222221	Display	D+Y	M holds out an object to display it to B.

Code	Category	Symbol	Definition
11222222	Turn round	T+R	M turns round an object to display it to B.
12334111	Make a Visual Spectacle	V"S	M makes an attractive spectacle with toys to show B another function of object.
12334112	Create Rhythm	R"S	M makes object emit sounds thereby revealing to B another function of object.
12334113	Vary Visual Spectacle	V"V	M adds improvised variation to the visual properties of an object (e.g. spin a bangle).
12334114	Vary Rhythm	V"R	M adds improvised variation to the auditory properties of an object (e.g. make a squeaking toy play the tune of "Jingle Bells.")
12533121	Give Object	G?M	M gives B the appropriate object for building a tower.
12533122	Indicate Object	P?M	M points at the appropriate object for building a tower.
12533123	Show Location	L?M	M points out the location where B could place an object thereby building a tower,
12533221	Nudge Baby	N?B	M touches B to persuade him to knock down a tower.
12533222	Tap Tower	T?T	M taps the tower she built for B to knock down.
12533223	Bring Tower Near	B?N	M brings a tower nearer to B to knock down.
111112211	Tap Object	--T	As 1121262 but here to get B back to toys.
111112212	Nudge B	--B	As 1121261 but here to get B back to toys.
111112213	Vocalise	--V	As 1121263 but here to get B back to toys.

APPENDIX B

Steps followed in the construction of the Hierarchy

1. Beginning with categories that make direct reference to features of form, e.g. 'look', 'touch', 'bring toy near', etc, the categories that share functional similarities were grouped together to distinguish them from others.

2. A group of similar categories are then assigned to another category on a level immediately above them. This new category denotes the function which the subordinate categories could achieve.

3. Categories that occupy the new level were also clustered in terms of similarity and each new cluster was assigned to a new superior category at a higher level immediately above them.

4. The procedure was continued until level 4 upwards was reached.

5. The process of generating categories and sub-categories was then begun with the category of 'create possibilities'. This was assigned to the top level of the hierarchy (level 1) and from it two other categories were generated and which represented subordinate categories to 'create possibilities', being assigned to a lower level (level 2).

6. Further categories were generated from the categories at level 2, thus resulting in level 3 categories.

7. The two parts of the hierarchy were then joined together.

The ordering of the elements within a cluster is largely arbitrary, although an attempt was made to define the pattern of progression from one element to another on the basis of simple to complex, or initial to terminal.

(i) In 'Assist' the sub categories of 'provide match' are ordered as follows, 'give', 'indicate', 'show location'. This is an example of progression from simple acts to complex acts: give requires less pro-formative skills from the infant than 'indicate' and so on.

(ii) In 'Teach' its sub-categories are arranged as follows: 'recruit', 'demonstrate', 'allow', 'assist'. This is an example of progression from initial to terminal since recruit marks the onset of a sequence of actions and 'assist' marks its termination.

APPENDIX C

Table 3.5 Mean percentage of observation time spent by the mothers of the four groups of infants in talking to others. The infants' ages in groups A to D are 6 to 9 months; $9\frac{1}{2}$ to 12 months; $12\frac{1}{2}$ to 15 months and $15\frac{1}{2}$ to 18 months, respectively.

Group	Mean Percentage			
	1st month	2nd month	3rd month	Overall
A	2	2.5	2.5	2.5
B	1	2	2	2
C	1	3	4	3
D	4	4	2	4

Table 3.6 Mean percentage of observation time spent by the mothers in the four groups in 'leaving field' activities.

Group	Mean Percentage			
	1st month	2nd month	3rd month	Overall
A	1	0	2	1
B	2	4	2	2.5
C	2	2	3	2
D	1	1	2	1

Table 3.7 Mean percentage of observation time spent by the mothers of the four groups in social play with their infants.

Group	Mean Percentage			
	1st month	2nd month	3rd month	Overall
A	2	5	5	5
B	2	0	1	1
C	2	4	2	2
D	0	1	0	0

APPENDIX D

(i) Definitions of Solitary Acts and their Sub-categories

Code	Category	Abbreviation	Definition
1	Solitary acts	SO	Acts involving a recognisable form of object manipulation which the infant pursues independently of the mother.
11	Single objects acts	SS	Independent infant's play involving only one object.
12	Multiple objects acts	SM	Independent infant's play involving more than one object.
111	Undifferentiated acts	SUD	Incidental manipulation of objects in which the infant does not discriminate between properties of various objects.
112	Differentiated acts	SDD	Specific manipulation of objects in which the act is appropriate to the characteristics of the object.
113	Mechanical acts	SKL	Manipulation of mechanical toys such as ones with winding devices.
114	Social acts	SOC	The use of objects with social functions in a conventional manner.
115	Unconventional acts	SUC	Use of an object in an imaginative manner.
116	Symbolic acts	SYM	Naming an object or its attribute.
121	Combine	SCM	Manipulating 2 objects together without making appropriate association between them.
122	Construct	SCN	The integration of two or more objects and assembling them into a structure.
123	Accommodating	SAM	Relating two or more social objects in functionally appropriate associations.
124	Grouping	SGR	Clustering together objects that share similar identities or functions
1111	Mouth object	STO	Oral contact with object.
1112	Hold object	SHO	Infant holds an object with one or both hands steadily.
1113	Inspect visually	SVI	Infant holds object close to face and looks at it intently.
1114	Pat object	SPA	Infant hits an object with open palm rhythmically.
1115	Wave object	SWA	Infant holds object and swings it about slowly in the air.

Code	Category	Abbreviation	Definition
1116	Manual-visual manipulation	SMV	Infant transfers object from one hand to another while looking at it intently.
1117	Hit object on surface	SHS	Infant brings an object down to make it hit a surface with a bang. The movement may be repeated rhythmically.
1118	Turn round object	STR	Infant rotates object while looking at it.
1119	Swipe	SSK	Infant flings object about while it is on a surface.
1110	Explore with finger	SXF	Infant holds object in one hand, while passing the index finger of the other hand around its contours.
1215	Perform 2 acts simultaneously	SAA	Infant manipulates an object in one way while engaging in another activity with another object.
1121	Pull/tear/squeeze	SQQ	Self-explanatory.
1122	Scrape	SRO	Infant moves an object across a surface while holding it firmly so that there is friction between object and surface.
1123	Shake	SRA	Infant moves object up and down in a vigorous manner.
1124	Open/close	SOS	Infant engages in a ritual of half opening and half closing an object with a lid or cover.
1131	Activate manually	SOM	Infant attempts to set a mechanical toy in motion manually, e.g. by making it walk or by shaking it or tapping it on a surface several times.
1132	Attempt to operate	SAW	Infant manipulates the operating device of an object in an attempt to reactivate it.
1133	Operate object	SOW	Infant operates a mechanical object.
1141	Drink/eat/hug	SSF	Self-explanatory.
1161	Imitate sound	SSY	Infant expresses a recognition of a live or pictured object by referring to it by the sound it makes, e.g. "Bow-wow" for a dog.
1162	Call by a special name	SNK	Infant refers to a particular object by a word-like creation of his own, e.g. "ta" for food.
1163	Call by proper name	SNM	Infant refers to an object by its name as used in adults' speech.

Code	Category	Abbreviation	Definition
1151	Innovate use	SIN	Infant uses an object in an imaginative manner such as roll a beaker as a ball.
1152	Innovate in relation to self	SIF	Infant relates an object to himself in an imaginative manner, e.g. wear a beaker as a shoe.
1211	Hold 2 objects	SHH	Infant holds 2 objects, one in each hand, passively.
1212	Hit 2 objects together	SHT	Infant holds one object in each hand and bangs the two together repeatedly.
1213	Hit one object with another	STT	Infant bangs one object on another repeatedly.
1214	Poke one object with another	SPT	Infant makes one object touch or rub another forcefully.
1215	Performs 2 acts simultaneously	SAA	Infant manipulates an object in one way while engaging in another activity with another object.
1221	Construct nest	SBB	Infant manipulates object that can be nested together.
12211	Nest	SBT	Infant fits objects inside one another.
12212	Dismantle nest	SNN	Infant takes apart the pieces that were nested together.
12220	Use container	SBB	Infant associates between objects as container and contained.
12221	Put in	SBI	Self-explanatory.
12222	Take out of container	SBO	Self-explanatory.
12223	Tip	SBP	Infant reverses a receptacle in order to get object out of it.
12224	Transfer	SBC	Infant takes objects out of one container and puts them in another.
12225	Palm in container	SBN	Infant manipulates articles in a container but without taking them out.
1223	Structure tower	STT	Infant uses objects that could be assembled into a tower.
12231	Build tower	ST+	Self-explanatory.
12232	Approximate tower	ST-	Infant attempts to build a tower but fails to maintain the objects in equilibrium due to several reasons such as choosing the wrong batch or not fitting the match firmly to the structure.

Code	Category	Abbreviation	Definition
12233	Knock down tower	SBK	Self-explanatory.
1224	Connect	SXX	Infant manipulates objects that could be fitted together.
12241	Fit	SBX	Infant fits together objects, e.g. a train toy to a carriage, or plastic threading beads.
12242	Disconnect	SX-	Infant disconnects objects that were fitted together.
1225	Post	SPO	Infant manipulates posting box and shapes.
12251	Attempt to post with incorrect match	SS-	Infant attempts to slot a shape through the wrong hole.
12252	Attempt to post with incorrect orientation	SSO	Infant attempts to slot a shape through the correct hole but by holding the shape in an incorrect orientation, e.g. holding a cylindrical shape horizontally instead of vertically.
12253	Slot	SSS	Infant posts a shape through its hole.
12234	Dismantle tower	SW-	Infants take apart the pieces that formed a tower.
12212	Dismantle nest	SNN	Infant takes apart the pieces that were nested together.
12225	Palm in container	SBN	Infant manipulates articles in a container but without taking them out.
1226	Stacking pole		Infant manipulates stacking pole and rings.
12261	Stack	SKK	Infant stacks rings through a pole.
12262	Unstack	SUK	Infant pulls rings off the stacking pole.
1231	Sir/pour/hammer	SAC	Self-explanatory.
1241	Relate functions	SRF	Infant clusters together two or more objects that are functionally associated, e.g. spoons are grouped together with cups but not with bricks.
1242	Relate shapes	SRH	Infant clusters together two or more objects that have similar shapes.
1243	Relate sizes	SRS	Infant clusters together objects os the same size.
1244	Relate colours	SRI	Infant clusters together objects of the same colour.
1232	Hide object	SRC	Infant covers an object with another

(ii) Definitions of Object-Contact Acts

Code	Category	Abbreviation	Definition
2	Object-contact acts	CT	Acts that bring infant into contact with objects.
21	Proximal contact	CP	Acts that bring infant into tactile contact with objects within reach.
22	Distal contact	CD	Acts that bring infant into visual or eventual tactile contact with objects.
211	Direct proximal contact	CDP	Acts that bring infant into tactile contact with objects through using simple eye-hand coordinations.
212	Indirect proximal contact	CIP	Acts that bring infant into tactile contact with object that are not readily obtainable by simple eye-hand coordination.
221	Passive distal contact	CPD	Visual contact with objects.
222	Active distal contact	CAD	Acts that express the intentions to achieve tactile contact with objects.
2111	Touch object	CCH	Self-explanatory.
2112	Grasp object	CGR	Infant extends his arm and closes his fist on a visually presented object.
2113	Take away	CTA	Infant removes an object from somebody's hand.
2114	Pick up	CPK	Infant picks up an object from a surface.
2121	Pull near	CPU	Infant brings an object nearer to him.
2122	Remove from shelf	CSH	Self-explanatory.
2123	Uncover	CUC	Infant obtains an object which was accidentally hidden.
2211	Gaze at object	CLT	Self-explanatory.
2212	Localise	CLO	Infant locates visually the whereabouts of an object.
2221	Reach for	CRC	Infant extends his arm towards a distant object.
2222	Approach	CAP	Infant locomotes towards object.
2223	Search	CSE	Infant searches manually, and/or visually for an object he had lost contact with.

(iii) Definitions of Sequential Acts

Code	Category	Abbreviation	Definition
3	Sequential acts	SQ	Acts which infants perform as part of a sequence with another interactant.
31	Self-initiated	QI	Infant performs the initial act in a sequence, which is to be complemented by the mother.
32	Mother-initiated	QR	Infant complements an act that was initiated by the mother.
311	Initiated object-exchange	QOF	Infant offers an object to mother.
312	Imperatives	QIR	Infant makes a request.
313	Declaratives	QDC	Infant elicits joint-attention to an object and focuses on it as a topic of conversation.
314	Initiate game	QJG	Infant starts a game with mother.
315	Interrupt	QII	Infant interrupts a mother's activity thereby introducing his own sequence of activities. (This action has the potential of eliciting a reaction from mother as resisting the infant's interruption).
321	Accept object exchange	QTA	Infant is willing to share objects with mother.
322	Attend	QAT	Infant responds to the mother's signals to gain his attention to an object or activity.
323	Reciprocate task	QDI	Infant performs a complementary act to the mother's actions on an object or request to perform a specific action with the object.
324	Imitate	QIM	Infant re-enacts a modelled action.
325	Comply	QOB	Infant obeys mother's command, request or instruction.
326	Reciprocate	QRG	Infant plays a reciprocal role in a game.
327	Appreciate spectacle	QSP	Infant watches with interest and delight a display of toys created by the mother.
3111	Offer/withhold	QG-	Infant offers an object to mother but does not let go of it.
3112	Offer/give	QG+	Infant gives an object to mother.
3121	Look/vocalise	QMV	Infant looks at object and vocalises in intonation indicating request. (This action is interrupted - by mother - as wanting the object).

Code	Category	Abbreviation	Definition
3122	Give object/ vocalise	QGV	Infant gives an object to mother and vocalises in intonations indicating a request. (This action is interpreted as wanting the mother to perform a certain action with the object).
3131	Show object	QSH	Infant holds out an object for mother to see, but not to take away.
3132	Point/vocalise	QPV	Infant points at an object while telling mother something about it, e.g. its name.
3133	Look/vocalise	QLV	Infant looks at an object while saying something about it.
3141	Play first move	QGI	Infant plays the first round in a game.
3142	Prepare next round	QGR	Infant prepares for a new cycle of the same game to be played again, e.g. if the game was for the mother to put a beaker on Baby's head and exclaim when B drops it, then B prepares a round by giving the beaker back to M.
3211	Receive object	QRC	Infant takes an offered object.
3212	Give on request	QGG	Infant gives mother an object she asked for.
3221	Look at mother	QLM	- in response to mother's signals.
3222	Look at object	QLT	- in response to mother's signals.
3231	Hidden object	QCC	Infant reciprocates task involving hiding objects.
3232	Use of container	QBC	Infant reciprocates a task that involves the use of containers.
3233	Means and ends	QME	Infant reciprocates a task involving use of specific means to obtain certain ends, e.g. pulling a toy near by a string.
3234	Equilibrium	QQQ	Infant reciprocates a task involving equilibrium between objects.
3241	Perform with mother	QMM	Infant re-enacts a model by following mother's movements as she guides his hand.
3242	Approximate model	QM-	Infant re-enacts a model with partial success.
3243	Re-enact	QEM	Infant replicates a modelled action.
3251	Perform act	QPA	Infant performs an act which his mother had requested of him, e.g. kiss dolly.

Code	Category	Abbreviation	Definition
3252	Fetch	QFT	Infant looks for an object his mother had requested him to find.
3253	Recognise	QRZ	Infant gives the right answer to mother's questions regarding the identities of objects, e.g. "where is your ball?" A. point at ball.
3254	Give answer	QRP	Infant gives a verbal response (usually naming an object) in response to his mother's question.
3261	Anticipate	QAC	Infant shows expectation of the mother's move in a game, e.g. coy smile in a tickling game when Mother's hand comes closer to B.
3262	Complement	QCP	Infant takes the complementary turn in a game, e.g. mother builds tower; B claps his hands.
3263	Appreciate	QAP	Infant shows delight when the peak of a game is reached, e.g. laughing at being tickled in a game auch as 'Round about the Garden'.
3264	Synchronise	QSY	Infant matches his role with that of the mother, e.g. joint clapping.
3265	Watch move	QLA	Infant watches mother while taking a turn in a game.
32311	Find	QFI	Infant finds an object hidden by M under a cover.
32312	Search	QSE	Infant lifts covers in search of an object hidden by M.
32321	Empty container	QOU	Infant takes out items from a container, filled by M.
32322	Play with contents	QUU	Infant plays with the contents in a receptacle provided by the mother.
32323	Fill container	QIN	Infant puts items in a receptacle provided by M.
32331	Knock	QKK	Infant knocks down a tower constructed by M.
32332	Build tower	QTW	As in SO but here in response to M's request.
32332	Approximate tower	QW-	As in SO but here in response to M's request.

Code	Category	Abbreviation	Definition
2224	Point	CPN	Infant indicates with his finger an object while looking at it.
2225	Let go	CLL	Infant drops an object.
2226	Position self	CVO	Infant shifts from one posture to another in order to gain contact with an object.
22121	Look at point of disappearance	CLD	Infant attempts to locate an object, by focusing his gaze on the point in space where he saw the object disappear.
22122	Follow direction of fall	CLF	Infant attempts to locate an object that dropped by following its trajectory.
22123	Turn to source of sound	CLS	Infant locates an object in space by the sound it emits.
22221	Walk with support	CW+	Infant walks towards object holding on to mother or to furniture.
22222	Walk without support	CW-	Infant walks, unsupported, to the object.
22223	Crawl	CCR	Self-explanatory
22224	Stand	CSD	Infant stands up in order to reach an object.
22225	Make a detour	CDT	Infant walks or crawls to object by going round a barrier.

(iv) Definitions of Negative Acts

Code	Category	Abbreviation	Definition
4	Negative acts	NE	Acts or states that decreases the likelihood of the infant initiating contact with toys or manipulating them, or that lead to a terminating of infant's contact and manipulation.
41	Distracted	NA	Infant's attention is directed to aspects in the environment other than the toys.
42	Distressed	ND	Infant is emotionally upset.
43	Protest	NP	Infant objects against a course of action taken by others.
44	Abandon play	NF	Infant rejects toys and ceases to play with them.
45	Substitute play	NS	Infant seeks another source of play in preference for playing with his toys with mother.
411	Look round	NLR	Infant is gazing into space.
412	Look at E	NLE	Infant focuses his gaze on the experimenter.
413	Look at sibling	NLC	Infant focuses his gaze on his brother or sister as they pursue their own activities.
421	Cry	NCR	Self-explanatory.
422	Fuss	NFS	Infant is whimpering or fretting.
423	Scream	NSC	Infant is shrieking in distress.
424	In temper	NTM	Infant engages in a temper tantrum.
431	Protest for prohibited object	NPO	Infant objects at being prevented from manipulating a specific object.
432	Protest for prohibited action	NPA	Infant objects at being prevented from indulging in a certain action.
433	Protest for leaving adult	NPM	Infant objects to the disappearance of an adult from his field of play.
434	Protest for leaving sibling	NPC	Infant objects to a brother or sister leaving the room where he is playing.
441	Leave field	NLV	Infant rejects play with toys.
442	Seek contact with M	NCT	Infant abandons play with toys in favour of seeking physical contact with mother alone.
443	Annoy	NWI	Infant is disobedient or non-cooperative or indulging in activities not allowed by his mother.

Code	Category	Abbreviation	Definition
451	Seek contact with E	NCE	Infant abandons play with mother and toys in favour of establishing contact and/or play with the experimenter.
452	Play with equipment	NVT	Infant reaches for and attempts to manipulate the camera and video-recorder.
453	Play with prohibited objects	NPF	Infant seeks contact with and attempts to manipulate valuable household objects such as ornaments.
4241	Stretch on floor	NFL	Infant expresses his temper by throwing himself and stretching his body on the floor. This is usually accompanied by crying or screaming.
4242	Arch body	NRB	Infant expresses his anger by curling his body up while lying on the floor, usually accompanied by crying or screaming.
4243	Kick legs	NKL	Infant expresses his anger by kicking his legs in the air, accompanied by crying or screaming.
4411	Destroy object	NSW	Infant tampers with the toys.
4412	Move away	NMA	Infant walks or crawls away from the toys.
4413	Fling objects	NHT	Infant throws or swipes away the toys
4414	Reject toy	NRJ	Infant refuses to accept an offered toy.
4421	Reach for M	NRM	Infant moves towards mother or extends his arms to her.
4422	Cling to mother	NCM	Infant grips mother's body or clothes.
4423	Search for mother	NSM	Infant looks around for mother after she had disappeared from the room.
4431	Resist	NRS	Infant withholds object and refuses to give it to adult or to allow adult to guide him in performing a specific activity with it.
4432	Say "no"	NNO	Self-explanatory: in response to mother's requests or instructions.
4433	Climb on furniture	NFU	Infant is up and down on armchairs, settees and tables.
4434	Desultory movements	NMV	Infant walks aimlessly around the room.
4435	Hide self	NHS	Infant hides himself away from mother's reach, e.g. under or behind furniture.
4436	Hit mother	NAG	Infant hits mother with his hand or with an object.

Instructions Sheet

APPENDIX E

(i) Scale I : Development of permanence of object

	Scale Step	Age
Situation 3: Finding an object which is partially covered.	3	3-5m

Objects: 2 sets a) doll underneath cloth

b) doll behind screen (book or board)

2 presentations of each set.

Directions:

1. Establish interest in T
2. Take T and place within B's reach
3. Cover T partially with cloth or screen (head or feet showing)

	Scale Step	Age
Situation 4: Finding an object which is completely covered.	5	7 months

Objects: 3 sets of objects, each set presented twice.

Set 1: Toy (doll) and screen

Set 2: Smartie/cup

Set 3: Toy (doll) and cloth

Directions:

1 & 2 (as above)

3: Cover T completely with cloth or screen

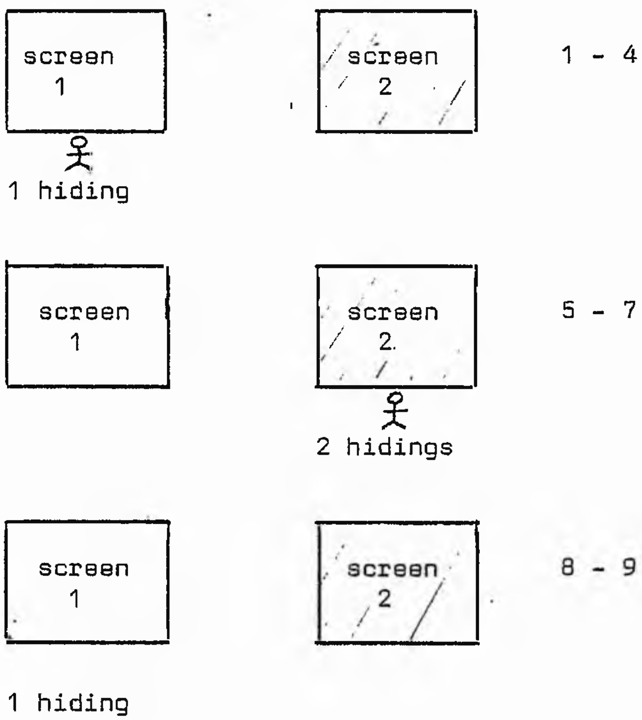
	Scale Step	Age
Situation 5: Finding an object which is completely covered with a single screen in 2 places.	6	7 months

1 set of objects: Toy/cloth; scarf.

Directions:

1. Following 2 successful retrievals from 4.
2. Introduce scarf (screen 2) and place on right side of cloth (screen 1)
3. Completely cover object with cloth *

	Scale Step	Age
4. Leave screens in present positions		
5. Completely cover object with scarf (screen 2)	*	
6. Repeat hiding under scarf once more	*	
7. Leave screens in present positions		
8. Cover object completely under cloth (screen 1)	*	



<u>Situation 6:</u> <u>Finding an object which is completely covered with a single screen whose place is alternated with another screen.</u>

Follows from 4 & 5

<u>Objects</u>: 2 sets

Set 1: Sweetie under 1 of 2 beakers (different colours, same size)

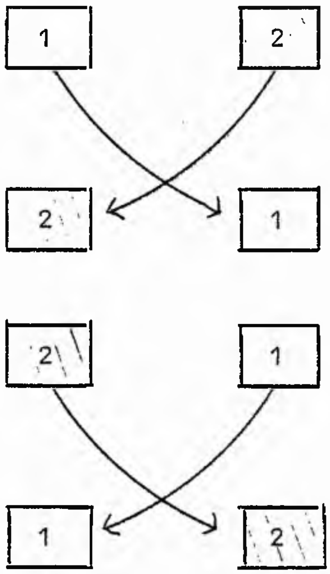
Set 2: Doll under 1 of 2 screens (cloth and scarf)

<u>Presentations</u>: Each set is presented twice

Step Age

Directions:

1. Place screen 2 (scarf) on the right of screen 1 (cloth)
2. Completely cover toy with screen 2
3. Simultaneously swop positions of screens without uncovering T
4. Completely cover T with screen 2 (scarf)
5. Simultaneously repeat step (3)



1 - 2

3

4

5

8. <u>Finding an object after successive visible displacements.</u>

<u>Objects:</u> 1 set: Toy (doll)/cloth, scarf; serviette

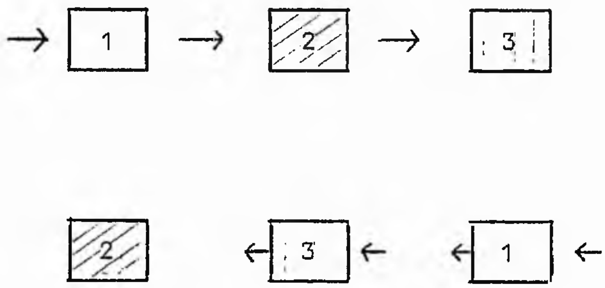
2 presentations: L to R

R to L

Step Age

Directions: Presentation -1

1. Place screens 1, 2, 3 in a row
2. Hold toy visibly in hand
3. Beginning with left hand screen (1 cloth) move toy under each screen successively, allowing toy to become momentarily visible between screens
4. Hide object completely under right-hand screen (3)
5. Show B your empty hand *
6. Change positions of screens to 2, 3, 1
7. Beginning with right-hand screen (1) repeat (3)
8. Completely cover object under left-hand screen (2)
9. Show infant your empty hand



9. Finding an object under three superimposed screens — Step: 8 — Age: 9-10 months

Objects: 1 set of objects: small toy or Smartie/ beaker; cloth; newspaper bag

Presentations: 2 times + 1 reliability check.

Directions:

1. Completely cover toy (or Smartie) with beaker (screen 1)
2. Completely cover beaker with cloth (screen 2)
3. Completely cover cloth with paper (screen 3) *
4. Reliability check: to ascertain that infant is not just interested in pulling screens,

Step Age

put object aside (within view and reach) and see whether infant will still pull the screens.

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10. Finding an object following one invisible displacement with a single object. 9 11-13

Objects: 1 set: Toy/box; cloth

Presentation: 3

Directions:

1. Hide object in box in view of B
2. Put box under the cloth
3. Tip out toy and leave hidden under cloth
4. Remove empty box and leave next to cloth? *
5. If B hesitates show empty box
6. On 3rd presentation introduce scarf (in screen B) in preparation for Situation 11

Foll-owed by 11

---

11. Finding an object following one invisible displacement with two screens. 10 13 months

Follows from 10.

Objects: 1 set: toy/box, cloth (screen A) and scarf (screen B)

Presentations: 1 + 2 times.

Directions:

1. Following 2 successful retrievals from Situation 10
2. On 3rd presentation of Situation 10, introduce scarf (screen B) on right of cloth (screen A) *
3. Leave screens in present position
4. Tip toy out of box under scarf (screen B) and leave completely covered *

Step Age

5. Repeat 4
6. Leave screens in present position
7. Tip toy out of box under cloth (screen A) and leave completely covered *

---

14. Finding an object following a series of invisible displacements. 13/14 17-22 months

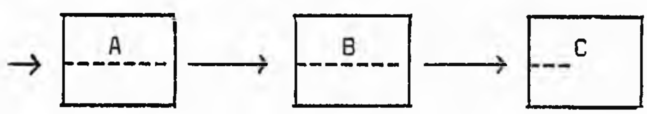
Objects: 1 set: small toy in E's hand/

A B C
cloth; scarf; serviette

Presentations: 3

Directions:

1. Hide object in palm of hand in view of B
2. Beginning with left-hand screen (A cloth), move hand under each screen successively, allowing hand - but not toy - to become visible between screens
3. Allow toy to be completely hidden under right-hand screen (C serviette)
4. Show infant empty hand *
5. Repeat presentation in the same direction



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15. Finding an object following a series of invisible displacements by searching in reverse of the order of hiding. 14 21-222

Follows from 14.

Objects: 1 set: small toy in hand

A B C
cloth; scarf; serviette

Presentations: 2

Directions:

1. Following 2 successful retrievals from Situation 14.
2. Hide object in palm of hand in view of infant

		Step	Age

3. Repeat as for Situation 14 but this time leave object under left-hand screen (A → cloth) although moving the hand in the same direction
4. Continue to move hand under screens
5. Stop hand momentarily under right-hand screen (C → serviette) (*)
6. Show infant empty hand
7. In order to repeat, two successful retrievals of Situation 14 in the opposite direction must be presented first.

(ii) Scale IV : Operational Causality

2. Repetition of actions producing an interesting spectable. — 2 — 3 months

Object: Sound emitting, and easily activated toy

Presentations: 3

Directions:

1. Hold object within easy reach of infant's hand, but in a way that discourages grasping
2. Wait for infant to strike toy *
3. If infant does not strike toy, hit it against infant's hand once
4. Pause (*)
5. Repeat 3

---

3. Use of specific action as a procedure. — 3 — 4 months

Object: Wooden rattle

Presentation: 3

Directions:

1. Activate object while infant is focusing on it
2. Stop abruptly for a while
3. Observe infant's action (*)
4. Repeat 1-3

	Step	Age

Note. Procedures = consistent vocalisations
hitting of a surface with palm
kicking legs
waving arm(s) up and down
swiping

---

5. Behaviour to a spectacle created by an Agent — Step: 3/4 — Age: 4/5 months

No objects

Presentations: 3

Directions:

1. Stand or sit within reach of infant, so that he can reach your hand or face
2. Perform an amusing facial gesture (preferably one involving sound)
3. Stop abruptly for a while
4. Observe infant's actions *
5. Repeat

---

6. Behaviour to a spectacle created by an agent acting on an object — Step: 3/4/5 — Age: 4/5/12

Objects: Bangle

Balloon

Presentations: 3 for each object (total 6)

Directions:

1. First introduce objects in Scale VI to familiarise infant with them
2. Activate object for a short duration while infant is focusing on it
3. Once object stops, pause leaving your hand & object within reach of infant *

---

7. Behaviour to a spectacle created by a mechanical object. — Step: 4/5/6/7 — Age: 5/12/18/21

Objects: 1. Mr Greedy

2. Sailors & ladder

	Step	Age

Presentations: 4 for each object → 2 out of sight; 2 within sight

(Total 8)

Directions:

1. Introduce object in Scale VI to familiarise infant with it
2. Activate object out of B's sight
3. Present infant with object in motion
4. Observe infant's actions when object is still in motion or when it stops (*)
5. Repeat 2-4
6. If infant attempts to activate object prior to demonstration, do not proceed any further
7. Activate object within sight of infant (*)
8. Repeat 6 (*)

(iii) Scale V : The Construction of Object Relations in Space	Step	Age in Months
Situation 2: Localising an object by its sound	3	3-5

Objects: Wooden rattle

Presentations: 2 from left to right

2 up and down

Directions:

1. Stand behind infant and shake rattle for a few seconds, ensuring that infant cannot see the movement of your hand
2. Observe behaviour

Situation 3: Grasping a visually presented object	4	4-5

Objects: Plastic rattle

Presentations: 3 times

Directions:

1. Make sure both hands of infants are free

		Step	Age in Months

2. Hold object steadily 12 inches in front of infant
3. Observe behaviour
4. Score not only in terms of one response but sequence of responses

---

Situation 6: Using the relationship of container and contained

Objects: Beaker and bricks small enough to fit in the beaker

Presentation: 3 times

Directions:

1. Present infant with beaker and bricks
2. Observe behaviour
3. If infant does not initiate play, put some of the bricks into the beaker out of sight of infant and present again
4. Observe behaviour
5. If the infant still does not initiate play, remove and replace bricks in sight of infant
6. Indicate in scoring whether or not response is before or after first or second demonstration

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		Step	Age in Months
Situation 7:	Placing objects in equilibrium one upon another	9	15

Objects: Beakers

Presentation: 2 times

Directions:

1. Present beakers to infant
2. Observe behaviour
3. If infant does not initiate play, demonstrate by making a tower of 3 or 4 objects high, then scatter them to avoid knocking-down routine
4. Observe behaviour
5. If infant does not initiate play demonstrate by making a tower 3 or 4 objects high and encourage infant to build on top

	Step	Age in Months

6. Observe behaviour

7. Indicate in scoring whether or not response is before or after first or second demonstration

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Situation 8: Appreciating gravity in play with objects	10	13-15

Objects: 1. Board and card

2. Box and string

Presentations: 3 of each set

Directions: 1. Present toy initially in Situation VI in order to familiarise the infant with it.

Set 1

2. Make an incline with the board
3. Place toy at top and allow it to slide down
4. Give object to infant whilst retaining the incline
5. Observe behaviour

Set 2

2. Seat infant on lap
3. Lower object to the floor and pull it up by means of a string
4. Lower toy again and leave string within reach of infant
5. Observe behaviour

Situation 9: Exploring the fall of dropped objects	10	13-15

(Follows directly after Situation 8 (Set 2))

Objects: Small bricks

Presentation: 3 times

Directions:

1. Introduce bricks initially in Scale VI in order to familiarise the infant with them
2. Seat infant on lap
3. Hold bricks on plam in front of infant
4. Observe behaviour

	Step	Age in Months

5. If infant does not drop objects, drop two or more

6. Observe behaviour

7. Indicate in scoring whether or not response is before or after demonstration

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Situation 10: Making detours

Objects: Ball

Presentations: 3 times

Directions:

	Step	Age in Months
1. Introduce ball initially in Scale VI in order to familiarise the infant with it	11	18

2. Roll ball behind a barrier created by an armchair or low table, making object come to rest underneath barrier at far side

3. Observe behaviour

(iv) Scale VI : Schemes for relating to objects

Part I : Schemes for relating to single objects

Objects: Paper; small beaker; large beaker; rattle; string and box

Directions:

1. Present the first object for one minute

2. Observe infant's behaviour with it

3. Remove the object while presenting the second one, and so on

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Part II : Schemes for relating to multiple objects

Objects: Beakers; box; bag and case; bricks

Directions:

1. Present one object

	Step	Age in Months

2. Observe behaviour
3. After 1 minute present the second object
4. Observe behaviour with the two objects, and so on

Part III : Schemes for relating to social objects

Objects: Spoon; balloon or bangle; doll and hat; Mr Silly; book; ball; car

Directions: As in Part II

(V) Distribution of scores on Scale VI and lists of critical actions

Part I	Score
1. Holding/mouthing/visual inspection	0
2. Manual-visual/explore with finger	1
3. Hitting on surface/patting/waving	2
4. Shaking/hitting two together	3
5. Differentiated schemes	4 or 5
6. Letting go activities	4 or 5
7. Activate/fulfil social function	4 or 5
8. Show	4 or 5
9. Name	4 or 5

Part II	
1. Holding/mouthing/visual inspection	0
2. Manual-visual/explore with finger	1
3. Hitting on surface etc/shaking/hitting 2 together	2
4. Differentiated schemes/letting to	3
5. Accommodating 2 objects	4 or 5
6. Show/offer	4 or 5
7. Name	4 or 5

	Score
Part III	
1. 1 to 2 (as above)	0
2. Hitting on surface etc; shaking/hitting 2 together	1
3. Differentiated schemes	2
4. Accommodating (non-social)	3
5. Activate/fulfil function/accommodate (social)	4 or 5
6. Innovate	4 or 5
7. Show/offer	4 or 5
8. Name and symbolic reference	4 or 5

(vi) List of differentiated schemes on the three parts of Scale VI

List of differentiated schemes on Part I

1. Crumpling or tearing paper/scraping
2. Banging or rolling beakers/scraping
3. Shaking rattle/scraping
4. Pulling string/tearing box/scraping

Differentiated schemes on Part II

1. Rolling beakers/rubbing 2 together
2. Opening box/palm inside box/tear box/scraping
3. Scrape case/pull bag out/stretch bag
4. Hitting bricks together

Differentiated schemes on Part III

1. Poke spoon on floor
2. Stretch or squeeze balloon
3. Pull doll's hair/poke doll/stand doll
4. Pull Mr Silly's feet
5. Tear book
6. Roll ball
7. Scrape car

Accommodating objects of Part II

1. Nesting beakers/building tower
2. Putting beakers in box/taking them out/tipping, etc
3. Open case/bag out/bag in/close case/putting bag in box

4. Putting shells in beaker or box/grouping shells together

Accommodating objects of Part III (non-socially)

1. Poke balloon with spoon/hit doll with spoon/hit Mr Silly with spoon/ poke book, ball and car with spoon
2. Rub balloon on other toys
3. Group doll and Mr Silly

Accommodating objects of Part III (socially)

1. Feed doll or Mr Silly with spoon
2. Put hat on doll's head

Activating and fulfilling social functions

1. Feed self or others with spoon
2. Attempt to blow balloon or give adult to blow
3. Dress doll; hug; put to sleep, etc
4. Make Mr Silly walk/attempt to wind/give to adult to wind
5. Turn pages of book/ask adult to read book
6. Initiate game with ball
7. Activate car

Symbolic references to objects (other than naming)

1. Imitate sound

APPENDIX E (continued)

(iv) Detailed performance of each individual infant on the IPDS:

	Ss	Perm-anence	Caus-ality	Space	Schemes A	Schemes B	Schemes C
Group A	* 1	11	60	29	18	21	26
	2	16	52	40	16	28	20
	3	18	36	31	16	24	23
	** 4	9	12	14	4	10	17
Group B	** 5	44	60	40	36	32	40
	6	62	56	57	72	48	47
	7	20	72	57	52	56	53
	* 8	58	84	57	72	60	63
	9	62	56	60	40	36	60
Group C	10	51	80	86	76	50	54
	11	58	64	80	90	80	87
	** 12	60	84	63	72	80	47
	13	60	80	69	68	32	63
	* 14	87	76	80	88	67	87
Group D	* 15	87	76	88	100	90	97
	16	49	92	83	48	80	74
	17	76	80	86	92	72	100
	18	89	84	83	68	73	80
	** 19	36	76	31	52	72	60

○ : Case studies

* : Best performer

** : Worst performer

APPENDIX (F)

Background Information on Subjects

Subjects		Age of baby (in months)	Age of mother (in years)	Sex of baby	Birth order of baby	Father's occupation	Mother's occupation before/ during study
A	1 *	6	26	M	2nd	R.A.F. pilot	Bank clerkess
	2	6½	23	M	1st	Lecturer	University graduate (B.A. Theology)
	3	6m, 1 week	33	F	2nd	Solicitor	Secretary
	4 **	6m, 1 week	30	M	1st	Company director	Teacher
B	5 **	9m, 1 week	36	F	3rd	Company director	Secretary
	6	9m, 1 week	27	M	2nd	Plumber	Shop-assistant
	7	10	25	F	1st	Shop-keeper	Nurse
	8 *	9m, 1 week	25	M	1st	Taxi-driver	Typist
	9	9m, 3weeks	23	M	1st	Factory worker	Typist
C	10	12	19	F	1st	Factory worker	School leaver
	11	12m,3weeks	38	F	3rd	Factory worker	Shop-assistant
	12 **	12½	24	F	2nd	Fire-man	Typist
	13	12m, 1week	31	M	2nd	Clerk	Hotel house-keeper/ Child-minder
	14 *	12	35	F	2nd	Lecturer	University graduate (B.A. Social Sciences)

APPENDIX (F) (continued)

Background Information on Subjects

Subjects	Age of baby (in months)	Age of mother (in years)	Sex of baby	Birth order of baby	Father's occupation	Mother's occupation before/ during study
15 *	15½	36	F	3rd	Factory worker	Typist
16	15½	21	M	1st	Farmer	Waitress
17	15½	26	M	2nd	Factory worker	Shop assistant
18	16	23	M	1st	Factory worker	Shop assistant
19 **	15½	31	F	2nd	Solicitor	Medical social-worker

◯ case studies: * for best performer; ** for worst performer

APPENDIX (G)

Procedure followed in the correlations of the IPDS and the infant/mother activities:

For the two sets of correlations (mothers' activities versus IPDS and infants' activities versus the scores on scale VIB) the mean frequency of behaviour, obtained from all the visits was correlated with the scores. This was in preference to correlating the scores with the mean frequency obtained from the visits immediately preceding the test, simultaneous with it and immediately after it, since pilot analysis (table below) showed no differences in the directions of correlations when using the two different means. Furthermore, the total mean was prefered because it is more representative of the mother and infant behaviour and because the within-age-band analyses showed no significant monthly changes in the frequency of maternal and infant activities.

Example of correlations of group A maternal activities with the IPDS using two different means: (first rows are based on mean from 3 visits, 2nd row on mean from all visits).

	I	IV	V	VIA	VIB	VIC
CDE	0.02	-0.86	-0.63	-0.61	-0.54	0.43
	-0.23	-0.74	-0.45	-0.43	-0.35	0.22
PSB	1.00	0.33	0.66	0.61	0.63	0.25
	0.78	0.28	0.43	0.62	0.55	0.60
SM	-0.40	-0.99	-0.81	-0.96	-0.81	-0.81
	-0.55	-0.97	-0.90	-0.97	-0.90	-0.75
ROP	-0.77	-0.78	-0.83	-0.96	-0.88	-0.79
	-0.87	-0.70	-0.93	-0.82	-0.90	-0.41