AN ETHOLOGICAL STUDY OF PREVERBAL COMMUNICATION: SOME IMPLICATIONS FOR THOUGHT AND LANGUAGE

by

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ABSTRACT

This research was concerned with (a) a systematic investigation of infant preverbal communication and (b) an examination of the role played by this communication in the development of thought and language. The essence of the study was empirical and based upon the methods and assumptions of ethology. Videotaped naturalistic observations of one mother-infant pair were collected from birth to six months. The data were collated and analyzed using the McLeish-Martin coding system of communicative behaviours. Seven activities were identified; bathing, feeding, dressing (long and short), play with objects, enface interaction and baby alone. The mother-infant communicative behaviours in each were described and compared over time. Communication between the mother and infant was conceptualized as a behavioural dialogue or 'conversation.' The elements of that dialogue included spoken words (verbal behaviour), audible sounds (vocal behaviour) and kinesic movements (non vocal behaviour). This dialogue began at birth in the initial mutual adjustment between the mother and infant and in everyday, ongoing activities, and was expressed later in reciprocal interaction. The results of the analysis confirm that the infant plays an active role in the development of communication with the mother. The infant's communicative skills

included; expressive declarative or demanding behaviours, affective behaviours including smiling and babbling; and receptive behaviours which involved the ability to attend to, recognize and distinguish familiar sounds and objects and, to understand the general meaning of mother's speech. These latter abilities were demonstrated in the infant's facial and bodily gestural responses. Of a possible 16 communicative behaviours, five were observed at one week and 14 by 16 weeks. The activities of bathing, feeding and dressing (long) were identified as task-oriented and low interactive activities in contrast to the more sociable, high interactive episodes during dressing (short), playing and enface sequences. The periods when the infant was alone were recognized as practise sessions during which she learned to attend to and manipulate objects, and exercise her vocal skills.

It is concluded that the beginnings of verbal language and thinking are to be found in the infant's pre gross-motor and pre-verbal stage of development. The behavioural dialogue between mother and infant forms the matrix within which verbal language and thinking are formed. The earliest indicators of the thought process are found in the perceptual development of the infant which is stimulated and supported by the mother. It is suggested that thinking does not only develop from manipulation with objects, or from the ability

to use words, but more significantly from the infant's initial perceptual responses to and differentiation of the social and physical environment. In the context of the neonate, thinking (perceptual differentiation of animate and inanimate objects) and language (vocal and non vocal behaviours), develop interdependently from birth.

EXAMINERS:

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

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Passing from infancy, I came to boyhood, or rather it came to me, displacing infancy. Nor did that depart (for where did it go?), and yet it was no more. For I was no longer a speechless infant, but a speaking boy. This I remember; and have since observed how I learned to speak. It was not that adults taught me words in any set method: But I, longing by my cries and sounds and various motions of my limbs to express my thoughts, so that I might have my will, and yet unable to express all I willed . . . . did myself . . . . practise the sounds in my memory. When they named anything, and as they spoke turned towards it I saw and remembered what they called what they meant by the name they uttered. And that they meant this thing, and no other, was plain from the motion of their body, the natural language, as it were, of all nations, expressed by the countenance, glances of eye, gestures of limb, and tones of the voice . . . . And in this manner by constantly hearing words, as they occurred in various sentences, I learned gradually what they stood for; and having broken in my mouth to these signs, I thereby gave utterance to my will.

The Confessions,
Saint Augustine
circa 400 A.D.

PREFACE

Interest in the nature of speech and language development in infancy has been a topic of some of the earliest literature in Western Civilisation. Since the fifth century B. C., a dual tradition of language study has existed. On the one hand there has been speculation about the origins of language, the differences between adult speech and children's speech and the effect of the former on the latter, and the relationship of speech to thought. On the other hand, there have been structural descriptions of contemporary spoken languages. Throughout history, one of these traditions has tended to dominate the study of language; rarely have the two been pursued with equal vigour. From the time of the Ancient Greeks until the nineteenth century, the study of language was preoccupied either with isolating the logical principles upon which grammar was based, or with solving, through philosophical argument, such problems as the connection of names with objects.

During the nineteenth century, the focus of study moved from grammar to comparative Indo-European studies and the development of a science of phonetics. The publication of Bloomfield's Language (1933) marked the emphasis on a vigorous structural approach in linguistic studies. About the

mid-fifties the spotlight shifted from structural linquistics to the speculative traditions and interest in language universals based on Chomsky's (1957, 1965) theory of syntactic and transformational grammar. Chomsky hypothesizes that deep (universal) and innately biological and cognitive structures shape the process of language acquisition. These structures provide an innate means of processing information and of forming internal cognitive and linguistic systems.

In the past decade, the emergence of a relatively new interdisciplinary field of developmental socio-psycho-linguistics has challenged Chomskian theory. This inter-disciplinary approach focuses on the post-natal period from birth to three years in the study of language development. Evidence has accumulated to support the contention that this period is critical in shaping the individual's future linguistic, social and intellectual development. Such evi-dence has come mainly from studies of the effects of poverty and environmental deprivation on the child's acquisition of language (Papoušek & Papoušek, 1977). The basis of this new interdisciplinary approach focuses on many of those observa-tions commented on by Saint Augustine nearly 1,500 years ago. He observed that above all else, language is acquired and developed through contact with others; that the infant is motivated to learn the meanings of words and gestures used by adults around him; that he plays an aggressive and active

role in the acquisition of speech, and that he practises his speech and eventually is able to recall the sounds of language spoken to him until finally, he can communicate his inner feelings.

This thesis, following in the traditions of Saint Augustine, whose ideas were later reflected in the writings of de Laguna, Malinowski, Vygotsky, Lévi-Bruhl, Skinner and Bruner, rejects the reductionist position of Chomsky and attempts to demonstrate that language emerges in a social and cognitive milieu as part of the general process of socialization. The corpus of observations on infant linguistic behaviour, although limited, compels us to consider that at a very early age it is possible to detect precursors of a system which develops into formal language. Since the early mother-infant relationship forms the base for the child's future psychological growth, it seems pertinent to analyze some of the earliest interactions between mother and infant that make up this relationship. This study attempts to illustrate that a communication network between the infant and mother exists from birth, and that the analage of language develops of and from aspects of this communication.

It is suggested that a child's language does not develop in an environmental vacuum but in relation to and discourse with another human being, in particular the mother or caregiver. The question of how and in what ways the mother

participates in this process must be considered a significant variable in a theory of language acquisition. It is difficult to assess to what degree mother-infant communication contributes directly to overall language development, but it seems highly likely that this daily exchange between them plays an important part in the infant's social, linguistic and cognitive development.

The development of the infant's language therefore begins in the daily interactive episodes between mother and infant. Communication between them is conceptualized as a behavioural dialogue or 'conversation' (Jaffe & Feldstein, 1970; Bakerman & Brown, 1977). The elements of this dialogue include not only words (verbal behaviour) but any audible sounds (vocal behaviour) and body movements (non vocal behaviour). The mother, in communicating with the infant, can employ the whole spectrum of these conversational tools, whereas the infant at birth is confined to a range of simple vocal sounds and body movements.

The model of language acquisition inferred in this study of preverbal communication is based upon a unified concept of individual development in which the social, linguistic and cognitive aspects are viewed as interrelated and interdependent domains since all are aspects of the same unified development of the individual. The emphasis is upon the holistic nature of behaviour and the infant's development in toto. This

emphasis brings to mind the well known Indian fable of the blind men and the elephant. Several blind men wanted to know what an elephant was, and each decided to investigate the phenomenon himself. Each happened to touch a different part of the elephant, and thus had a different perception and conception of the animal. Each thought he knew the true nature of the elephant; and although each was in part correct, all were wrong, because the elephant is more than each part. We can similarly construct a unified concept of individual development, of which there are social, linguistic and cognitive aspects. None of these exists by itself; the development of each specific aspect is influenced by the development of the others.

CHAPTER 1

MOTHER-INFANT INTERACTION AND THE DEVELOPMENT OF COMMUNICATION

Spoken language has its origins in preverbal communication. The skills needed to use and understand language do not arrive 'de novo' in the infant, but have their roots in earlier interactive events between mother and infant (Bates et al, 1977). These skills develop in a social context in which the mother and infant learn to share a code of conduct long before they share a linguistic code (Schaffer, 1977a). In the beginning, the infant's communicative skills exclude words and are related to his perceptual and motor abilities which he uses to take part in sequences of 'interpersonal' behaviour. Together, the mother and infant stimulate and shape the development of communication between them. The term 'mother' refers to "anyone with the responsibility of the child's care over a prolonged period" (Schaffer, 1977b, p. 5).

The Behaviour of the Infant

Through the application of new methods for measuring aspects of infant behaviour, it has become clear that there is organization and greater ability in the infant's behaviour than was previously realized. Recent studies have come to

emphasize the active, as opposed to the passive, role of the infant.

A study carried out by Parmelee et al (1964), refuted the old idea that infants spend the majority of their time asleep. Many infants are awake for approximately one third of each day as early as the first week of life. The most important change in sleeping patterns occur as rhythms of diurnal waking and nocturnal sleep replace the random sleep periods of the newborn as a result of environmental influences. Prechtel & Beintema's study (1964) on the concept of states of wakefulness revealed two important aspects of infant behaviour, spontaneity and periodicity. They concluded that spontaneous behaviours are largely governed by internal forces or "state" and that these states are cyclic. The infant's state of wakefulness and arousal led Korner (1974) to study its effects on the mother. Crying, he noted, is possibly the first elicitor of maternal attention.

Wolfe (1967) in his analysis of sucking behaviour found that this is not a uniform activity passively elicited by the mother. Rather, it is a finely integrated sequence of behaviour controlled by the infant, which includes the rooting reflex, sucking, swallowing and breathing, and which becomes linked to the mother's response system. Kaye (1977) found a similarity between the burst-pause pattern in sucking during the first month of life and later burst-pause cycles of activity such as

visual attention to objects (alternating with gaze aversion) and face-to-face interaction (with cycles of arousal and passivity). Kaye suggests a developmental course from the burst-pause or on-off cycles in the individual to turntaking and dialogue in social systems.

Techniques for exploring the infant's perceptual world have yielded measurements which indicate that the infant's sense organs function from birth (Stern, 1977). The visual motor system (looking at and seeing) comes immediately into operation. The newborn can not only see, but arrives with reflexes that allow him to follow and fixate on an object up to eight inches away (Bower, 1977). This distance coincides with the approximate distance between the mother's and infant's eyes during feeding. Robson (1967) notes that there is a distinctive responsiveness to eye-to-eye contact which is crucial in the bonding phenomena between mother and baby. Trevarthen (1975) has demonstrated how infants can distinguish between the categories of people and things, and show a distinctive response to each, preferring the former. By six weeks of age the infant is capable of fixating on his mother's eyes, and holding the fixation with eye widening and eye brightening (Wolfe, 1963). This developmental landmark often catapults interaction with the mother onto a new level. At three months, the infant can follow objects and by six months interact with them by reaching and grasping.

As the visual motor system develops, so also do head behaviours. Blauvet & McKenna (1961) have commented on the ability of the newborn for orientation. At the same time the infant shows a distinct responsiveness to sound, particularly the human voice (Hutt et al., 1969). From the mother's point of view, the nature and degree of the infant's gaze direction, the head turning movements and reaction to sound are important social signals and constitute an important cornerstone in the development of the mother's attachment to her infant.

Two important points emerge from the realization of the infant's abilities. First, the infant is able to regulate what he takes in by selective attention; and second, he shows a preference for the human face. This latter point is important in the development of smiling. Brackbill (1967), and Rheingold et al. (1959), have demonstrated how the infant's smile moves from a reflexive activity (internally triggered), to a social response (elicited by external stimulation), to an instrumental behaviour produced to elicit social responses. The smiling response, plus the infant's responsiveness to the human face and sound, have important implications in the development of communication between the mother and infant. Instead of being regarded as passive, the infant's behaviour shows order and organization and "the buzzing confusion which William Jones once attributed to the infant's perceptual world, belongs not in him, but in our minds and recording techniques" (Schaffer, 1977b, p. 38). This orderliness needs to be appre-

ciated in order to understand the mother's role in interaction with the infant.

One of the most important components of infant behaviour of relevance to social interaction is "spontaneity," which is expressed through its periodicity and selectivity. Since the infant is spontaneous, the role of the socializing mother is not to create behaviour out of nothing, but to synchronize with and influence the direction of the behaviour that is already organized.

The Role of the Mother

> . . . The infant's first exposure to the human world consists simply of whatever his mother actually does with her face, voice, body and hands. The ongoing flow of her acts provides for the infant his emerging experience . . . . This choreography of maternal behaviour is the raw material from the outside world with which the infant begins to construct his knowledge and experience of all things human: the human presence, the human face and voice, their forms and changes that make up experiences, the units and meanings of human behaviours, the relationship between his own behaviour and someone elses. (Stern, 1977, p. 9)

The doctrine that infants develop by maturation no longer applies. Infants need continuous and progressive interaction with their environment in the form of personalized stimulation from the mother. It is the mother's task to ensure that such stimulation interconnects with the infant's state, ability to attend and willingness to reciprocate. The amount of stimulation, its variety, intensity, duration and timing are

important facets which need to be worked out by the mother to foster communicative (and later linguistic), development. However, a mother's sensitivity to the infant's state will also determine what kind of stimulation she provides (Millar, 1974). Equally important is her sense of timing. Through the relation in time between stimulus and response, the infant becomes aware of a link between his action and the outside world (Millar, 1976). Because of the prompt action of the mother, a sequence and pattern of behaviour is built up; for example, the infant cries, the mother appears. Through such sequences the infant acquires a general expectation that he can affect his environment.

A realization of the importance of the mother in the social development of the child has led to a series of descriptions of the things mothers do with their infants. Brody & Axelrad (1971) discovered a positive relationship between the degree of social stimulation and social responsiveness. Costello (1975) obtained quantitative estimates of the distribution of mother's time with the infant and suggested a possible relationship between developmentally delayed infants and small amounts of maternal attention.

The effect of maternal deprivation and separation on the development of communicative skills has also been a focus of study. Harlow & Harlow's (1965) and Bowlby's (1969) theories on the negative effects of maternal deprivation are well documented. Richards & Bernal (1971) note more specifically

the effects of separation on infants due to analgesic drugs administered to the mother during delivery. The differences between the 'drug' and 'non-drug' babies were demonstrated in the length of feeding, which was shorter for drug babies. The shorter patterns of feeding led to different styles of interaction. Ringler et al. (1976) also noted the influence of separation during the post-partum period and found that with extended care, there was an increase in sensitivity and attention towards the infant. Sensory deprivation of infants in incubators was also monitored by Richards & Bernal (1971), who found that this led in many cases to a delay in the establishment of a communication pattern between mother and infant. These studies, whilst important, tend to emphasize the mother's role as the primary environmental determinant of infant behaviour. The limitations of this emphasis have been increasingly recognised by Lee-Painter (1974), Brazelton, Koslowski & Main (1974) and Thomas & Martin (1976) who propose a model of interaction based on mutual influence.

The Dynamics of Interaction

In current theories on mother-infant communication, interaction can be thought of as two people engaged in a conversation (Bakerman & Brown, 1977). A weakness in past research is that it has considered the amount of influence of stimulation, attention or infant dependence in isolation, and has

failed to appreciate the finely tuned interacting quality of mother-infant dyads. This emphasis on the analysis of elements rather than on interaction has been an error. Current findings suggest that the key feature in interaction is temporal synchronization (Collis & Schaffer, 1975). Interaction takes place over time and requires mutuality to integrate responses into a consistent flow. This integration is evident in the early interactions between mother and infant which have the appearance of a 'dialogue.'

The fine degree of organization and coordination in the infant's behaviour has been outlined; for example sucking, swallowing and breathing are integrated into one system (Ainsworth & Bell, 1969). The development of this 'intrapersonal' synchrony to 'interpersonal' occurs as the mother and infant enmesh their behaviours. Condon (1975) has found infant synchrony with adult speech as early as the first day of life. Also, microanalytic studies of mother and infant face-to-face reveal a rhythmic, cyclic pattern. Brazelton, Koslowski & Main (1974), who examined looking and non-looking between infant and mother, identified a process where the mother waits for the infant to look towards her before she dovetails her behaviour with his. Stern (1971), observing the same activity, described the pattern as a waltz, where the steps and turns are cued by one partner who leads, although both are familiar with the pattern to move together. Lee-Painter (1974) described this mutuality of behaviour as a kind of

chaining and pausing process in communication, with the partners alternating the roles of actor and audience.

The earliest examples of this reciprocity in behaviour can be found in the 'dialogue' of feeding where the mother allows herself to be paced by the infant, fitting in with the sucking pattern and responding to rests while using the opportunity to intervene. Responses become finely dovetailed as the mother learns to read the infant's signals in his behaviour and fit her own into the pattern he creates (Newson, 1977). Most normal early interactions assume this pattern where

> . . . Any one member of the dyad becomes part of a cluster of behaviours which interact with a cluster of behaviour from the other. No single behaviour can be separated from the cluster without losing its meaning. (Brazelton, Koslowski & Main, 1974, p. 55)

The infant learns about turn-taking, a kind of proto-conversation, from the mother. Schaffer (1977b) identifies six techniques the mother employs in the process of dialogue with the infant. These include phasing techniques, where the mother watches for the correct moment to intervene. A great number of early interactions begin with the infant's spontaneous behaviour and are continued by the mother's phasing techniques. The mother also adapts her behaviour to the infant. Her body movements tend to be slow, her facial expressions exaggerated, gestures deliberate, her speech intermittent and simple in structure (Newport et al., 1977).

The mother, however, does not passively follow the infant's initiative but follows in order to lead and elaborate on his interest. In many cases the mother might also initiate interaction. In other circumstances she may use controlling techniques.

It appears from the very beginning that mother-infant interaction is interlocutory. At first this dialogue is a little unbalanced because it depends largely on the mother to pace and be paced. A 'dialogue of precision' later develops in vocal interchanges between mother and infant where the pattern of turn taking appears like a real conversation (Bateson, 1975).

The development of 'dialogue' begins in the finely tuned interactive events between mother and infant. Through these interactions the infant builds up a repertoire of behaviours, which in the beginning are mostly expressive vocal behaviours but to which are added gestures, simple sounds and later, spoken language. Language evolves from the infant's ability to participate in interactive sequences (Bruner, 1974). In other words, the dialogue between mother and infant expresses itself in interaction long before the first word. Kaye (1977) has suggested it starts in the feeding activity. But the ability to communicate depends not only on the help of the mother, but also on the development of certain perceptual-cognitive processes of the infant. These include distinguishing self from other, an increase in attention span and object permanence

(when the infant becomes aware that objects exist even when they are no longer in sight).

The traditional view that infant communication is a question of indoctrination by the mother is incorrect. The development of the infant's ability to communicate begins in the context of his own behaviour and starts from within the relationship between mother and infant (Nelson, 1973; Denzin, 1976). By three months of age the infant should be well equipped with a repertoire of behaviours to engage and disengage the mother. The gazing, head turning and facial expressions that have been subject to the shaping process of learning during the early months of their emergence, are generally performed together in intrapersonal synchrony as units of ongoing behaviour. By this time the infant and mother should have used their separate repertoires, have evolved their own interactive style and their own interactive fit as a pair. Socialization and communication are therefore basically a two-way process and a joint venture. The difference between the mother and infant lies in the mother's 'awareness of ends' and the infant's random behaviour, a 'shaping' versus 'spontaneous' behaviour system to begin with.

A Model for Preverbal Communication

Applying the concept of an organismic model, coined by Gewirtz & Boyd (1976), the development of preverbal communication can be viewed as one where the infant and mother are active

and constantly changing members of a dyad, each affecting one another's behaviour. Both are partners in a subtle, dynamic process. The beginnings of this process are found in the infant's intrapersonal rhythms of behaviour. The mother uses these rhythms to shape and further develop the infant's abilities. Their relationship develops in a reciprocal inter-dependent fashion, beginning as a mutual process of adjustment and developing into a 'dialogue' of shared attention and activities. This process of adjustment is found in the early organization of the infant's sleeping and feeding rhythms and the daily activities shared during the wakeful periods.

The period of adjustment is gradually replaced by one of mutuality through the process of joint attention and joint activity when mother and infant respond to one another's cues. Successful communication follows and proto-conversation is established (Bruner, 1978). Through eye-to-eye contact, learning to attend, and then through joint attention to a common focus, the activity of labelling develops. Labelling arises out of the context of action through shared activity. This happens in the activities of bathing, dressing and play. Attention and activity thus provide the benchmarks for spoken language. The mother operates, not so much as a corrector or reinforcer, but as an 'expender of utterances' while interacting with the child (Bruner, 1978). Through such interactive exchange the infant is socialized into the speech community which has acoustic and kinesic aspects (Birdwhistell, 1952).

As the 'dialogue' of interaction develops the infant learns appropriate responses which elicit reinforcement of one kind or another and 'discovers' the function of communication. Trevarthen (1977), in studying the pre-speech activities of infants listed a range of behaviours which had the function of communicating. These included mouth activity, vocalizations and movements of the head, trunk and limbs which appeared to be sychronized with utterances or grimaces. Braunwald's study (1976) noted that at age six weeks infant vocalization conveyed both pleasure and frustration. The social smile also could appear at this time. By three months the mother would often elicit a repetition of a sound the infant could make, and the infant could also imitate vocal interchange by cooing. By six months the infant could imitate a sound from the mother. Following on from this study, it would seem that through the mother's repetitive verbalizations and physical gestures, the infant learns the significance of pairing which eventually leads to labelling. Before he can use words as labels, however, the infant will have built up a repertoire of communicative behaviours ranging from facial expressions, body movements and vocalizations as well as the ability to attend to the mother and maintain her attention.

In summary, preverbal communication begins at birth and develops out of interaction which is initially expressed in mutual adjustment and later in reciprocity. Mother-infant

interactive patterns consist of both vocal and sensori-motor components and constitute a micro-social system which functions, amongst other things, to facilitate the growth of communication out of which develops spoken language.

CHAPTER 2

THE RELATIONSHIP BETWEEN THOUGHT AND LANGUAGE: A LITERATURE REVIEW

Current research in mother-infant interaction and infant development suggests that the precursors of 'thinking' and oral language in the infant are to be found in the interactive events with the mother before the infant can use words. Thought and language do not suddenly begin with the first use of words; rather, the infant gradually builds a repertoire of behaviours for 'thinking' and speaking which develop through contact with the 'mother.' In order to substantiate these suggestions, it is necessary to review the literature on thought and language.

Major studies in psychology on the relationship between thought and language have been mostly a twentieth century endeavour. They include the work of Watson and the traditional behaviourist school; Piaget and the Genevan School; Vygotsky and the Soviet School, and Sapir, Whorf and Malinowski who represent the linguistic ethnographic approach. Although relatively recent developments, these studies are an amalgamation of diverse traditions which have a long history. They incorporate philosophical speculations based on Plato's and Aristotle's theories of language, Baconian traditions of observation, analysis and induction, and the evolutionary ideas

of Erasmus Darwin. The twentieth century studies represent a post-Darwinian scientific movement in psychology and a trend towards biological models. The biological models inclined some to holism, to the idea of adaption, to the notion that development procedes in stages marked by qualitative changes and to the use of the concept of chain reflexes.

In Europe this biological model was the basis of Piaget's research. In the United States the rejection of Watsonian behaviourism (and the extreme position it occupied), led to a decline in the child study movement and a neglect of these areas until the 1950's. In the Soviet Union, the movement in psychology was based on the materialist movements in science and philosophy, finding expression in the dialectical materialism of Vygotsky and his followers.

A prerequisite to making headway in the understanding of the relationship between 'thought' and 'language' is a cogent definition of each of these concepts.

A Definition of Language

Language is a symbolic, systematic system of representing experience. It is concerned with re-presentation, the problem of presenting to ourselves and others an earlier experience after a lapse of time. Because of its systematized and rule governed nature, language assists us in organizing experience and regulating behaviour.

Language has three major components; the tangible, physical process of speech which is made up of sounds used to communicate to others; the relation of words to meanings; and the logic or grammar which governs the combination of words. The psychologist has a pragmatic interest in all of these, but in the study of preverbal communication emphasizes the oral aspect of language in seeking to explain how language is acquired, develops and functions. It is through the study of the functions of speech and language that the psychologist seeks to explain the relationship between thought and language.

A Definition of Thinking

In current terminology the word thinking is a polymorphous concept (Ryle, 1949) and refers to a range of contrasting activities. In a general sense it refers to all of mental activity. Specifically, it includes autistic thinking, remembering, creative or imaginative thinking and reasoning. In more everyday usage, thinking is regarded as a manner of behaviour (hence, "think what you're doing") and as believing.

Much of our thinking is what psychologists have called autistic thinking (McKellar, 1955). This refers to daydreams and fantasies which are viewed as the imaginative expression of our wishes, wants and needs. In a different sense, thinking is also synonymous with remembering, distinguished from the wishful thinking of fantasy because it is determined by actual

happenings in the past and involves an attempt to describe them accurately. Between the uncontrolled flow of autistic thought and the deliberate attempt to recall, is imaginative thought. Imaginative thought is evoked by external sources of stimulation and is modelled on, and derived from, observations of how things usually happened. Reasoning is identified as "the deliberate exploration of experience for a purpose" (de Bono, 1976). Much of past psychology theory and research has emphasized the reasoning aspect of the thinking process, in particular the work of the pragmatist philosopher Dewey (1933) and Freud (1915).

The most influential contemporary theories in psychology that deal with the study of thinking include: the Piagetian theory with its major emphasis on the development of logical thinking and the study of structural laws; the Stimulus-Response theory with its study of functional relationships and adaptation of the organism to the environment; the Information-Processing approach whose viewpoint stresses the mechanisms for controlling sequences of operations involved in thinking; and the Phenomenological approach which emphasizes the role of perception and consciousness. Each of these theories deals with thinking from an alternative perspective and should be seen in a complementary rather than a contradictory role. A major question is, "to what extent is the capacity to think dependent upon the capacity to use language?"

Major Theories

Thought is Language

Whilst it is difficult to find modern research that holds this view, it is a position that was held for centuries. Plato writes, "the soul when thinking appears to me to be just talking--asking questions of herself and answering them, affirming and denying." (Jowett, 1892, p. 252). Aristotle similarly assumed that if speech were the sole content of mental activity, then thinking must depend on establishing the correct rules of grammar and syntax. In his logical treatises, Aristotle appears to have been searching for such rules.

The quest for 'rules of talking' continued throughout the Middle Ages (Engelfield, 1977). It was not until the time of Descartes that the idea of the unity of thought and language was seriously challenged. Descartes saw clearly that thinking involves something else besides words, but whatever might be the real nature of the thinking process, it seemed that it could only be brought into the open with words.

A recognition of the shortcomings of language to account for all thought stimulated the search for a philosophical language which, by virtue of its structure, would preclude misunderstanding. Many attempts were made to invent a scientific language free from the defects of languages in common use. This was aided by the appearance of logarithms, analytical geometry and calculus. The idea that a universal language,

based on logical principles, could express all thought, occupied philosophers in the seventeenth and eighteenth centuries. These attempts were based on the common idea that language was capable of representing the whole range of human thought.

The unity of thought and language was taken up again by the American behaviourist, J. B. Watson who, in his enthusiasm to create a new psychology founded on observable stimuli and responses, proposed a new model of thinking. According to Watson, thinking is nothing more or less than internalized subvocal speech, and speech is essentially a form of muscular and glandular activity:

> . . . when a man is silently thinking his laryngeal muscles and the muscles of his tongue are active and are carrying out as orderly a system of movements as if he were executing a sonata on the piano. (1919, p. 15)

Watson had totally misunderstood, and wrongly applied the complex reflex theories of the Russian physiologists Sechenov and Pavlov. In assuming the unity of thought and language, Watson simply denied the existence of the problem of relating language to thought.

Whilst there is some experimental support for Watson's claim insofar as thought is often accompanied by measurable electro-muscular changes in the tongue and vocal organs, few modern researchers would accept this strong version of Watson's hypothesis. There is considerable evidence against the unity of thought and language. The pioneering introspective studies

of the Würzburg School under Marbe and Külpe (Humphrey, 1951) found that not only was thought possible without words, but without images also. They discovered that 'set' and 'determining tendencies' foster purposeful and intelligent thought. William James also noted that the deaf and dumb can weave their tactile and visual images into "a system of thought quite as effective and rational as that of a word-user." (1890, p. 269). The introspections of Albert Einstein are also illuminating:

> . . . the words of the language, as they are written, do not seem to play any role in my mechanism of thought. The psychical entities which seem to serve as elements of thought are certain signs and more or less clear images which can be 'voluntarily' reproduced and combined . . . . Conventional words and other signs have to be sought for laboriously only in a secondary stage when the associative play [between certain signs and less clear images] is sufficiently established and can be reproduced at will. In a stage when words intervene at all, they are, in my case, purely additive. (Slobin, 1971, p. 102)

Clearly, one cannot equate thought with either speech or language, but language does play a role in thinking.

Language Depends on Thought

This position, characterizing one of the oldest and yet one of the most recent theories on thought and language, occupies a popular middle ground in psychology. The view that language is a result of thought can be found in the writings of Wundt, who recommended the study of language in order to discover the nature of the mind (Boring, 1950). Wundt felt that the psychology of the people (or Folk Psychology) could be understood through the study of language. Wundt's ideas found

expression in the work of the structural and cognitive anthropologists, Lévi-Strauss (1966) and Tyler (1969) who suggested that thought determined the structure of language. Hence an analysis of language would produce the underlying categories of thought. This is the reverse of the views of the cultural-relativists, Sapir and Whorf, but very similar to the theory of Noam Chomsky. In his theory of language acquisition Chomsky (1957) hypothesizes that innate biological and cognitive processes determine language development. Furthermore, there are general features of grammatical structure which are common to all languages and limit the variety of human language (Chomsky, 1965). These common 'universal' features are not learned but are innate, and provide the organizing principles that make the learning of language possible.

The genetic epistemological position of Piaget expresses a similar position. In his early work however, Piaget (1926) assumed that speech reflected thinking and studied the relationship between them through the analysis of children's speech. Using Freud's distinction between primary and secondary process thinking, Piaget described the function of speech as being firstly autistic, which later develops into an egocentric form, and then finally into socialized speech. A decrease in egocentric speech and an increase in objective thinking develops primarily from the need to take an interest in the other point of view. As a result of further observations, Piaget (1958) later de-emphasized the influence of social factors in the

development of thought. Because egocentric speech changes into social speech, while thought develops into a more private, internal process, he assumed that the link between the two gradually weakened. By formulating the concept of the schema, together with the processes of assimilation and accommodation, Piaget was able to trace the origin of egocentric schemata back to their roots in the sensori-motor adaptation period. A schema, Piaget defined as a generic unit of structure which included anything that was repeatable and generalizable. The earliest structures are simple reflexes. Piaget viewed the development of thought as a continuous process reaching back to the reflexes of earliest infancy and built up from the progressive coordination of schemata corresponding to real action sequences. The source of thought he found in the 'symbolic function' which has its roots in the sensori-motor period. Piaget suggests that symbolic activity arises out of material action; later it becomes an action which replaces objects and events with signs (words) and movements. A concept is equal to a plan of action. The infant's first knowledge of objects is limited to his sensori-motor contacts and manipulations. Hence, all thought is firstly externalized. Once the child can distinguish means and ends and has actively experimented by trial and error, he becomes capable of internalizing his own behaviour. Piaget saw the origins of symbolic activity (thinking) in internalized imitation:

> . . . Just as absent events were re-presented in the sensori-motor period by overt imitations triggered by sensory input, so the representation is now accomplished by means of an imitation that has been made in the past and internalised. (Philips, 1972, p. 512)

Piaget concluded that thought originates independently of language, but is followed by language development. This development obeys internal laws but is influenced by interaction with people and things. Concept formation develops in the same way in children throughout the world, despite differing environmental influences. Piaget did not accept the notion that thought results from learning words because the first signifiers are not linguistic signs but concrete signals that are based on action. For example--Lucienne . . . . lying down . . . . grasping blanket . . . . sucking thumb . . . . represents going to sleep. Piaget views language as independent of the development of thought--it is essentially an epiphenomenon. However, language facilitates in transforming thought and the two are naturally reciprocal:

> . . . without language, the operations would remain personal and would consequently not be regulated by interpersonal exchange and cooperation. It is this dual sense of symbolic condensation and social regulation that language is indispensable in a genetic circle where each necessarily leans on the other in independent formation and continuous reciprocal action. (Piaget, 1954, p. 179)

In support of Piaget's position is a large body of experimental evidence. Köhler (Hilgard & Bower, 1975) has demonstrated the success of elementary problem solving without language.

Head's work (1926) on aphasia indicated that even with speech disorders due to brain injury or disease, patients can think without adequate control over their language. Sinclair (1969) demonstrated that training in linguistic terms in concrete operational tasks does not improve performance in those tasks. Furth (1966) has summarized research on the cognitive capacities of the deaf, concluding that individuals who are deprived of normal language learning can still perform at high levels on a broad range of cognitive tasks. However, one cannot rule out the possibility that Furth's subjects had access to other kinds of symbolism (imagery or gesture). Dramatic cases of these other forms of symbolism are evident in the development of Hellen Keller and Laura Bridgman, two blind, deaf-mute children who learned to use symbols by being able to interpret and use tactile impressions as a basis of communication. Cassirer (in Bolton, 1972), suggests that in the development of these girls a major breakthrough occured when they realized that everything has a name.

Thought is Dependent on Language

The Cultural-relativist position. The idea that the language system we learn influences the way in which we experience the world and hence think, finds its greatest support in the writings of Malinowski (1923), Sapir (1946) and Whorf (1956). For them, language constitutes a frame of reference for thoughts and so moulds the thought of its habitual users:

> . . . Human beings do not live in the objective world alone, nor alone in the world of social activity as ordinarily understood, but are very much at the mercy of the particular language which has become a medium of expression for their society . . . . We see, hear and experience very largely as we do because the habits of our community predispose certain choices of interpretation. (Sapir quoted by Whorf, 1956, p. 134)

A similar theory is expressed by de Laguna:

> . . . human perception is transformed by the ability to speak. The language which the child inherits as part of his social endowment constitutes a veritable a priori form of cognition. His perceptions of the world about him, moulded as they are by language, are to an indefinite degree 'réprésentations collectives'. (1927, p. 344)

Sapir's ideas were elaborated by Whorf who presented some evidence for them on the basis of his linguistic study of the syntactical and lexical aspects of the Hopi Indian language of Arizona. Whorf introduced a new principle of relativity, which in its strongest form suggests that thought patterns are determined by the form of the code one first learns to speak. In a weaker form it means that the language one habitually uses influences the manner in which one perceives the environment. Malinowski (1923) had previously extended this idea to incorporate the effect of context of situation and culture, as well as language or thought:

> . . . exactly as a single word is--some in exceptional circumstances--meaningless, and receives its significance only through the context of other words, so a sentence usually appears in the context of other sentences, and has meaning only as part of a larger significant whole. I think it is very profitable to widen the concept of situation so

> that it embraces not only spoken words, but facial expressions, gesture, bodily activities, the whole group of people present during an exchange of utterances and the part of the environment on which these people are engaged. (p. 306)

Through the analysis of primitive language, Malinowski found a similarity with children's language. Both are oral languages and like primitive language, the language of children must be studied against a background of activity and viewed as a mode of action and not as an instrument of reflection. In the same way, narrative speech is also a mode of action, that is social action. This pragmatic function of language led Malinowski to believe that

> . . . language is little influenced by thought but thought, on the contrary having to borrow from action its tool--that is language--is largely influenced thereby. (1923, p. 328)

The Soviet position. The problem of the relationship between thought and language is central to Soviet psychology. Vygotsky (1934, 1977, 1978) gave the greatest attention to this problem and laid the basis for the further research of Luria (1956, 1969, 1978), El'konin (1969), Gal'perin (1969) and Sokolov (1972). Unlike most other theorists, Soviet psychologists adopt an integrated approach to the study of thought and language, basing their work on the principles of dialectical materialism. The two central tenets of this approach include firstly the concept that phenomena can be studied as processes in motion and change (McLeish, 1975). For

Vygotsky the task was to reconstruct the origin and growth of consciousness, applying the dialectical concept of development which involves qualitative and quantitative change. Secondly, the view that historical changes in society and material life produce changes in consciousness and behaviour, was seen as significant in the development of mental processes. Through human labour and tool use man can change nature and in so doing transform himself. Vygotsky extended this concept of mediation in human-environment interaction to the use of signs as well as tools.

Against the background of dialectical materialism, Vygotsky studied the relationship of thought and language. He suggested that thought and language develop independently of each other at both the phylogenetic and ontogenetic levels (Vygotsky, 1934). There exists a preverbal phase of thinking and a preintellectual phase of speech. Both are rooted in concrete actions which become internalized through language as a result of social interaction. At about the age of two years, the development curves of thought and language come together in the phenomenon of object names:

> . . . the most significant moment in the course of intellectual development which gives birth to the purely human forms of practical and abstract intelligence occurs when speech and practical activity, two previously completely independent lines of development converge. (1978, p. 24)

With the aid of speech the child learns to master his surroundings and thus produces new relations with the environment in addition to the new organization of behaviour itself. As the two year old uses names to identify objects, these names, which have a symbolic function, represent the coming together of thought and language or what Vygotsky calls verbal-intellectual growth:

> . . . the meaning of a word represents such a close amalgam of thought and language that it is hard to tell whether it is a phenomenon of speech or a phenomenon of thought. A word without meaning is an empty sound; meaning therefore is a criterion of 'word,' its indispensable component. It would seem, then, it may be regarded as a phenomenon of speech. But from the point of view of psychology, the meaning of every word is a generalization and concept. And since generalizations and concepts are undeniably acts of thought, we may regard meaning as a phenomenon of thinking. It does not follow, however, that meaning formally belongs in two different spheres of psychic life. Word meaning is a phenomenon of thought only insofar as speech is connected with thought and illumined by it. It is a phenomenon of verbal thought, of meaningful speech--a union of word and thought. (1934, p. 120)

Vygotsky insisted that to understand the nature of word meaning it is necessary to look at the relationship between the 'social realm and consciousness,' because it is through communication with others that meaning, characteristic of the interrelation of thought and language, becomes established. He believed that the development of thought was greatly influenced by social interaction between adult and child. The mother's first words when she shows her child different objects and names them have important influences on the child;

> . . . intercommunication with adults is of decisive significance because the acquisition of a language system involves a reorganisation of all the child's basic mental processes, the word thus becomes a tremendous factor which forms mental activity, perfecting the reflection and reality and creating new forms of attention of meaning and imagination, of thought and action. (Luria, 1956, p. 23)

Piaget and Vygotsky: some comparisons and contrasts.

Certain similarities are clear between the theories of Piaget and Vygotsky. Both drew from the historical evolution of ideas and as a result became part of a general movement which held the view that consciousness could be investigated by the scientific methods of the biological sciences. Both studied child development within the framework of the biological model of development, process and evolution. They both accepted the notion that thought processes arise initially out of concrete actions and the first use of signs. They saw thought as the internalization of overt action. Piaget's early work attached importance to the socializing process in the development of thought and language. To Vygotsky socialization was a crucial and causal factor, but to Piaget it later became merely a concomitant.

Their divergent opinions are more striking. In the first place Soviet psychology as a whole, following Vygotsky, rejects any approach to mental activity that includes innate or autonomous processes--the 'inborn' attributes of assimilation and accommodation upon which Piaget placed so much emphasis.

Vygotsky, like Piaget, accepted the evolutionary-biological model, but viewed development as being governed by the dialectical interpretation of subject and object, the latter being in this case external factors of the environment:

> . . . proceeding from the reflex theory advanced by Sechenov and elaborated by Pavlov, it [materialistic psychology], regards all mental processes as complex functional formations which are built up as an outcome of concrete forms of interaction between the organism and the environment. In the process of concrete activity, through reflex responses to the environment, dynamic systems or 'systems of functions' are formed which we have no foundation to regard as innate properties of mental life; which can only be understood as the outcome of certain forms of reflex activity subject at every point to concrete analysis. (Luria, 1956, p. 21)

The emphasis on internal factors by Piaget and on dialectics by Vygotsky, led them to adopt different units of analysis. For Piaget, the unit is the schema; for Vygtosky it is word meaning. As a result the respective theories took different paths and whilst Vygotsky stood firmly in the context of language to understand thought, Piaget moved away from it. Piaget's minimal emphasis on the role of language is all the more striking because of his recognition of the crucial significance of the transition from sensori-motor schemata to representation, where through the process of internalization of actions, 'virtual' actions take the place of real actions. This would seem to point unmistakably to the study of the speech process itself as the principal means of representation.

Although Piaget and Vygotsky stress the role of concrete action as a prerequisite to symbolic functioning, Piaget does not go so far in appreciating the role of action and experience in a social context. He believes that socialization is not enough to bring about an increase in the coordination of schemata, but the internal processes of organization and adaptation could. In contrast, Soviet psychology stresses the importance of action in a social setting.

A major disagreement centres around the stages of development of thought and language;

Piaget	Traditional Behaviourist	Vygotsky
1. Non-verbal autistic thought	Vocal speech	Social speech
2. Egocentric speech and thought	Whispers	Egocentric speech
3. Socialized speech and logical thinking	Inner speech	Inner speech
Direction		
Individual-to-social	External-to-internal	Social-to-individual

Both agree that thought is external in its first stage and is limited to the child's sensori-motor contacts and manipulations. But Piaget insists that thought is autistic in function and only changes under social pressure. Vygotsky viewed thought in its early stages as essentially social.

The most controversial issue centres around the character and function of egocentric speech. Piaget considers egocentric speech as essentially speech for oneself; it performs no function in the child's thinking, but merely accompanies thinking and disappears with the child's egocentrism. Vygotsky pointed out that this view confuses the structural aspect of speech with its functional aspects. From the structural point of view, egocentric monologue looks like social conversation. It takes over the grammatical forms of speech as used in communication. But from the functional point of view it is thinking in speech. Moreover, it does not disappear, but is internalized. The true successor to egocentric monologue is not social communication (which precedes it and coexists with it) but inner speech.

Summary

The overall impression from the literature review suggests that thought and language are two forms of behaviour powerfully interacting but distinct in origin, with differing forms of development. Both non-verbal thought and non-intellectual speech exist, but thought and language come together in reciprocal dependence through verbal thought. Thinking, it is suggested, cannot be reduced to learning and using the system of signs called language. Nor does thinking have to take place in words. It can take place in images or feelings which are

quite different but too amorphous to articulate. Nevertheless, without language, thinking could not develop beyond a simple level analagous to that exhibited by infants in the sensori-motor period.

Perhaps the greatest influence of language on thought is a matter of social psychology. Thought has its origins in the concrete actions and experience before language. But language, whose primary function is communication (via speech) serves to develop thinking. This development of thinking is moulded in the context of life with others, through constant communication. This communication begins at birth and develops, in the first instance, under the influence of the mother.

CHAPTER 3

ETHOLOGY AND THE STUDY OF BEHAVIOUR

A Rationale Defined

The theoretical views of Vygotsky, Malinowski, Whorf, and Piaget, on the relationship of thought and language, together with the current findings in infant psychology provide certain premises upon which a study of the development of preverbal communication can be based.

Thought and language are conceptualized as two separate forms of behaviour with independent origins. More important, they function reciprocally in a dynamic environmental context, each requiring input from the other to derive and build its structure. The origins of thought are found in the perceptions and concrete actions of the infant as they occur in a social setting before formal language emerges. The precursors of language are found in the same system and develop out of the need to communicate and regulate behaviour. The primary function of language is communication, initially through vocal and non vocal behaviours and later through speech. But language, through words and meaning, also serves to organize thought and helps to develop thinking from its initial 'external' form based on action and tied to the present, into internal representation. In using words to catalogue experience, the child

is influenced by both the language and members of the social group. However, communication begins before the infant learns to use words. It is thus probable that thought has its origins, not only in solitary concrete action with objects, but in the joint attention and joint activity between the infant and mother from birth.

A number of factors influence this rationale. Firstly, the studies referred to in Chapter 1 indicate that from a very early age the infant is capable of a variety of perceptual and cognitive feats, making him a viable partner in an interactive context. Similarly, some laboratory experimental studies indicate that the infant's social behaviour can be influenced by environmental feedback. For example, Brackbill (1958), Rheingold et al. (1959) and Weisberg (1963) demonstrated that smiling, vocalizing and crying could be altered by social cues in the environment.

Secondly, in the past, most approaches to communicative development and language acquisition have assumed a unidirectional model whereby the mother influences the child. Later research, notably by Bell (1968) corrected this imbalance by recognizing the infant's contribution to his own socialization. As a result the infant's impact on the mother became a focus. The current trend has shifted to a study of reciprocity in interaction, in which mother and infant mutually regulate each other's behaviour (Lewis & Lee-Painter, 1974).

Thirdly, the focus of mother-infant interaction has increasingly concentrated on the earliest stages of interaction, with observations beginning in the hospital and continuing in the home (Richards & Bernal, 1971; Tulkin & Kagan, 1972; Clarke-Stewart, 1973). This shift in emphasis is in contrast to early research guided by the attachment theory of Bowlby which focused on the period after six months and assumed that infants could only form attachment after achieving object permanence.

Finally, there has been an enthusiastic consent to use naturalistic observational methodology, based upon a concern for the limited 'ecological validity' of traditional methodologies, particularly the heavy emphasis on laboratory experimentation. Many researchers have favoured the advantages of rigorous experimental procedures in discovering the infant's ability to perceive objects or respond to reinforcement. But there has been growing concern that the infant shows best what he can do when allowed to express himself in an unconstrained situation. When controls have been arranged to obtain quantitative data on a limited range of questions, the findings have led to a distorted and disintegrated view of infant capabilities. This kind of method obscures the spontaneous aspect of mother-infant interaction. There is now a growing emphasis on an alternative kind of research, more holistic at the beginning, as a necessary prerequisite to experiment in the scientific study of infant communication. This alternative method is best expressed in the ecological perspective using the methods

of ethology. It attempts to capture the total ongoing behaviour (between mother and infant) as it begins and then develops in the context of the environment. Application of this approach to the study of preverbal communication places emphasis upon the functional interaction of cognition, communication and social development.

The Ecological Perspective

Some of the main features that distinguish the ecological perspective from other approaches to the study of behaviour have been addressed by Willems (1977) and Schoggen (1978). The emphases, assumptions and implications of what they refer to as 'behavioural ecology' include the concept of behaviour in environment, the concept of systems and a preference for naturalistic studies.

The ecological perspective stresses the mutual interdependence between organism, behaviour and environment (Lewin, 1951; Brunswick, 1957). Brunswick writes

> . . . Both organism and environment will have to be seen as systems, each with properties of its own, yet both hewn from basically the same block. Each has surface and depth, or overt or covert regions . . . . the interrelationship between the two systems has the essentials characteristic of a 'coming-to-terms' . . . . much as psychology must be concerned with the texture of the organism or of its nervous processes and must investigate them in depth, it also must be concerned with the texture of the environment. (1957, p. 5)

An important influence on mother-infant interaction patterns is the immediate context or setting in which the interaction takes place. Not only do contexts vary in terms of their degree of structure, but also the same responses adopt a very different meaning in various contexts. Brazelton et al. (1975) presented a typology outlining the amount of constraint and structure in different situations. They found that the function of behaviours changed with the context of situation. For example, mothers are likely to react to arm waving and laughing in different ways in feeding and play contexts. Bruner was ". . . struck by Roger Barker's ironic truism that the best way to predict the behaviour of a human being is to know where he is: in a post office he behaves post office, at church he behaves church" (1965, p. 106).

The ecologist also uses the concept of systems to emphasize holism and the study of "complex, simultaneous and sequentially independent phenomena" (Schoggen, 1978, p. 37). This general systems theory based on Weiss' work (1971) provides a perspective that incorporates the interdependence of the mother and infant who are viewed in a system emphasizing the dynamic quality of mutual change and ongoing reciprocity. In such a system there are many interacting factors and it is often difficult to pinpoint either partner's behaviours as causing one particular behaviour in the other; the two are so intricately interwoven. The systems approach has a major obstacle to overcome as Thoman states:

> . . . There is not currently available either a language for labelling interactive processes or statistics that are appropriate for translating elemental data into systems data that change over time. Although some investigators have made use of Markov sequence analyses in looking at interactive process, as Lewis & Painter (1974) have pointed out, the determination of a point of entry into an ongoing system is always a problem. (1978, p. 99)

Finally, fundamental to the ecological approach is a naturalistic emphasis and preference for the collection of data from direct observation in real life settings. Later, this data are studied in terms of the range and intensity of frequency of each behaviour.

The Ethological Method

Human ethology as outlined by Eibl-Eibesfeldt (1970) and Blurton-Jones (1972) draws its method from zoology and biology and is interested "primarily in the behaviour of the total organism and its relationship with the organic and inorganic environment" (Eibl-Eibesfeldt, 1970, p. 2). The ethological approach focuses on the study of causation, development and comparative behaviour and these are linked around an interest in evolution, the process of adaptation and the concept of function. The ethological method is based on the quantitative observations of behaviour and is dedicated to the belief that students of behaviour need to correct psychology's deficiency in neglecting the descriptive, natural history phase of scientific development.

According to Barker & Wright:

> . . . Psychology has been predominantly an experimental science . . . . The descriptive, natural history, ecological phase of science which is strongly represented in the biological sciences, sociology, anthropology, earth sciences and astronomy has had virtually no counterpart in psychology. This has left a serious gap in psychological knowledge, for in leaving out ethological methods psychology has almost completely omitted a basic scientific procedure that is essential if some fundamental problems of human behaviour are to be solved. (1955, p. 1)

Only a few years later, Tinbergen (1963) expressed a similar position:

> . . . in its haste to step into the twentieth century and to become a respectable science, psychology skipped the preliminary descriptive stage other natural sciences had gone through, and so was soon losing touch with the natural phenomena. (p. 4)

A major goal of human ethology is the direct observation of naturally occuring patterns of behaviour as they are found in non-contrived situations in ordinary, everyday life. The information about behaviour is collected by trained observers and on the basis of this information, hypotheses may be tested in experimental situations at a later date. This ethological approach contrasts with the 'rigorous' methods of the experimental psychologist who tends to isolate some aspect of the total behaviour for measurement. The ethologist looks at the total behaviour and studies under what conditions it develops and what function it performs. In studying overt behaviour,

the ethologist makes no inferences about intrinsic psychological processes within the behaving organism such as goals, intentions, purpose or feelings.

The basis of each ethological investigation is the ethogram, a precise catalogue of all the behaviour patterns of the organism. From this catalogue the physical descriptions and functional units of behaviour are studied in terms of direction, frequency and position in time. In short, the ethological method is perhaps the only method that can tell us something about the nature of the development of behaviour through naturalistic, longitudinal, or observational studies.

Research Objectives

The main purpose of this research was an exploratory yet intensive and systematic study of the communication process as it emerges in its preverbal form between mother and infant in a non-contrived situation. A secondary aim was to see if it was possible to identify any indicators of thought and oral language in their early stages of development during this preverbal period. The specific objectives included:

1. To observe one mother infant pair from and including the birth to six months in a naturalistic setting.

2. To observe the infant "alone" to discern what patterns of behaviour occured in the absence of other people.

3. To identify and attempt to code the behaviours of the infant and mother using the McLeish-Martin (1975) coding system.

4. To analyse the coded results to illustrate:

(i) the nature of the communicative act in various everyday activities;

(ii) the amounts and frequencies of communicative behaviours;

(iii) the chronological sequence of these behaviours,

(iv) and if possible the sequential flow and integration of mother-infant interaction.

CHAPTER 4

METHODOLOGY: RESEARCH DESIGN, DATA COLLECTION AND DATA REDUCTION

Research Design

The central aim of the project was to observe and measure the natural development of preverbal communicative skills in their vocal (all sounds) and non-vocal (body movements) forms. This was attempted in a naturalistic and longitudinal approach using video recording equipment. Two major controls were built into the design. In order to observe how communicative behaviour varied from that in everyday activities, such as feeding and bathing, the mother was requested to interact face-to-face with the infant. In contrast to these enface episodes, a second control involved observing the baby alone. The study was also restricted in time span and sample size. It covered a period of six months, beginning with and including the birth of the baby and her subsequent development to six months. This is the approximate time when babbling becomes interspersed with simple vowels and consonants and the baby can vary and control volume, pitch and rate of utterances. It is also the time of the onset of object permanence. Owing to the time and cost factors, it was decided to observe one mother-infant pair.

Training

Prior to this study the author completed a training course in observation techniques for group interaction under the supervision of Dr. J. McLeish. This involved the theoretical background of Bales' (1950) interaction analysis system and the McLeish-Martin coding system (1975) and their practical application to videotaped material. Previous experience with the use of a portable video-camera and recording equipment negated the need for any training in the use of these.

Subject

A mother was selected for the project on the basis of recommendations by medical staff at the Victoria General Hospital. At the time of her delivery, the mother already had a healthy son, age two years and nine months. The mother was not working outside the home during her pregnancy.

Data Collection

The author visited the mother, father and son on two informal occasions prior to the delivery of the second child to familiarize them with the general nature of the study and the video recording equipment.

Delivery and Postpartum Period

Permission was obtained from the mother and the hospital to be present at and film the birth (Appendix A). The delivery, the physical examination of the baby (Apgar Test) and the feeding period immediately following the birth were filmed. The Apgar Test is a rating out of a possible ten points to measure heart rate, respiratory effort, muscle tone, reflex irritability and colour. At one minute after birth the score for the baby was eight points, at five minutes, ten points. Two subsequent observation periods were recorded after the baby's birth in the maternity ward, at age two hours and two days.

Home Observation Visits

The mother and infant were visited at the end of the first week and every other week, except the eighth, until the baby was 25 weeks old. An identical procedure was followed during each visit. The author arrived at the home at a prearranged time (usually around 10:00 a.m.) to maximize the likelihood that the baby would be awake. Immediately on arrival, the author talked with the mother about the baby's condition and spent some time with the older child. Then, for a maximum of 30 minutes, the normal activities of infant and mother, or infant were filmed. If the baby fell asleep observations were discontinued. If there were any interferences such as telephone calls, children or visitors that lasted more than two minutes, the recording equipment was switched off until such

interruptions ended. The baby's activity, when left alone, was also filmed.

At the end of each observation period, the author took notes on the visit, describing what had happened during the observation period. As the study proceded, the videotaped material was reviewed by J. McLeish to ensure that the project was proceding within the context of the research parameters.

Data Reduction

Stage One

The videotaped observations covering 25 weeks were all reviewed and comprehensive notes made. These descriptive accounts included the place where the behaviours occured, who was present and what mother and infant did in response to one another's behaviour. On the basis of these notes it was possible to identify a group of activities that appeared consistently over the six month period. These activities included, in order of least to most social; baby alone, feeding, bathing, dressing, playing with mother and objects, and mother and infant face-to-face. The dressing activity was then subdivided into 'long' and 'short' examples. The 'long' dressing episodes occured after bathing and were more task-oriented for the mother. The 'short' dressing periods included brief diaper changes which had a greater degree of sociability about them.

Stage Two

On the basis of these seven activities, the descriptive notes of all the videotaped observations were reviewed and organized in chronological sequence under these activity headings. For example, there were seven episodes of bathing, eight episodes of feeding, five of dressing (long), seven of dressing (short), six of play, eight of face-to-face and nine episodes of baby alone. From these episodes examples were selected in each activity, for coding, on the following basis:

1. The degree of interference from children and visitors. On a number of occasions the mother was naturally interrupted during her activities with the baby to attend to the needs of her older son. At other times visitors made it difficult to observe continuous mother-infant sequences.

2. On two occasions the baby suffered from minor illnesses and did not respond in her usual manner.

3. The quality of videotape was poor in parts. As it was important to keep the visits as non-contrived as possible artifical lighting was not used. As a result, a small percentage of the film footage was difficult to analyse.

4. After viewing the tapes repeatedly it became apparent that 2.5 to 3.0 minutes of film was the maximum length of an uninterrupted sequence. Hence samples were selected on the basis of approximately three minutes of continuous interaction.

Table 1 illustrates the distribution of examples. It shows an irregular distribution which reflects the routines of the mother over the six month period. During the first seven weeks, the baby was bathed, dressed and fed during the observation time. Any face-to-face interaction or play that occured did so incidentally and briefly during feeding, bathing and dressing. After feeding the baby was then placed in the crib and fell asleep immediately, if she had not already done so.

Between nine and 15 weeks the routines varied, with bathing taking place in the evenings rather than the morning visits. As a result it was possible to observe interaction during diaper changes, when baby was alone and when mother and infant, upon request, interacted face-to-face.

During the period from 16 to 25 weeks the baby's sleeping pattern became more regulated and her wakeful periods more sociable. Bathing became more play oriented and there were more deliberate play periods between mother and baby. During this time also, the baby spent longer periods alone and awake in her crib.

Stage Three

The videotaped examples listed in Table 1 were each viewed a number of times and detailed transcripts of each made (Appendix B contains examples of transcripts). This involved the following procedure. In a two-columned notebook the author

TABLE I

Distribution of Coded Samples Per Activity

Age	ACTIVITY						
	Baby Alone	Feeding	Bathing	Dressing (L)	Dressing (S)	Play	Enface
Birth		X					X
Postpartum		X			X		
1 week		X	X	X			
2 weeks		X					
3 weeks			X	X			
4 weeks		X			X		X
5 weeks			X				
6 weeks	X	X	X				
7 weeks		X					
8 weeks	No Visit						
9 weeks					X		
10 weeks					X		X
11 weeks							
12 weeks							X
13 weeks							
14 weeks	X						
15 weeks					X		X
16 weeks			X	X			
17 weeks		X				X	
18 weeks						X	
19 weeks							X
20 weeks	X		X	X			X
21 weeks	X						
22 weeks	X				X		X
23 weeks							
24 weeks						X	
25 weeks	X						
Total	6	8	6	4	6	3	8

recorded the behaviours of mother and infant. In the right hand column the infant's behaviour was noted, in the left, the mother's. If their behaviours occured simultaneously they were entered on the same horizontal line. If they occured sequentially they were written on alternate lines. The aim in compiling the transcripts was to try and give a moment by moment account of what happened. The transcripts, in conjunction with the videotaped sequences, were then coded using the McLeish-Martin coding system.

The McLeish-Martin Coding System

This is a coding system developed to analyze the communicative process in student discussion groups. The procedures are based on Bales (1950) and Skinner (1957). The basic tenet of this system is that communication is a dynamic process and is "conceptualized in terms of Pavlov's conception of the organism reactive in an environment" (McLeish, 1977, p. 2). Behaviour is conceived as a complex 'amalgam' of verbal and non-verbal aspects or components. In communicating with others, the individual demonstrates a large variety of behaviours. The coding system enables the communicative process to be identified on a functional basis. In coding, the observer pays attention to the behaviour pattern as a whole and codes it according to the specific function it performs. This is done without regard to 'intention' or purpose (McLeish, 1978).

The function of the overt behaviour is determined by considering the specific act in relation to context; what went before, what was the act, what effect did it have. In other words, the behaviour act is not coded according to its structual properties but according to the relationship it has to the unit of behaviour immediately preceding or succeeding. The relationship decides the category in which the behaviour is placed. Each piece of behaviour is viewed as having a particular function. The same formal act may perform different functions depending on the differing contexts in which it is considered.

Size of Unit of Analysis

To make the coding system work, it is necessary to isolate items of behaviour. The purpose is to analyze communication in terms of the function of controlling variables. The size of the behaviour unit is not fixed but changes depending upon the controlling variable present and the function it performs (Winokur, 1976). For example, in some contexts a whole sentence might constitute a unit, in others a single word or a shrug, a smile or grimace. In another example, the act of placing baby over the shoulder represents a unit, in another a single movement of the head is also a unit of analysis. In other words, all social behaviour is conceptualized as communicative in the sense that it is at once a response to the physical, social, vocal and non vocal environment in which the individual is situated and a stimulus responded to by "the other."

The coding system begins with the individual in the environment. From here there are four broad categories of possibilities of interacting with the environment and communicating about it. These broad categories, given as headings below, can be subdivided into ten classes of communicative behaviour or operants (McLeish, 1977):

A. Contingencies of Reference.

Here the individual refers to, acknowledges or uses something in the environment in a neutral way. The reinforcement is the general acceptance of the individual response.

1. Direct references or TACTS
2. Indirect references or EXTENDED TACTS
3. ECHOICS.

B. Contingencies of Action.

Here the individual responds by seeking to use another person as an 'instrument' to change certain features of the environment. The normal reinforcement is compliance by the other.

4. Controlling acts or DOMINANT CONTROL AUTOCLITICS
5. Submissive acts or SUBMISSIVE CONTROL AUTOCLITICS
6. Interactive, instrumental acts or MANDS.

C. Contingencies of Expressive Behaviours.

Here the individual reacts expressively. The reinforcement is some kind of social consensus (normally non-verbal) such as an empathic acceptance or an expression of sympathy.

7. Positive affective reactions or POSITIVE AUTOCLITICS
8. Negative affective reactions or NEGATIVE AUTOCLITICS.

D. Contingencies of Connection.

These are generated by the verbal act itself. The grammar, syntax and semantics of the language exercise their own controls.

9. Thematic responses or INTRAVERBALS
10. Contextual descriptive acts or INFORMATIVE AUTOCLITICS.

Table II gives a summary of these ten broad categories together with examples for mother and baby.

In using the coding system, the observer adopts the role of generalized other. This implies a non-involvement with the interacting individuals (McLeish, 1978). The tables in Appendix C comprise the raw data of the coded examples. These data include the vocal and non vocal behaviours of mother and infant in the activities; baby alone, feeding, dressing (L), dressing (S), playing and enface. The raw scores represent the number of times an operant was observed during that particular activity, at a certain age in the infant's development. To facilitate comparison, all the raw scores were standardized to a three minute sample length.

Inter-Observer Reliability

Observer reliability of the coding system was determined by Scott's π (pi) coefficient. The formula for π is as follows:

$$\pi = \frac{Po - Pe}{100 - Pe}$$

where 'Po' is the percentage of agreements and 'Pe' the percentage of agreement expected by chance. 'Pe' is calculated

Table II

Category System of Analysis of Communicative Behavior

Operant Categories	Definitions	Example			
		Mother (vocal)	(non-vocal)	Baby (vocal)	(non-vocal)
Mand	A communicative operant whose function is to involve another person as an instrument of change in the situation.	"Don't cross your eyes!" "What's the matter?" "Stop that?"	Directing gestures of command. Sits baby in upright position after feeding	Very loud cries interspersed among softer cries.	Shows discomfort, gestures with arms and legs.
Tact	A communicative operant in which a response is evoked or strengthened by the presence of an object, event or the property of an object or event.	"This is your rattle." "It's so cold." "I have forgotten a shirt."	Rubs baby dry. Washes baby's face. Combs hair.	Loud sucking noises during feeding. Burping.	Eats objects. Sucks fist. Holds objects. Silent feeding. Playing with toy.
Extended Tact	A communicative operant in which reference is made to objects, or events outside of the present.	"Yesterday, you were talking like a blue streak."	Bows playfully to baby as baby gains mother's attention.	None.	Follows mother as she leaves room and continues to look. Looks for fallen objects.
Echoic	A communicative operant in which the response has the same formal properties as the stimulus.	Any spoken repetition of self or baby.	Repetition or modelling of postures, gestures of self or baby.	Uses vowel sounds to imitate mother. Repeats self.	Models mother's behaviour. Opens mouth. Smiles.
Intraverbal	A communicative operant in which the response is thematically related but shows no point to point correspondence.	Baby cries when soap rubbed on the face. Mother says, ". . . which she does not like."	Laying out towel as baby is lifted from bath.	None.	None.
Dominant Control Autoclitic	A communicative operant which calls attention to the speaker or what he is saying or doing.	"Now . . ." "So . . ." "Well . . ." "Ah'm . . ."	Leaning forwards or backwards. Standing up. Pause for effect.	Loud "ah". Half cry. Gulping sounds arouse attention.	Looking at mother. Gesturing with arms and legs.
Negative Affective Autoclitic	A communicative operant which indicates an emotional reaction to what has been said or done.	"No . . ." "I don't like that."	Looking away. Ignoring baby's attention getting signals.	Consistent cries or whimpers	Turning away. Wriggling.
Informative Autoclitic	A communicative operant which clarifies or alters the effect of a communication, but does so without emotion.	"I see where . . ." "On the other hand . . ." "I wish . . ."	Gestures which clarify other behaviour. Shaking the head while saying "no."	None.	None.
Submissive Control Autoclitic	A communicative operant which indicates passive acceptance.	A bland "yes."	Attentive listening. Direct eye contact with speaker.	None.	Co-operative, but no eye contact. Later develops into eye contact.
Positive Affective Autoclitic	A communicative operant which indicates a positive reaction to what has been said or done.	"I agree." "Definitely." Laughing aloud.	Smiling. Nodding.	Laughing and giggling aloud usually with eye contact	Smiling. Waving arms and legs.

by squaring the proportion of tallies in each category, summing overall the categories and dividing by 100. In other words, π is the amount that two raters exceed chance agreement, divided by the amount that perfect agreement exceeds chance. Scott (1955) and Flanders (1966), give a more detailed explanation of π.

In this project, the reliability was calculated from an analysis of one tape by two observers working independently. Approximately three minutes of interaction were coded, and this yielded about 250 "acts." Scott's π coefficient was .73. The calculation of the observer reliability rates are included in Appendix D.

CHAPTER 5

PRESENTATION OF RESULTS

The results of the study are organized in five sections. The first deals with the infant at birth and the post partum period. Section two considers the development of mother and infant in six activities and compares this with 'baby alone.' The fourth section gives examples of a micro-analysis of interaction and finally, the overall behaviour patterns of mother and infant are described and illustrated.

The Infant

The Infant at Birth

The birth was a smooth, uncomplicated occasion. After the umbilical cord was cut, the baby cried and was immediately placed on the mother's upper stomach and covered with a warm blanket. She lay on her right side facing her mother about eight inches from her face. The mother held the baby with her right arm and continuously looked at and stroked the baby's face with her left hand, making incidental comments as she did so. The baby remained in this position during the mother's suturing and was quiet and relaxed. (The Apgar test indicated 'no drug' effects in the baby.) During these first moments with the mother, the baby lifted her left arm out of the blanket,

opening and closing her hand simultaneously, and moved it around in front of the mother's face. Concurrently the baby also slowly and consistently blinked her eyes until they remained permanently open. Accompanying the eye movements were slight head turning actions and opening and closing of the mouth. The baby was then weighed, examined and given to the mother for feeding. This total enface episode which lasted 7.5 minutes is summarized in Table III.

TABLE III

Birth: Enface Sequence. Operants Identified

	Operant Categories										
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Total
BABY											
Vocal	-	-	-	-	-	-	14	-	-	-	14
Non vocal	-	2	-	-	-	-	-	-	50	-	52
MOTHER											
Vocal	4	7	3	1	2	2	1	-	1	4	25
Non vocal	1	5	-	-	-	-	8	-	12	28	54

Three operants were identifiable in the infant at birth, two vocal and one non vocal. The non vocal submissive autoclitic (category 9, a response to mother's stroking behaviour) was observed together with the vocal negative affective (category 7, crying).

Feeding at Birth

The baby did not respond immediately when placed at the breast. Successful feeding began after an initial trial and error period of two minutes. This sequence is outlined in Table IV.

TABLE IV

Feeding at Birth. Operants Identified

	Operant Categories										
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Total
BABY											
Vocal	-	-	-	-	-	-	1	-	-	-	1
Non vocal	-	2	-	-	-	-	8	-	8	-	18
MOTHER											
Vocal	4	-	3	-	-	1	-	-	-	-	8
Non vocal	6	-	-	-	-	-	2	-	-	5	13

Non vocal behaviours dominated, with the baby demonstrating negative (category 7, turning away) and submissive (category 9, calm and cooperative) behaviours. The small number of non vocal tacts (category 2, feeding) indicated a short feeding period. The vocal negative behaviour (category 7) consisted of intermittent whimpers.

In summary, the infant at birth appeared alert, calm and capable of some elementary form of adjustment to and exploration of the environment through eye, arm and hand movements. She was also able to communicate her negative responses to certain stimuli by turning away and crying. It is interesting to note that the total number of behaviours for the mother only slightly exceeded the baby's.

The Infant during the Postpartum Period

The infant and mother were observed at two hours after delivery during a feeding session and later at two days in a short dressing sequence. The feeding activity at two hours was completely successful with the baby feeding continuously. This is indicated in Table VI which shows, for the baby, an absence of all operants except the non vocal tact. The mother during this time made indirect comments about the baby but her non vocal behaviour exceeded the vocal.

The dressing sequence at age two days outlined a different kind of interaction.

TABLE V

Dressing(S) Sequence. Operants Identified

	Operant Categories										
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Total
BABY											
Vocal	-	1	-	-	-	-	-	-	-	-	1
Non vocal	-	5	-	-	-	-	7	-	4	-	16
MOTHER											
Vocal	-	4	3	-	-	-	1	1	-	2	11
Non vocal	1	6	-	-	-	-	1	-	-	-	8

The behaviours observed in the baby included tact (category 2), negative affect (category 7) and submissive autoclitic (category 9). These were mostly non vocal, although the vocal tact (thumb sucking) was observed for the first time. The non vocal tact was identified as a visual exploration of the immediate surroundings, whilst the non vocal negative behaviours manifested themselves in wriggling and turning away. At other times the baby lay quiet.

Compared with the birth, the baby's repertoire at two days showed no change. Had it been possible to observe the infant, for example, prior to feeding, other operants may have been

identifiable, particularly the mand (category 1, loud demanding cries) and possibly the spontaneous smile.

Mother-Infant Interaction from Birth to Six Months

Feeding

The standardized scores for mother's and baby's vocal and non vocal behaviours during eight observational sessions are tabulated in Table VI. For both mother and baby the total number of operants identified at each session remained fairly constant and the routine followed a fixed procedure. During the first seven visits feeding periods occured in the living room where the older child usually played on the floor close to the mother, or watched television. As the baby nursed, the mother affectionately and silently stroked the baby's body or adjusted her clothing, while occasionally speaking to the older child or glancing at the television. Periodically, the mother would speak to the baby. At the end of the feeding session the baby fell asleep and was placed in her crib. The visit at 17 weeks followed a similar pattern except that it took place in the kitchen and the baby was put to play on a blanket when she had finished.

The mother's overall dominant behaviours during feeding are listed in Table VII. The most characteristic behaviour was non vocal submissive, in which the mother sat to let the baby

TABLE VI

Feeding: Standardized Data (3 mins.) for Vocal (v.) and Non-vocal (n.v.) Operants: Mother (m) and Baby (b).

Age	Actual Time	vocal non.v.	Operant Categories: Mand		Tact		Extended Tact		Echoic		Intra-Verbal		Dominant Control Autoclitic		Negative Control Autoclitic		Informative Autoclitic		Submissive Control Autoclitic		Positive Affective Autoclitic		Totals	
			m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b
		v.	7.5	-	-	-	5.6	-	-	-	-	-	1.9	-	-	1.9	-	-	-	-	-	-	15.0	1.9
Birth	1.6	n.v.	11.3	-	-	3.8	-	-	-	-	-	-	-	-	3.8	15.0	-	-	-	15.0	9.4	-	24.5	33.8
2		v.	1.6	-	12.6	-	1.6	-	-	-	1.6	-	-	-	-	-	-	-	1.6	-	1.6	-	20.6	-
hours	1.9	n.v.	1.6	-	4.7	52.1	-	-	-	-	-	-	-	-	3.2	-	-	-	12.6	-	1.6	-	23.7	52.1
1		v.	1.0	-	-	1.0	1.9	-	1.0	-	-	-	1.0	-	3.9	-	-	-	-	-	-	-	8.8	1.0
week	3.1	n.v.	5.8	-	3.9	19.3	-	-	-	-	-	-	-	-	10.6	-	-	-	7.7	15.5	2.9	1.0	30.9	35.8
2		v.	2.3	-	0.7	-	1.5	-	-	-	-	-	-	1.5	3.0	-	1.5	-	-	-	0.7	-	9.7	1.5
weeks	4.0	n.v.	4.5	1.5	2.3	18.7	-	-	-	-	-	-	0.7	-	3.0	0.7	-	-	4.5	6.0	4.5	-	19.5	26.9
4		v.	4.4	-	3.9	6.2	2.6	-	-	-	-	-	0.9	0.9	2.6	-	0.9	-	-	-	2.6	-	17.9	7.1
weeks	3.4	n.v.	7.9	-	1.8	13.2	-	-	-	-	-	-	-	-	0.9	9.7	-	-	6.2	0.9	5.3	-	22.1	23.8
6		v.	7.5	-	0.9	0.9	1.9	-	1.9	-	-	-	5.6	1.9	0.9	1.9	1.9	-	0.9	-	1.9	-	23.4	3.8
weeks	3.2	n.v.	9.4	-	-	30.0	-	-	-	-	-	-	0.9	-	9.4	13.1	-	-	8.4	6.6	7.5	-	35.6	49.7
17		v.	-	0.9	0.9	6.4	2.7	-	-	-	-	-	0.9	2.7	-	0.9	-	-	-	-	0.9	-	5.4	10.9
weeks	3.3	n.v.	3.6	-	1.8	18.2	-	-	0.9	-	-	-	0.9	-	7.3	1.8	-	-	7.3	4.5	10.0	-	31.8	24.5
17		v.	3.4	-	2.0	-	4.8	-	0.7	-	-	-	1.4	2.7	0.7	0.7	2.0	-	-	-	1.4	-	16.4	3.4
weeks	4.4	n.v.	7.5	0.7	0.7	22.5	-	-	-	-	-	-	0.7	-	2.7	6.8	-	-	8.2	3.4	8.9	0.7	28.7	34.1
Totals	24.9	v.	27.7	0.9	21.0	14.5	22.6	-	3.6	-	1.6	-	11.7	9.7	11.1	5.4	6.3	-	2.5	-	9.1	-		
		n.v.	51.6	2.2	15.2	177.8	-	-	0.9	-	-	-	3.2	-	40.9	47.1	-	-	54.9	51.9	50.1	1.7		
		v. + n.v.	79.3	3.1	36.2	192.3	22.6	-	4.5	-	1.6	-	14.9	9.7	52.0	52.5	6.3	-	57.4	51.9	59.2	1.7	644.3	

feed and waited for the baby to pause. The second most frequent behaviour--the non vocal mand--was observed in the mother's directive behaviour which she used to initiate feeding and to arrange the baby's position. In a successful feeding sequence, the baby nursed continuously and stopped momentarily for rests. On other occasions, a less successful session was indicated by an increase in both the baby's negative behaviour and the mother's manipulative acts. The mother also scored high in the positive affective category, exemplified in caressing behaviour as the baby fed. Overall, the mother's non vocal behaviours (64.8%) were greater than the vocal (35.2%) and suggest that in this mother-infant pair, the task oriented character of the activity took precedence over the social.

The baby's behaviour during feeding showed a slight change over time. The four operants identified at birth occured again at eight days. At two weeks, the first mand was observed in head-turning movements towards the mother when the baby was placed over her shoulder. Also at this time, the vocal dominant control autoclitic was identified in an elementary form. It consisted of very loud gulping sounds combined with a clicking of the tongue, which had the spontaneous function initially of directing mother's attention to the baby. This led the mother to look at the baby and verbally comment on the noise. This pattern of behaviours was observed on all subsequent visits and performed the same function. On later

TABLE VII

Feeding: Dominant Operants for Mother and Baby (Percent)

Mother Operant	vocal non vocal	%	Baby Operant	vocal non vocal	%
Submissive Autoclitic	non v	16.4	Tact	non v	57.3
Mand	non v	15.4	Submissive Autoclitic	non v	16.7
Positive Affective Autoclitic	non v	15.0	Negative Affective Autoclitic	non v	15.3
Negative Affective Autoclitic	non v	12.1	Tact	v	4.8
Mand	v	8.2	Dominant Control Autoclitic	v	3.1
Extended Tact	v	6.8	Negative Affective Autoclitic	v	1.8
Tact	v	6.3	Mand	non v	0.7
Tact	non v	4.6	Positive Affective Autoclitic	non v	0.5
Dominant Control Autoclitic	v	3.5	Mand	v	0.3
Negative Affective Autoclitic	v	3.2			
Positive Affective Autoclitic	v	2.7			
Informative Autoclitic	v	2.4			
Echoic	v	1.1			
Dominant Control Autoclitic	non v	0.9			
Intraverbal	v	0.5			
Submissive Autoclitic	v	0.3			
Echoic	non v	0.3			
Total no. operants 334.0			Total no. operants 310.3		
	v	35.2		v	10.0
	non v	64.8		non v	90.0
Time elapsed 24.9 mins.					

occasions, it developed into eye-to-eye contact when the baby would stop feeding momentarily on seeing and hearing the mother, and then smile. The mother replied with further comments and a chain of behaviours was built up. At the seven week visit, seven operants were identifiable for the baby, including the vocal mand (loud rooting sounds). During the 17 week visit smiling became an important part of the interactive sequences.

Table VII shows that silent feeding (non vocal tact) was the most frequent operant for the baby, followed by submissive behaviours (allowing mother to direct) and negative responses (in less successful sessions). In total, nine behaviour types for the baby were observed during this activity, five non vocal and four vocal. Compared to other activities, feeding was not a 'high interactive' occasion.

Bathing

Like the feeding activity, bathing followed a consistent pattern. In the first four examples, the baby was undressed in the bathroom on the countertop next to the washbasin. The mother then proceded to systematically wash the baby over the washbasin. Occasionally, the older child would enter to 'inspect' the proceedings. The mother made direct and indirect intermittent comments to both baby and older child. On the fifth visit (age 16 weeks), bathing took place with a more

TABLE VIII

Bathing: Standardized Data (3 mins.) for Vocal (v.) and Non-vocal (n.v.) Operants: Mother (m) and Baby (b).

Age	Actual Time	vocal, non.v.	Operant Categories: Mand		Tact		Extended Tact		Echoic		Intra-Verbal		Dominant Control Autoclitic		Negative Control Autoclitic		Informative Autoclitic		Submissive Control Autoclitic		Positive Affective Autoclitic		Totals	
			m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b
1		v.	2.5	2.5	1.3	-	10.0	-	1.3	-	-	-	-	-	1.3	20.0	1.3	-	3.8	-	3.8	-	25.3	22.5
week	2.4	n.v.	5.0	-	25.0	-	-	-	-	-	-	-	-	-	-	7.5	-	-	-	12.5	-	-	30.0	20.0
3		v.	2.5	-	6.2	2.5	7.5	-	1.3	-	-	-	-	3.8	-	1.3	1.3	-	1.3	-	6.2	-	26.3	7.6
weeks	2.4	n.v.	1.3	-	25.0	-	-	-	1.3	-	-	-	-	-	-	-	-	-	2.5	39.7	-	-	30.1	39.7
5		v.	-	-	1.2	1.2	4.8	-	-	-	1.2	-	1.2	-	1.2	4.8	1.2	-	-	-	2.4	-	13.2	6.0
weeks	2.5	n.v.	3.6	-	20.4	-	-	-	-	-	-	-	-	-	-	14.4	-	-	-	13.2	-	-	24.0	27.6
6		v.	1.3	-	-	-	7.5	-	-	-	-	-	1.3	-	-	8.7	1.3	-	-	-	1.3	-	12.7	8.7
weeks	2.4	n.v.	1.3	-	13.7	-	-	-	-	-	-	-	-	-	-	1.3	-	-	2.5	15.0	1.3	2.5	18.8	27.5
16		v.	12.7	-	3.5	-	10.4	-	1.2	-	-	-	11.5	1.2	-	1.2	-	-	1.2	-	9.2	-	49.7	2.4
weeks	2.6	n.v	10.4	-	13.8	9.2	-	-	-	-	-	-	-	1.2	1.2	6.9	-	-	-	21.9	-	24.5	25.4	63.7
20		v.	3.5	-	-	-	3.5	-	-	-	-	-	3.5	-	-	3.5	-	-	-	-	5.3	-	15.8	3.5
weeks	1.7	n.v.	8.8	-	10.6	22.9	-	1.8	-	-	-	-	3.5	-	1.8	3.5	-	-	-	3.5	5.3	-	28.2	31.7
Totals	14.0	v.	22.5	2.5	12.2	3.7	43.7	-	3.8	-	1.2	-	17.5	5.0	2.5	39.5	5.1	-	6.3	-	28.2	-		
		n.v.	30.4	-	108.5	32.1	-	1.8	1.3	-	-	-	3.5	1.2	3.0	33.6	-	-	5.0	105.8	4.8	27.0	552.9	
		v. + n.v.	52.9	2.5	120.7	35.8	43.7	1.8	5.1	-	1.2	-	21.0	6.2	5.5	73.1	5.1	-	11.3	105.8	33.0	27.0		

playful atmosphere in the bathtub. On the sixth visit (age 20 weeks) the baby was bathed in a plastic tub in the bedroom and this resulted in a different interactive style.

The standardized frequency scores for this activity are listed in Table VIII. Over the 20 week period, the mother's behaviour showed a slight change. Table IX lists these behaviours in hierarchial sequence. The non vocal tact (washing baby) was dominant, followed by the vocal extended tact (referring to baby indirectly). Directive behaviour by the mother (non vocal mands) also scored high, in contrast to the low counts in the submissive category. The vocal positive affect category was reflected in the mother's concern for the baby in the early weeks, but later developed into playful, smiling episodes. In contrast to the feeding activity which was dominantly non vocal, the bathing sequences involved a more even distribution of vocal (48%) and non vocal (52%) operants.

The baby's behaviour during bathing changed significantly over time. In the first five weeks the pattern was constant and included vocal mands (loud crying) and negative behaviour (crying, wriggling and turning away). At six weeks smiling responses were noted. These began with eye-to-eye contact and developed into verbal play by the mother, which elicited a smile from the baby. By 16 weeks, these smiling responses

TABLE IX

Bathing: Dominant Operants for Mother and Baby (Percent)

Mother			Baby		
Operant	vocal non vocal	%	Operant	vocal non vocal	%
Tact	non v	36.2	Submissive Autoclitic	non v	41.7
Extended Tact	v	14.6	Negative Affective Autoclitic	v	15.6
Mand	non v	10.6	Negative Affective Autoclitic	non v	13.4
Positive Affective Autoclitic	v	9.4	Tact	non v	12.8
Mand	v	7.5	Positive Affective Autoclitic	non v	10.6
Dominant Control Autoclitic	v	5.8	Dominant Control Autoclitic	v	2.0
Tact	v	4.0	Tact	v	1.6
Submissive Autoclitic	v	2.1	Mand	v	1.0
Submissive Autoclitic	non v	1.7	Extended Tact	non v	0.8
Informative Autoclitic	v	1.7	Dominant Control Autoclitic	non v	0.5
Positive Affective Autoclitic	non v	1.6			
Echoic	v	1.3			
Dominant Control Autoclitic	non v	1.2			
Negative Affective Autoclitic	non v	1.0			
Negative Affective Autoclitic	v	0.8			
Echoic	non v	0.4			
Intraverbal	v	0.4			
Total no. operants 299.5			Total no. operants 252.2		
	v	47.7		v	20.2
	non v	52.3		non v	79.8
Time elapsed 14.0 mins.					

(positive affective category) occured more frequently than any other behaviour for the baby. At age 20 weeks the non vocal tact (playing with water) dominated. During this sequence an important event occured when the baby looked around without hesitation to the sound in the next room (extended tact). By 20 weeks, the baby's repertoire had increased from three identifiable operants at birth to ten, and included smiling, attending to and looking for, and exploratory behaviours. This latter behaviour, demonstrated when the baby played with water, appears to have developed from thumb-sucking, to sucking the towel to responding to contact with water. Although the baby's overall behaviour (submissive and negative) were responses to the mother's directive acts during bathing, the occurence of the dominant control, positive affect and tact categories indicated the baby's ability to take part in interaction.

Dressing (Long)

The dressing activities that followed bathing took on a similar pattern to the feeding and bathing sequences in the kinds and frequencies of behaviours. The finer details of each dressing sequence are entered in Table X. The total number of operants for the mother ranged from 26.7 to 71.3 and appeared to be a function of how the baby reacted. At three weeks, the baby scored low in the negative and high in the submissive categories. Correspondingly, the mother registered low on

TABLE X

Dressing (L): Standardized Data (3 mins.) for Vocal (v.) and Non-vocal (n.v.) Operants: Mother (m) and Baby (b).

Age	Actual Time	vocal, non.v.	Operant Categories: Mand m	Mand b	Tact m	Tact b	Extended Tact m	Extended Tact b	Echoic m	Echoic b	Intra-Verbal m	Intra-Verbal b	Dominant Control Autoclitic m	Dominant Control Autoclitic b	Negative Control Autoclitic m	Negative Control Autoclitic b	Informative Autoclitic m	Informative Autoclitic b	Submissive Control Autoclitic m	Submissive Control Autoclitic b	Positive Affective Autoclitic m	Positive Affective Autoclitic b	Totals m	Totals b
1		v.	3.9	0.9	10.6	-	2.9	-	0.9	-	-	-	0.9	-	-	9.7	2.9	-	1.8	-	3.9	-	27.8	10.6
week	3.1	n.v.	5.8	1.8	17.4	3.9	-	-	-	-	-	-	-	-	-	8.7	-	-	-	22.2	0.9	-	24.1	36.6
3		v.	0.8	-	-	-	2.6	-	-	-	-	-	1.6	-	-	1.6	0.8	-	1.6	-	2.6	-	10.0	1.6
weeks	3.4	n.v.	7.9	-	8.8	0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	17.6	-	-	16.7	18.4
16		v.	13.6	-	2.6	-	7.0	-	1.9	1.9	-	-	3.2	0.6	-	-	1.9	-	3.2	-	2.6	-	36.0	2.5
weeks	4.7	n.v.	3.2	-	7.7	-	-	0.6	-	-	-	-	-	-	0.6	1.9	-	-	0.6	23.6	1.3	14.7	13.4	40.8
20		v.	6.7	-	6.7	-	15.6	-	3.3	1.1	-	-	3.3	1.1	-	-	5.6	-	5.6	-	5.6	-	52.4	2.2
weeks	2.7	n.v.	6.7	-	7.8	16.7	-	4.4	-	5.6	-	-	2.2	-	-	4.4	-	-	1.1	14.4	1.1	1.1	18.9	46.6
Totals	13.9	v.	25.0	0.9	19.9	-	28.1	-	6.1	3.0	-	-	9.0	1.7	-	11.3	11.2	-	12.2	-	14.7	-		
		n.v.	23.6	1.8	41.7	21.4	-	5.0	-	5.6	-	-	2.2	-	0.6	15.0	-	-	1.7	77.6	3.3	15.8	358.4	
		v. + n.v.	48.6	2.7	61.6	21.4	28.1	5.0	6.1	8.6	-	-	11.2	1.7	0.6	26.3	11.2	-	13.9	77.6	18.0	15.8		

vocal operants and high on the non vocal, especially mands (directing behaviour) and tacts (dressing). The mother's role was dominant and task oriented, showing little submissive behaviour. An exception occured at 20 weeks when the dressing session took on a playful character and a wider range of behaviours was observed through all categories.

Unlike the feeding and bathing activities, the mother's vocal behaviour in dressing (long) exceeds the non vocal (Table XI). Also, apart from the mand and tact categories, the positive affect and echoic behaviours rate higher than in previous activities. The baby's behaviour during these dressing sequences appeared to complement the mother's. Almost 50% of the baby's behaviour registered in the submissive category. On close inspection, the analysis of the changing function of the tact was also interesting. In the earlier weeks of dressing the non vocal tact was represented by thumbsucking, but was later extended to random play with the towel or dress. When the baby spontaneously placed the object near or over her face, the mother initiated a peek-a-boo game. Eventually a pattern of behaviour built up which began with the baby's random grasping behaviour and led to joint attention and activity through game playing. At other times non-reciprocal interaction was evident when the baby wriggled and turned away.

TABLE XI

Dressing (Long): Dominant Operants for Mother and Baby (Percent)

Mother			Baby		
Operant	vocal non vocal	%	Operant	vocal non vocal	%
Tact	non v	20.2	Submissive Autoclitic	non v	48.8
Extended Tact	v	14.2	Tact	non v	13.5
Mand	v	12.0	Positive Affective Autoclitic	non v	10.0
Mand	non v	11.8	Negative Affective Autoclitic	non v	9.4
Tact	v	10.1	Negative Affective Autoclitic	v	7.1
Positive Affective Autoclitic	v	7.5	Echoic	non v	3.6
Submissive Autoclitic	v	6.2	Extended Tact	non v	3.1
Informative Autoclitic	v	5.7	Echoic	v	1.8
Dominant Control Autoclitic	v	4.6	Mand	non v	1.1
Echoic	v	3.0	Dominant Control Autoclitic	v	1.0
Positive Affective Autoclitic	non v	1.7	Mand	v	0.6
Dominant Control Autoclitic	non v	1.1			
Submissive Autoclitic	non v	0.9			
Negative Affective Autoclitic	non v	0.3			
Total no. operants 199.3			Total no. operants 159.1		
	v	63.3		v	10.6
	non v	36.7		non v	89.4
Time elapsed 13.9 mins.					

Two important operants, the vocal and non vocal echoic, emerged in this dressing activity for the baby. The vocal echoic was observed at 16 weeks when the mother elicited, through her short high-pitched questions, a smile from the baby. The mother then silently continued with the dressing routine and then the baby attempted to gain the mother's attention with a simple "uh" (vocal dominant control autoclitic). Mother responded by looking and the baby repeated the sound four times. At 20 weeks the non vocal echoic occured when the baby modelled the mother's mouth movements.

Overall, the most frequent behaviours for the baby during dressing (Table XI) included submissive, followed by the non vocal tact and the positive affective operants. Like the feeding activity, the non vocal behaviours greatly exceeded the vocal.

Dressing (Short)

The short dressing activities were distinguished from the long, in that they were not preceded by bathing, took place in a variety of locations and involved only a diaper change. Usually these episodes were more play than task oriented and consequently a different pattern of interaction emerged. With this mother-infant pair, as the relationship between them developed, the removal of the diaper became a signal for play. The frequency counts for each operant are listed in Table XII.

TABLE XII

Dressing (Short): Standardized Data (3 mins.) for Vocal (v.) and Non-vocal (n.v.) Operants: Mother (m) and Baby (b).

Age	Actual Time	vocal, non.v.	Operant Categories: Mand		Tact		Extended Tact		Echoic		Intra-Verbal		Dominant Control Autoclitic		Negative Control Autoclitic		Informative Autoclitic		Submissive Control Autoclitic		Positive Affective Autoclitic		Totals	
			m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b
2		v.	-	-	4.6	1.2	3.5	-	-	-	-	-	-	-	1.2	-	1.2	-	-	-	2.4	-	12.9	1.2
days	2.6	n.v.	1.2	-	6.9	5.8	-	-	-	-	-	-	-	-	1.2	8.1	-	-	-	4.6	-	-	9.3	18.5
4		v.	7.2	-	2.1	1.0	2.1	-	1.0	-	-	-	-	-	-	1.0	3.1	-	-	-	3.1	-	18.6	2.0
weeks	2.9	n.v.	3.1	-	8.3	-	-	-	-	2.1	-	-	-	-	-	1.0	-	-	-	13.4	-	8.3	11.4	24.8
9		v.	24.0	-	7.0	-	10.0	-	7.0	20.0	-	-	4.0	2.0	-	3.0	4.0	-	9.0	-	5.0	2.0	70.0	27.0
weeks	3.0	n.v.	1.0	-	5.0	-	-	-	-	4.0	-	-	2.0	-	-	1.0	-	-	-	14.0	2.0	21.0	10.0	40.0
10		v.	25.9	-	2.9	-	2.9	-	11.6	41.6	-	-	1.0	2.0	-	-	1.0	-	5.8	-	3.9	-	55.0	43.6
weeks	3.1	n.v.	5.8	-	4.8	-	-	-	-	2.9	-	-	2.0	-	-	11.6	-	-	1.0	5.8	3.9	12.6	17.5	32.9
15		v.	17.0	-	10.0	1.0	9.0	-	4.0	8.0	1.0	-	8.0	1.0	-	-	1.0	-	4.0	-	5.0	9.0	59.0	19.0
weeks	3.0	n.v.	7.0	-	9.0	10.0	-	-	-	2.0	-	-	4.0	-	-	-	-	-	1.0	25.0	2.0	18.0	23.0	55.0
22		v.	19.0	-	10.0	-	2.0	-	11.0	12.0	-	-	13.0	2.0	-	1.0	3.0	-	7.0	-	4.0	5.0	69.0	20.0
weeks	3.0	n.v.	17.0	-	15.0	13.0	-	-	1.0	1.0	-	-	3.0	-	-	2.0	-	-	5.0	29.0	5.0	35.0	36.0	80.0
Totals	17.6	v.	93.1	-	36.6	3.2	29.5	-	34.5	81.6	1.0	-	26.0	7.0	1.2	5.0	13.2	-	25.8	-	23.0	16.0		
		n.v.	35.1	-	49.0	28.8	-	-	1.0	12.0	-	-	11.0	-	1.2	23.7	-	-	7.0	91.8	12.9	86.6		
		v. + n.v.	128.2	-	85.6	32.0	29.5	-	35.5	93.6	1.0	-	37.0	7.0	2.4	28.7	13.2	-	32.8	91.8	35.9	102.6	748.4	

The mother's behaviour at two days and four weeks was similar when she 'got on with the job' (non vocal tact), moving the baby around (non vocal mand) and making affectionate comments (positive affect). Only 27 operants were counted. By nine weeks, the pattern had changed and remained constant throughout the remaining visits with an average count of 85 operants. The number of behaviour categories also increased from seven at two days to 14 at 22 weeks. The trend in the mother's behaviour showed a stable number of mands and tacts but an increase in dominant control, echoic and positive affective behaviours.

Table XIII indicates that the most dominant behaviour for the mother was the vocal mand. However this became less directive and manipulative and more play oriented. For example, the mother would say in affectionate tones, "For goodness sake, get those pants off!" This kind of remark generally elicited a smile from the baby, so often the whole sequence would develop into a peek-a-boo game once the diaper had been removed. The 'game playing' was reflected in the high frequency of vocal echoic behaviour for the mother. As a result, her vocal behaviours (72.4%) greatly exceeded her non vocal (27.6%).

The baby's behaviour during dressing appears to change at four weeks. Table XII illustrates the consistent occurence of positive affective behaviour demonstrated in smiling and laughing. This increased in frequency until at 22 weeks

TABLE XIII

Dressing (Short): Dominant Operants for Mother and Baby (Percent)

Mother			Baby		
Operant	vocal non vocal	%	Operant	vocal non vocal	%
Mand	v	23.7	Submissive Autoclitic	non v	25.8
Tact	non v	12.5	Positive Affective Autoclitic	non v	24.3
Tact	v	9.3	Echoic	v	22.4
Mand	non v	8.9	Tact	non v	8.1
Echoic	v	8.8	Negative Affective Autoclitic	non v	6.5
Extended Tact	v	7.5	Positive Affective Autoclitic	v	4.6
Dominant Control Autoclitic	v	6.6	Echoic	non v	3.3
Submissive Autoclitic	v	6.6	Dominant Control Autoclitic	v	1.9
Positive Affective Autoclitic	v	5.8	Negative Affective Autoclitic	v	1.4
Informative Autoclitic	v	3.3	Tact	v	0.9
Positive Affective Autoclitic	non v	3.2			
Submissive Autoclitic	non v	2.8			
Negative Affective Autoclitic	v	1.8			
Negative Affective Autoclitic	non v	0.3			
Echoic	non v	0.3			
Intraverbal	v	0.2			
		0.2			
Total no. operants 392.7			Total no. operants 355.7		
	v	72.4		v	31.7
	non v	27.6		non v	68.3
Time elapsed 17.6 mins.					

positive affect represent 35% of all behaviours. At four weeks the non vocal echoic was identified in the baby's mouthing acts. This developed into vocal echoics of repetitive vowel sounds and at ten weeks represented 54% of all the infant's behaviours. During these 'proto-conversation' periods the baby used the sounds "ah" and "m" in a sentence-like form with the pause, rhythm and intonations of an adult.

The baby's most frequent behaviour during the dressing (short) activity consisted of attending to (submissive) and responding to (positive affect) the mother's behaviour, followed by attempts to reply to the mother (echoic). In this activity, the baby's vocal operants (31.7%) were higher than those in feeding, bathing or dressing (long).

Playing

Play activity was defined as interactive episodes in which the prominent characteristic was joint attention and joint activity with play objects. It was distinguished from the play periods in the short dressing sequences in that it involved not only verbal play but also the manipulation of objects. A regular pattern of interaction occured. The mother would hold out a toy to the baby and comment on it. The baby looked, grasped, manipulated, and dropped the toy, and would then look for it as the mother looked on. The mother would then initiate the cycle again. Four kinds of behaviours remained consistent for the mother (Table XIV); the directive behaviours (mands),

TABLE XIV

Playing: Standardized Data (3 mins.) for Vocal (v.) and Non-vocal (n.v.) Operants: Mother (m) and Baby (b).

Age	Actual Time	vocal, non.v.	Operant Categories: • Mand		Tact		Extended Tact		Echoic		Intra-Verbal		Dominant Control Autoclitic		Negative Control Autoclitic		Informative Autoclitic		Submissive Control Autoclitic		Positive Affective Autoclitic		Totals	
			m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b
17		v.	21	-	6	-	5	-	2	-	-	-	3	-	-	-	1	-	9	-	11	2	58	2
weeks	3	n.v.	8	5	1	28	-	2	-	-	-	-	-	-	-	2	-	-	5	19	-	14	14	70
18		v.	15	-	3	-	2	-	6	42	-	-	3	-	-	3	-	-	1	-	9	2	39	47
weeks	3	n.v.	3	-	-	8	-	-	-	-	-	-	-	-	-	1	-	-	15	22	-	6	18	37
24		v.	14	3	6	-	4	-	-	5	-	-	3	2	-	2	-	-	1	-	10	-	38	12
weeks	3	n.v.	14	-	5	26	-	4	1	-	-	-	1	-	-	7	-	-	18	16	-	15	39	68
Totals	9	v.	50	3	15	-	11	-	8	47	-	-	9	2	-	5	1	-	11	-	30	4		
		n.v.	25	5	6	62	-	6	1	-	-	-	1	-	-	10	-	-	38	57	-	35	442	
		v. + n.v.	75	8	21	62	11	6	9	47	-	-	10	2	-	15	1	-	49	57	30	39		

tacting (using physical objects), together with the affective responses of submissive and positive affective behaviours. The negative category was totally absent. These four behaviour groups were dominant throughout the playing activity (Table XV) with the vocal exceeding the non vocal operants.

During these play sessions the baby demonstrated an interesting change from previous activities. Whereas in the feeding, bathing and dressing (long) sequences she scored mostly in the submissive, negative and mand categories, the dominant operant during play was the non vocal tact (Table XV). This was followed by submissive behaviour. At 18 weeks, 50% of all the baby's behaviour was made up of echoics which consisted of simple vowel sounds uttered as she held a toy. By 24 weeks, the baby, while holding a toy, would make simple sounds, drop the object and then look for it. This 'looking for' was momentary and lasted for two seconds, but appeared to be the beginning of 'object permanence.'

Enface

Face-to-face episodes occured spontaneously at times when the author was not present. To ensure that this activity could be filmed the mother was requested to engage in face-to-face interaction when it appeared convenient. The baby was seated in a special baby seat approximately 12 inches from the mother, or lay on the floor with the mother bending over. These

TABLE XV

Playing: Dominant Operants for Mother and Baby (Percent)

Mother			Baby		
Operant	vocal non vocal	%	Operant	vocal non vocal	%
Mand	v	24.3	Tact	non v	26.3
Submissive Autoclitic	non v	18.4	Submissive Autoclitic	non v	24.2
Positive Affective	v	14.6	Echoic	v	19.9
Mand	non v	12.1	Positive Affective Autoclitic	non v	14.8
Tact	v	7.3	Negative Affective Autoclitic	v	4.3
Extended Tact	v	5.3	Extended Tact	non v	2.5
Submissive Autoclitic	v	5.3	Mand	non v	2.1
Dominant Control Autoclitic	v	4.4	Negative Affective Autoclitic	non v	2.1
Echoic	v	3.9	Positive Affective Autoclitic	v	1.7
Tact	non v	2.9	Mand	v	1.3
Echoic	non v	0.5	Dominant Control Autoclitic	v	0.8
Dominant Control Autoclitic	non v	0.5			
Informative Autoclitic	v	0.5			
Total no. operants 206			Total no. operants 236		
	v	65.5		v	25.9
	non v	34.5		non v	74.1
Time elapsed 9 mins.					

episodes were important in allowing the duo to practise and familiarize themselves with the skills needed to gain and maintain attention and elicit responses.

The mother's behaviour was characterized by exaggerated facial expressions, changes in tone of voice, intonations and pauses such as "Well . . ." or "Hi . . . ." She gained the baby's attention by waiting for the baby to look to her. If the baby failed to orient, the mother would call her name or whistle softly. Generally, the baby's cycle of looking at and turning away was rhymthmic and predictable. In the earlier weeks the period of 'looking at' was short, but increased in duration to at least 30 seconds by 24 weeks. From analysis of the data in Table XVI, a pattern emerges in the mother's behaviour. In the first six examples up to 19 weeks this pattern consisted of the mother vocally directing the baby's attention--for example, "What's this?" or "Will you stop waving those arms about?" These vocal mands were followed by the mother paying attention to the baby (submissive category). The mother's echoic behaviour consisted of the repetition of her own acts for effect or modelling the baby by imitating facial expressions. By 20 and 22 weeks, the roles had reversed with the mother being predominantly submissive as the baby maintained her attention. The dominant behaviours for the mother (Table XVII) included vocal mands, submissive listening and looking, control skills for gaining attention and modelling gestures with positive affective overtones.

TABLE XVI

Enface: Standardized Data (3 mins.) for Vocal (v.) and Non-vocal (n.v.) Operants: Mother (m) and Baby (b).

Age	Actual Time	vocal, non.v.	Operant Categories: Mand		Tact		Extended Tact		Echoic		Intra-Verbal		Dominant Control Autoclitic		Negative Control Autoclitic		Informative Autoclitic		Submissive Control Autoclitic		Positive Affective Autoclitic		Totals	
			m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b	m	b
		v.	1.6	-	2.8	-	1.2	-	0.4	-	0.8	-	0.8	-	0.4	5.6	-	-	0.4	-	1.6	-	10.0	5.6
Birth	7.5	n.v.	0.4	-	2.0	0.4	-	-	-	-	-	-	-	-	3.2	-	-	-	4.8	20.0	11.2	-	21.6	20.4
4		v.	14.3	-	3.9	-	3.9	-	6.5	-	1.3	-	7.8	-	-	-	-	-	3.9	-	2.6	-	44.2	-
weeks	2.3	n.v.	3.9	-	-	6.5	-	-	-	6.5	-	-	1.3	-	-	19.6	-	-	18.3	22.2	2.6	7.8	26.1	62.6
10		v.	27.8	-	9.6	-	10.7	-	4.3	56.8	1.1	-	6.4	2.1	-	-	1.1	-	12.8	-	10.7	-	84.5	58.9
weeks	2.8	n.v.	2.1	-	-	2.1	-	-	2.1	2.1	-	-	5.4	-	-	17.4	-	-	10.7	13.9	5.4	38.6	25.7	64.2
12		v.	24.0	1.0	1.0	5.0	14.0	-	8.0	59.0	-	-	5.0	-	-	-	-	-	19.0	-	5.0	-	76.0	65.0
weeks	3.0	n.v.	1.0	-	-	2.0	-	-	1.0	10.0	-	-	-	-	-	-	-	-	5.0	15.0	6.0	15.0	13.0	42.0
15		v.	15.0	-	1.2	-	2.5	-	3.8	3.8	-	-	6.2	-	-	-	-	-	1.2	-	1.2	-	31.1	3.8
weeks	2.4	n.v.	3.8	-	2.5	3.8	-	-	-	-	-	-	2.5	-	-	1.2	-	-	8.7	21.2	2.5	16.2	20.0	42.4
19		v.	40.0	-	5.0	-	7.0	-	4.0	1.0	-	-	8.0	1.0	-	2.0	1.0	-	6.0	-	3.0	2.0	74.0	6.0
weeks	3.0	n.v.	1.0	-	-	3.0	-	-	1.0	2.0	-	-	2.0	1.0	1.0	10.0	-	-	10.0	37.0	3.0	19.0	18.0	72.0
20		v.	18.0	-	7.5	-	-	-	7.5	9.0	-	-	4.5	-	1.5	13.5	-	-	3.0	-	3.0	22.5	45.0	45.0
weeks	2.0	n.v.	16.5	3.0	6.0	4.5	-	-	6.0	-	-	-	1.5	-	-	4.5	-	-	27.0	11.5	3.0	24.0	90.0	47.5
22		v.	18.0	-	3.0	1.0	4.0	-	7.0	15.0	-	-	5.0	2.0	-	6.0	1.0	-	9.0	-	7.0	6.0	54.0	30.0
weeks	3.0	n.v.	7.0	-	1.0	3.0	-	-	1.0	-	-	-	3.0	-	-	12.0	-	-	20.0	19.0	2.0	19.0	34.0	53.0
Totals	26.0	v.	158.7	1.0	34.0	6.0	43.3	-	41.5	144.6	3.2	-	43.7	5.1	1.9	27.1	3.1	-	55.3	-	34.1	30.5		
		n.v.	35.7	3.0	11.5	25.3	-	-	11.1	20.6	-	-	15.7	1.0	4.2	54.8	-	-	107.5	159.8	35.7	139.6	1258.6	
		v. + n.v.	194.4	4.0	45.5	31.3	43.3	-	52.6	165.2	3.2	-	59.4	6.1	6.1	81.9	3.1	-	162.8	159.8	69.8	170.1		

TABLE XVII

Enface: Dominant Operants for Mother and Baby (Percent)

Mother			Baby		
Operant	vocal non vocal	%	Operant	vocal non vocal	%
Mand	v	24.9	Submissive Autoclitic	non v	25.7
Submissive Autoclitic	non v	16.8	Echoic	v	23.4
Submissive Autoclitic	v	8.6	Positive Affective Autoclitic	non v	22.6
Dominant Control Autoclitic	v	6.8	Negative Affective Autoclitic	non v	8.9
Extended Tact	v	6.8	Positive Affective Autoclitic	v	4.9
Echoic	v	6.5	Negative Affective Autoclitic	v	4.4
Positive Affective Autoclitic	non v	5.6	Tact	non v	4.1
Mand	non v	5.6	Echoic	non v	3.4
Positive Affective Autoclitic	v	5.3	Tact	v	1.0
Tact	v	5.3	Dominant Control Autoclitic	v	0.8
Dominant Control Autoclitic	non v	2.5	Mand	non v	0.4
Tact	non v	1.8	Mand	v	0.2
Echoic	non v	1.7	Dominant Control Autoclitic	non v	0.2
Negative Affective Autoclitic	non v	0.6			
Intraverbal	v	0.5			
Informative Autoclitic	v	0.4			
Negative Affective Autoclitic	v	0.3			
Total no. operants 640.2			Total no. operants 618.4		
	v	65.4		v	34.7
	non v	34.6		non v	65.3
Time elapsed 26.0 mins.					

The development of the baby's behaviour during these enface sequences was erratic (Table XVI). In the beginning she was generally submissive and responded positively or negatively. At age 10 and 12 weeks however, the echoic operant and positive affect categories scored high. A detailed analysis of the development of the echoic operant revealed an intricate chaining of behaviours. This began with eye-to-eye contact, followed by the mother eliciting a smile using short, dramatic questions. After smiling, the baby would produce a series of "ah...ah...ah" sounds in sentence like form. This was accompanied by arm and leg movements referred to as "trafficking." At 12 weeks, these proto conversations of the baby lasted between 22 and 30 seconds. During these 'talking to mother' sequences, the mother would watch attentively, smile and nod her head. Overall this activity appeared to be dominantly a role playing event in which mother and infant took turns.

Baby Alone

There were no recorded sequences of baby alone prior to six weeks, as she usually fell asleep after the bathing, dressing and feeding activities. Six sessions were observed at 6, 14, 20, 21, 22 and 25 weeks and are listed in Table XVIII. In the first three and last examples, the baby was observed in her crib. On two other occasions she lay alone on a blanket in the livingroom. Whereas in other activities the

TABLE XVIII

Baby Alone: Standardized Data (3 mins.) for Vocal (v.) and Non-vocal (n.v.) Operants.

Age	Actual Time	vocal, non.v.	Operant Categories: Mand	Tact	Extended Tact	Echoic	Intra-Verbal	Dominant Control Autoclitic	Negative Control Autoclitic	Informative Autoclitic	Submissive Control Autoclitic	Positive Affective Autoclitic	Totals
6		v.	-	-	-	21.9	-	-	1.2	-	-	-	23.1
weeks	2.6	n.v.	-	23.0	1.2	-	-	-	3.5	-	8.1	-	35.8
14		v.	3.0	-	-	6.0	-	-	4.5	-	-	1.5	9.0
weeks	2.0	n.v.	4.5	19.5	-	-	-	-	12.0	-	16.5	12.0	64.5
20		v.	3.3	-	-	-	-	-	-	-	-	-	3.3
weeks	1.8	n.v.	-	39.9	6.7	1.7	-	-	20.0	-	21.7	23.3	113.3
21		v.	-	-	-	111.2	-	-	-	-	-	-	111.2
weeks	1.7	n.v.	-	31.7	1.8	-	-	-	8.8	-	8.8	1.8	52.9
22		v.	3.0	-	-	2.0	-	1.0	9.0	-	-	-	15.0
weeks	3.0	n.v.	24.0	29.0	-	1.0	-	-	20.0	-	16.0	-	90.0
25		v.	-	-	-	6.0	-	-	1.0	-	-	-	7.0
weeks	3.0	n.v.	17.0	17.0	2.0	23.0	-	-	11.0	-	8.0	2.0	80.0
Totals	14.1	v.	9.3	-	-	147.1	-	1.0	15.7	-	-	1.5	174.6
		n.v.	45.5	160.1	11.7	25.7	-	-	75.3	-	79.1	39.1	436.5
		v. + n.v.	54.8	160.1	11.7	172.8	-	1.0	91.0	-	79.1	40.6	611.1

mother's and baby's behaviours had been coded as responses to one another, in the alone sequence the physical environment provided the yardstick against which the baby's behaviour was measured. During the episodes in the crib, a mobile hanging directly above was observed to be the most dominant environmental 'control.' During the episodes on the floor, the control was identified as the baby's dress.

At age six weeks the non-vocal operants dominated all behaviour with the non vocal tact (playing with hands, kicking legs) the most frequent activity. More important however, the vocal echoic represented 94.8% of all vocal behaviour and 37% of all vocal and non vocal behaviours combined at six weeks. This echoic occured when the baby fixated on the mobile and 'talked' to it.

At 14 weeks her behaviour became extremely regular. The baby would look at the mobile, fixate on it (while moving arms and legs), turn away, look back to the mobile, fixate and look away. The period of fixating (continuous eye contact) developed from eight seconds at 14 weeks, to 22 seconds at 25 weeks. The vocal echoic, so dominant at six weeks has almost disappeared at 20 weeks.

During the 21 week visit the echoic operant again ranked highly, and represented 68% of all behaviours at that session. In this sequence the baby alone on the floor and with diaper off, babbled continuously for three minutes as she wriggled

TABLE XIX

Baby Alone: Dominant Operants for Baby Alone (Percent)

Tact	non v	26.2
Echoic	v	24.1
Submissive Autoclitic	non v	12.9
Negative Affective Autoclitic	non v	12.3
Mand	non v	7.4
Positive Affective Autoclitic	non v	6.4
Echoic	non v	4.2
Negative Affective Autoclitic	v	2.6
Extended Tact	non v	1.9
Mand	v	1.5
Positive Affective Autoclitic	v	0.3
Dominant Control Autoclitic	v	0.2
Total no. operants 611.1		
	v	28.6
	non v	71.4
Time elapsed 14.1 mins.		

around and played with her dress. This kind of behaviour could have been 'triggered off' by previous contingencies where the mother removed the diaper and elicited responses from the baby. Certainly the association between babbling and diaper removal was observed in some form in many of the observed sessions.

The most frequent behaviours for baby alone are entered in Table XIX. The non vocal tact (silently exploring and using objects in the environment) scored the highest and was followed by the vocal echoic and the submissive and affect categories. The vocal operants (71.4%) were far more prevalent than the non-vocal (28.6%). In general terms, the baby alone activity had the same characteristics as the playing activity and to a lesser extent the feeding sessions. In all three activities the non vocal tact was dominant (Table XX) and the position of the echoic operant was slightly changed.

TABLE XX

Important Operants for Baby: Alone, Playing, Feeding

Alone		Playing		Feeding	
Tact non v.	26.2%	Tact non v.	26.3%	Tact non v.	57.3%
Echoic v.	24.1%	Submissive non v.	24.2%	Submissive non v.	16.7%
Submissive non v.	12.9%	Echoic v.	19.9%	Negative non v.	15.3%

The above activity had the overall character of a task-oriented event with 'social' overtones. That is, the baby, when alone, did not remain silent but appeared to use these times to 'practise' what she had learned in the presence of the mother. Because the inanimate objects in her environment could not respond, the baby was less submissive than she would have been in the presence of the mother.

Selected Interactive Sequences

The summary tables and figures of frequency counts highlight the overall functions of behaviours, but have the disadvantage of suggesting a static character to behaviour, and do not indicate the important aspects of flow and dynamic quality. In studying communicative behaviour it is difficult to tease apart the role of mother and infant. The methodology used in this study was technically inadequate to accurately demonstrate the time and sequence of behaviours as they occur. What follows is a visual impression of how chains of interaction build up from associations with other behaviours. Figures 1 to 5 were drawn in conjunction with the transcripts and videotapes of each sequence, noting the behaviours that preceded one another and what effect they had. The figures are arranged in chronological order from one week to 14 weeks. The time line and annotations on the figure run from bottom to top, with the mother's behaviours on the left

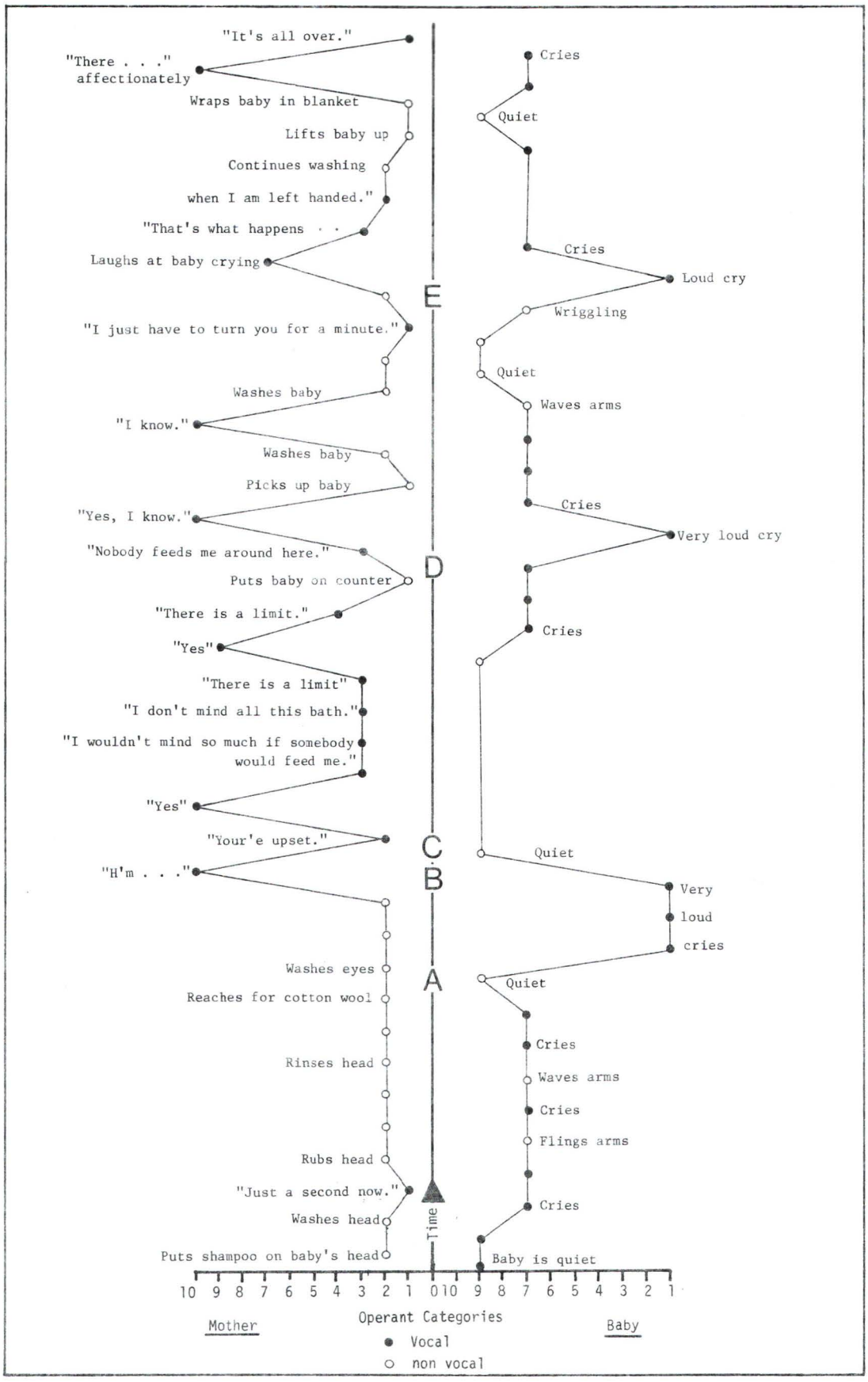


FIGURE 1. Bathing sequence at age 1 week.

and the baby's on the right. The letters along the time axis designate important contingencies of behaviours.

The bathing sequence at one week (Figure 1) illustrates a trial and error stage where mother and infant adapt to one another's behaviour. At A baby stops crying as the mother momentarily discontinues washing. As soon as she commences again the baby responds with very loud cries. At B the mother acknowledges this response with a soft vocal reply; the baby stops immediately (C). The same pattern of baby crying-mother responding is unsuccessful (the baby continues to cry, D). At E the mother ineffectively responds.

The feeding episode at two weeks (Figure 2) shows a different kind of interaction. Points A and B designate the mother's reaction to the baby's loud gulping sounds. As the baby feeds the mother demonstrates a number of behaviours. When she puts the baby on her shoulder, the baby immediately orients towards her. This pattern of interaction was very typical for feeding.

The dressing and enface examples (Figures 3 and 4) demonstrate the eliciting function of some of the mother's behaviours. In Figure 3 the verbal games the mother plays with the baby begin first by eliciting a smile (A). The baby then elicits attention by trying to imitate (B). At C the mother elicits another smile and pauses at D for the baby to

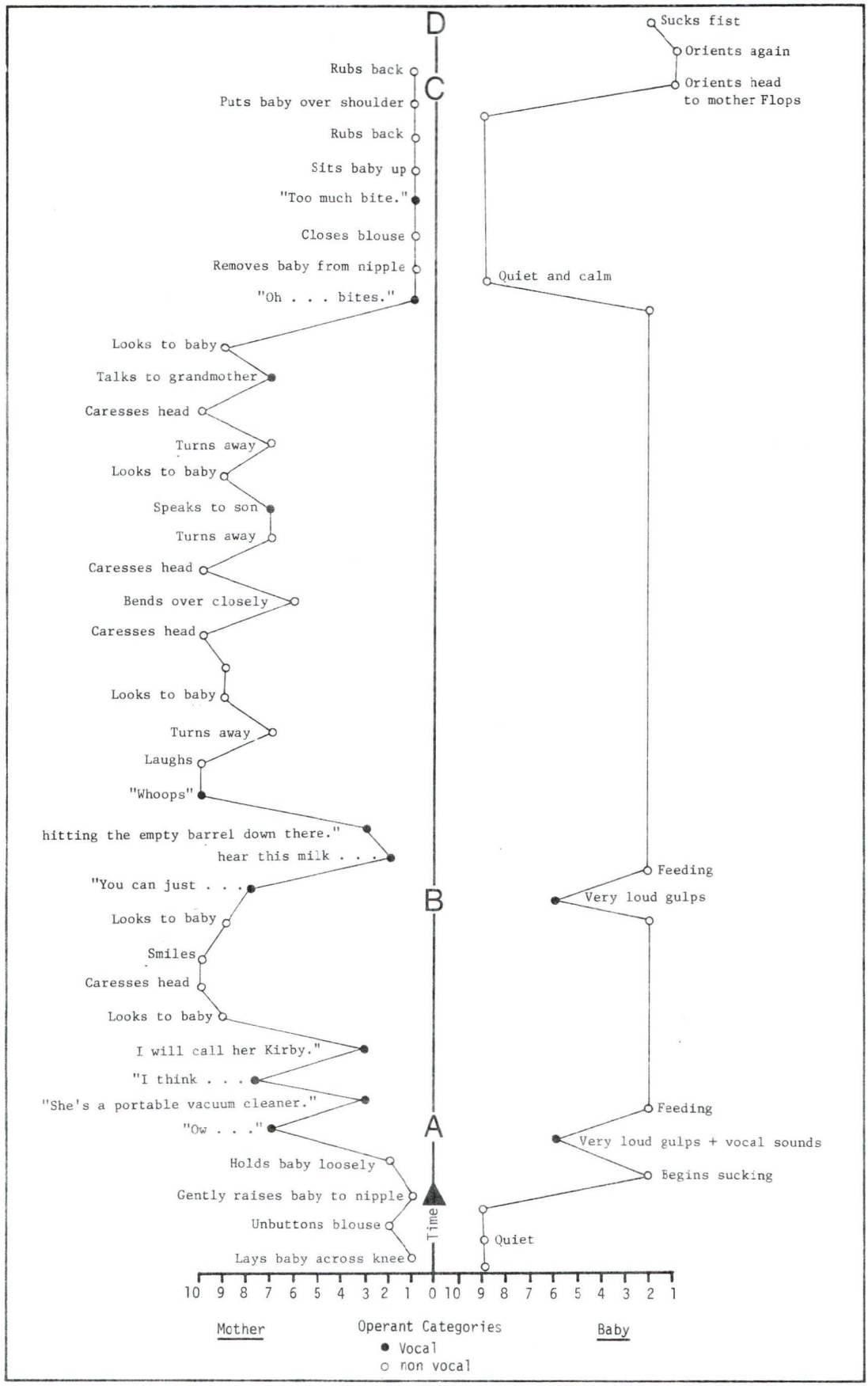


FIGURE 2. Feeding sequence at age 2 weeks.

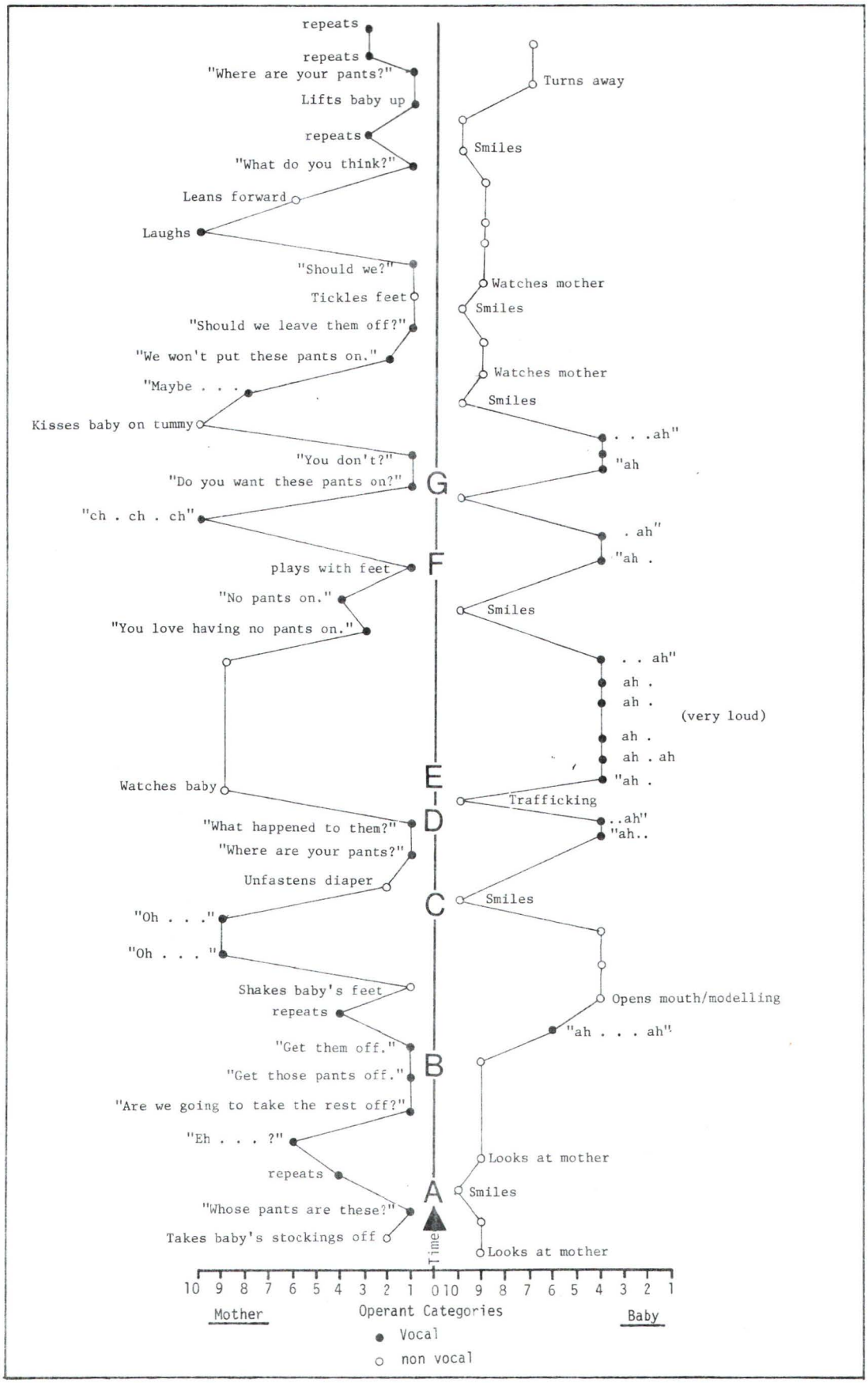


FIGURE 3. Dressing (short) sequence at age 10 weeks.

respond which she does at E in a long conversation-like string of simple "ah...ah" sounds. The mother begins the cycle again at G. By 12 weeks of age (Figure 4) the baby is very capable of attracting and maintaining the mother's attention for as long as 30 seconds. The mother in this enface sequence is paced by the baby. She responds to the baby's 'conversations' with smiles, head nodding and verbal reinforcements such as "I know, I know." In between her vocal and verbal expositions, the baby maintains attention with excited head and leg movements (defined as 'trafficking').

Finally at 14 weeks (Figure 5) the baby alone sequence shows a cyclical pattern similar to the enface episode except that she responds to her own body and the immediate physical environment. Her 'looking at' behaviours are at first random. On seeing an object--the mobile (A), she fixates and learns to attend as she has already experienced in interactions with the mother. Becoming aware of an object, attending to it and fixating on it lasts, in some cases, for over 20 seconds. The turning away behaviour (B and C) are only momentary. At D it appears that she is sufficiently aware of the presence of the mobile to attempt to interact vocally with it.

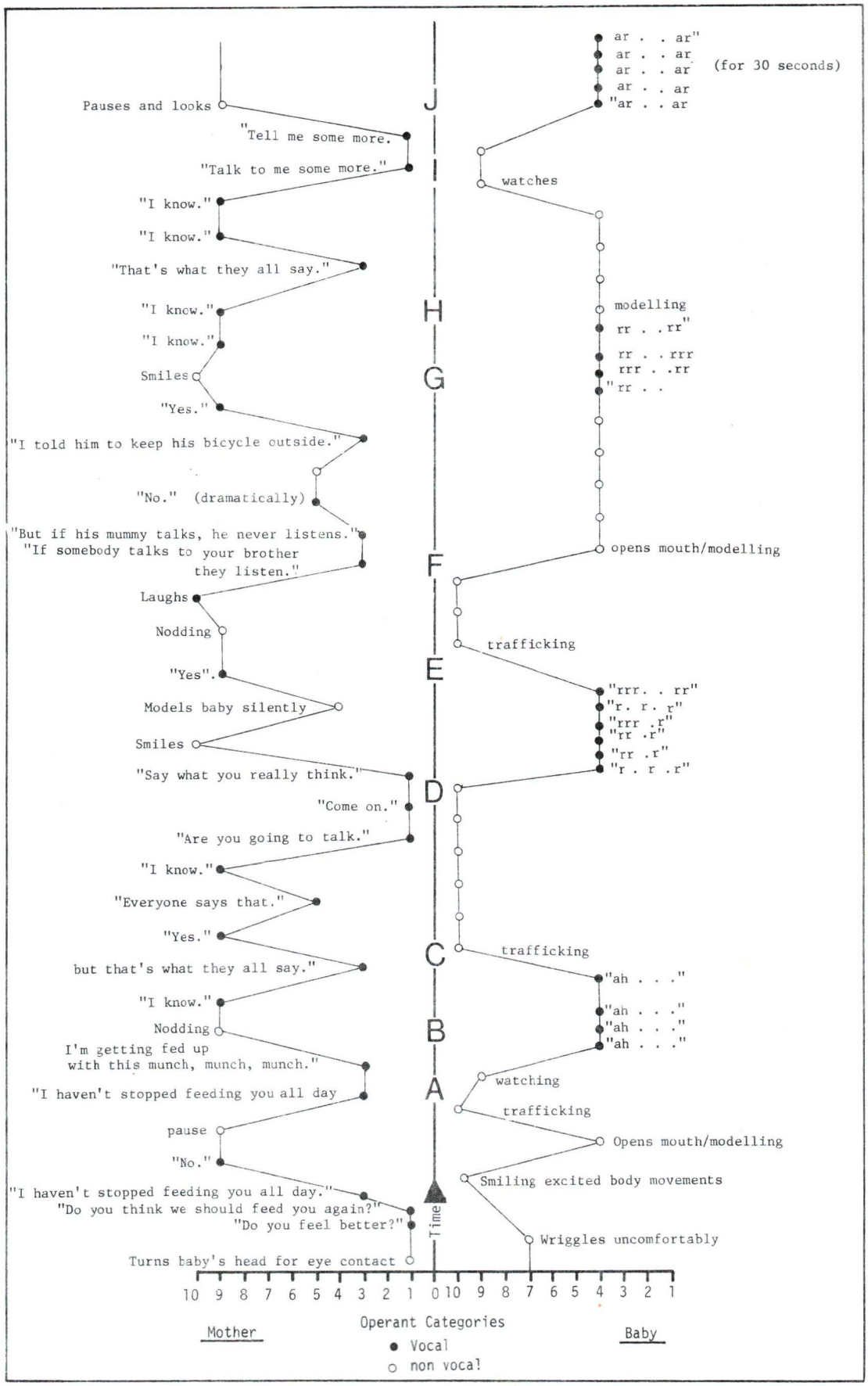


FIGURE 4. Enface sequence at age 12 weeks.

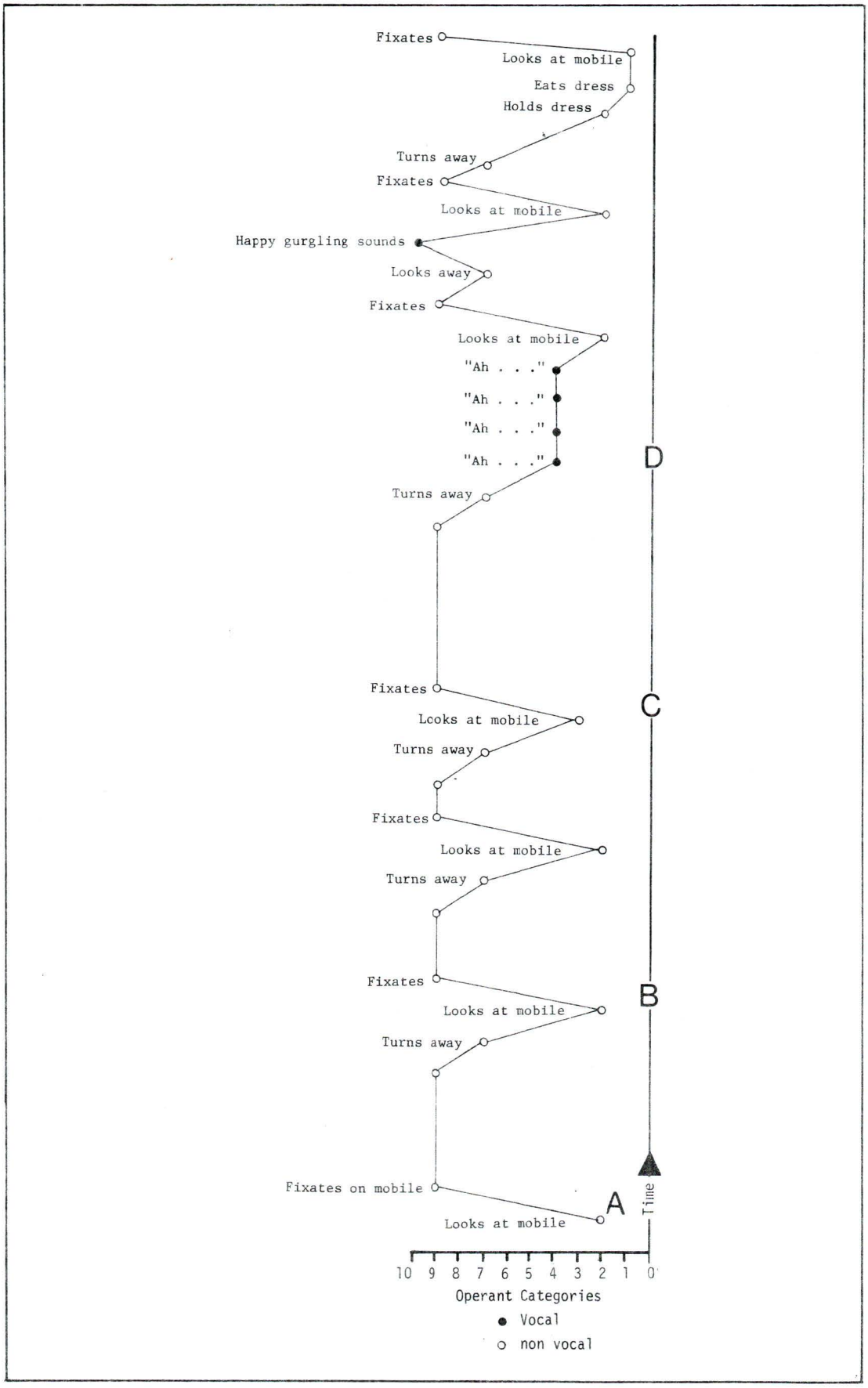


FIGURE 5. Baby Alone (in crib) sequence at age 14 weeks.

The General Pattern of Mother Infant Interaction

The details of mother-infant interactions within activities and over time have been presented. Data were also consolidated in the following way to allow for some general conclusions.

1. The vocal and non vocal behaviours for mother and baby were isolated to illustrate which of these was dominant in each activity (Figures 6 and 7).

2. The vocal and non vocal acts for mother, and for baby were combined for each behaviour category in the seven activities (Figures 8 and 9).

3. The behaviour categories for mother and baby were then grouped into the major functions of task, role (manipulative, directive and submissive), affect and linguistic for each activity (Figures 10 and 11).

In drawing together the results from these Figures and Tables (in Appendix E), the following picture emerged:

In all activities, the baby's non vocal behaviours were more manifest than the vocal (Figure 6). The highest frequencies occured in the feeding activity and decreased through dressing (long), bathing, baby alone, playing and dressing (short), with the enface sequences registering the lowest non vocal scores. The mother's non vocal acts, on the

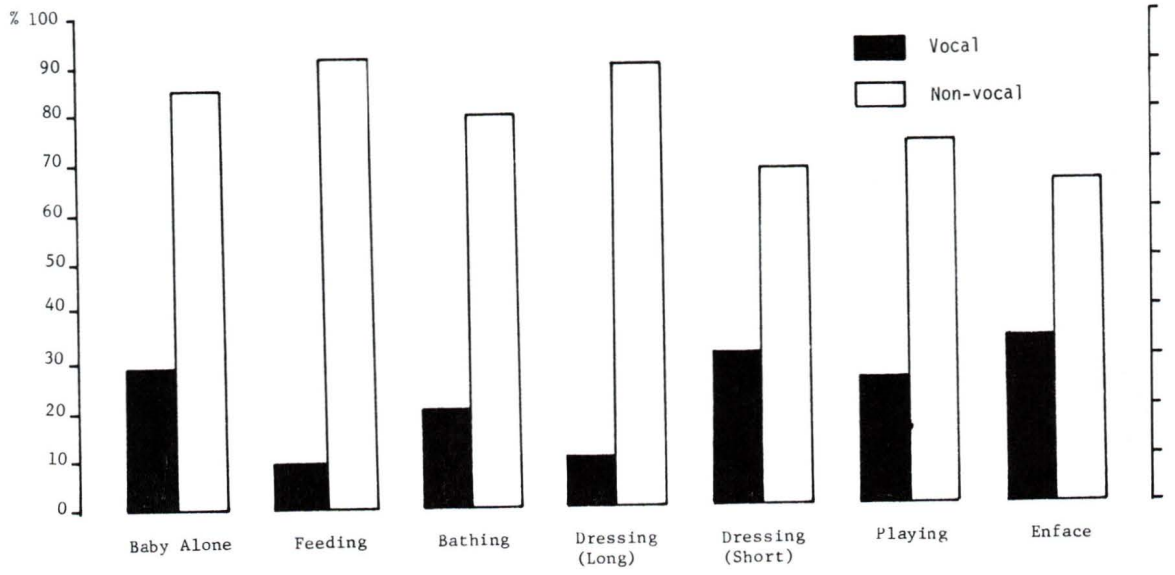


FIGURE 6. Baby: vocal and non vocal operants per activity (percent).

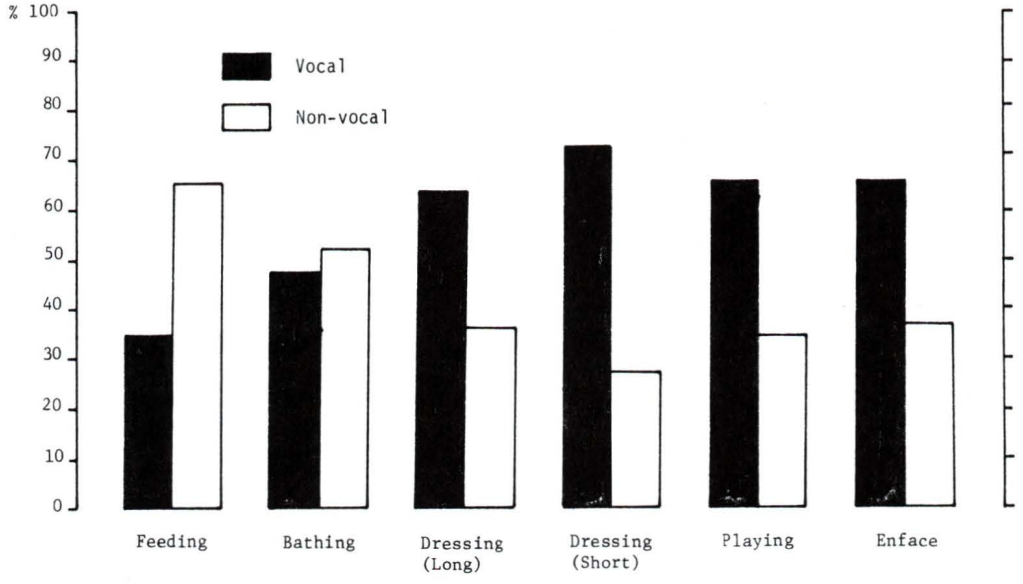


FIGURE 7. Mother: vocal and non vocal operants per activity (percent).

other hand, exceeded the vocal in only feeding and bathing (Figure 7). The greatest amounts of vocal behaviours for the mother occured in the dressing (short) activity.

A comparison of Figures 8-11 shows a complimentarity between mother and infant behaviours. In feeding, the baby's behaviour scored highly in the tact category and was more task-oriented in function, whereas the mother emitted more mands and performed an overall dominant role-directive function. For bathing and dressing (long), the patterns of behaviour were almost identical in that the baby was submissive to the mother's task-oriented conduct. The only difference between the activities was the dominance of the mother's vocal acts in the dressing (long) sequences.

The function of behaviours changed slightly in the dressing (short) events. As in the feeding episodes, the mother's manding behaviour was dominant but the baby expressed herself more in the affective domain than the task-oriented group. The playing sessions were also under the control of the mother's manding (directive) actions, whereas the baby, being preoccupied with toys, demonstrated a task-oriented function in her behaviour.

Two control activities, the enface and baby alone, were incorporated into the research design as comparative aids against which the other activities could be described. It is

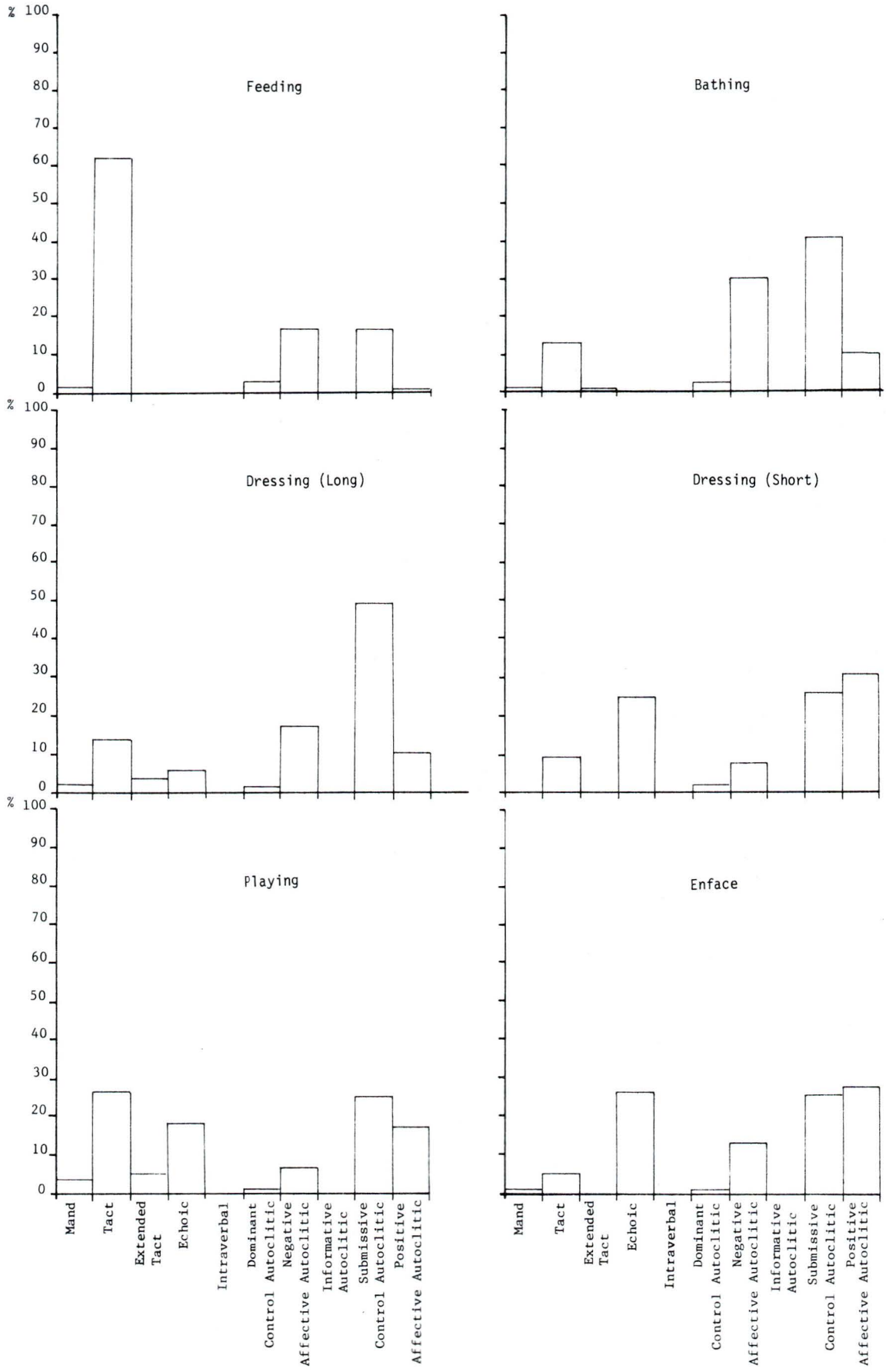


FIGURE 8. Baby: vocal and non vocal operants combined, per activity (percent).

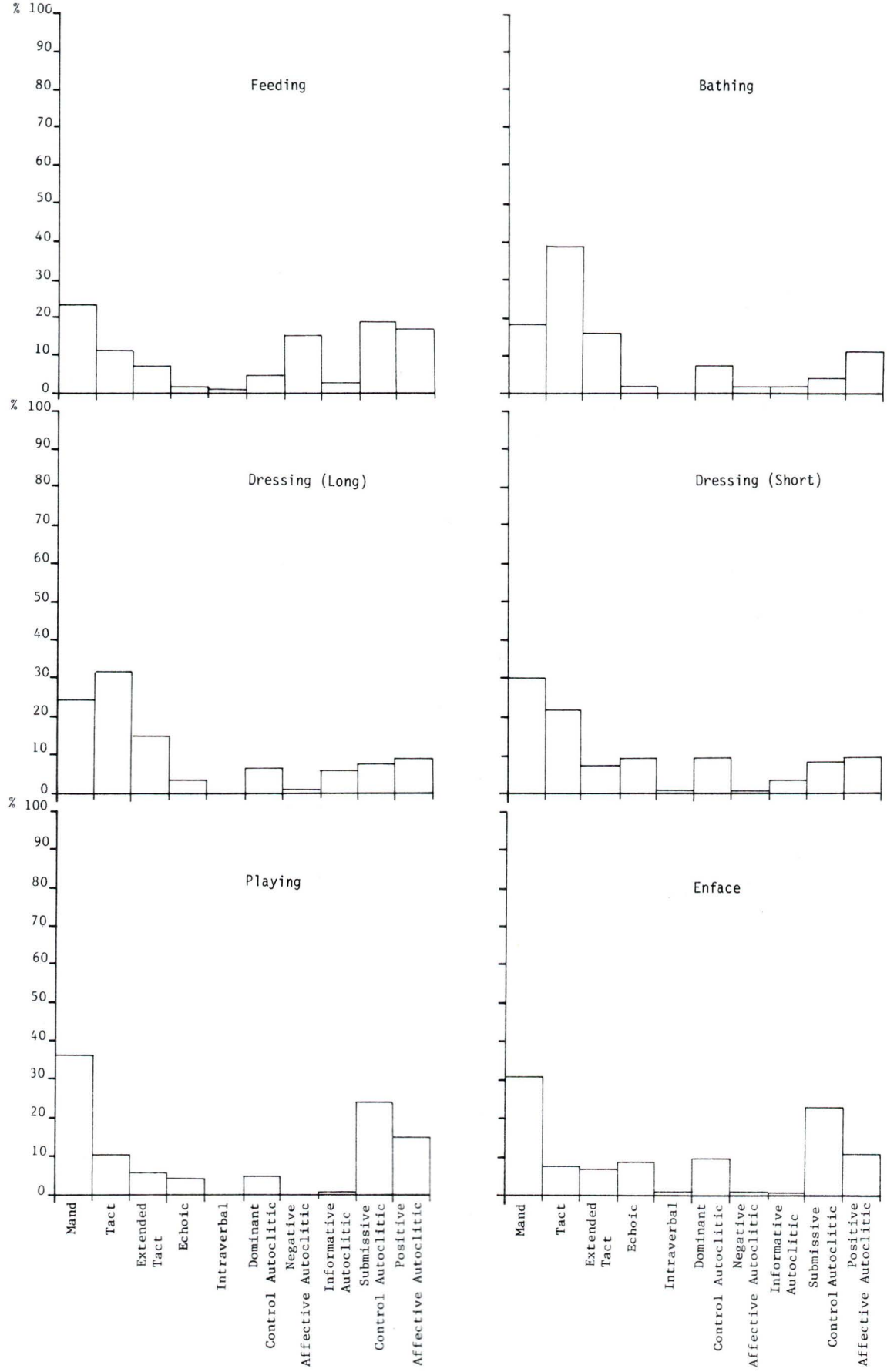
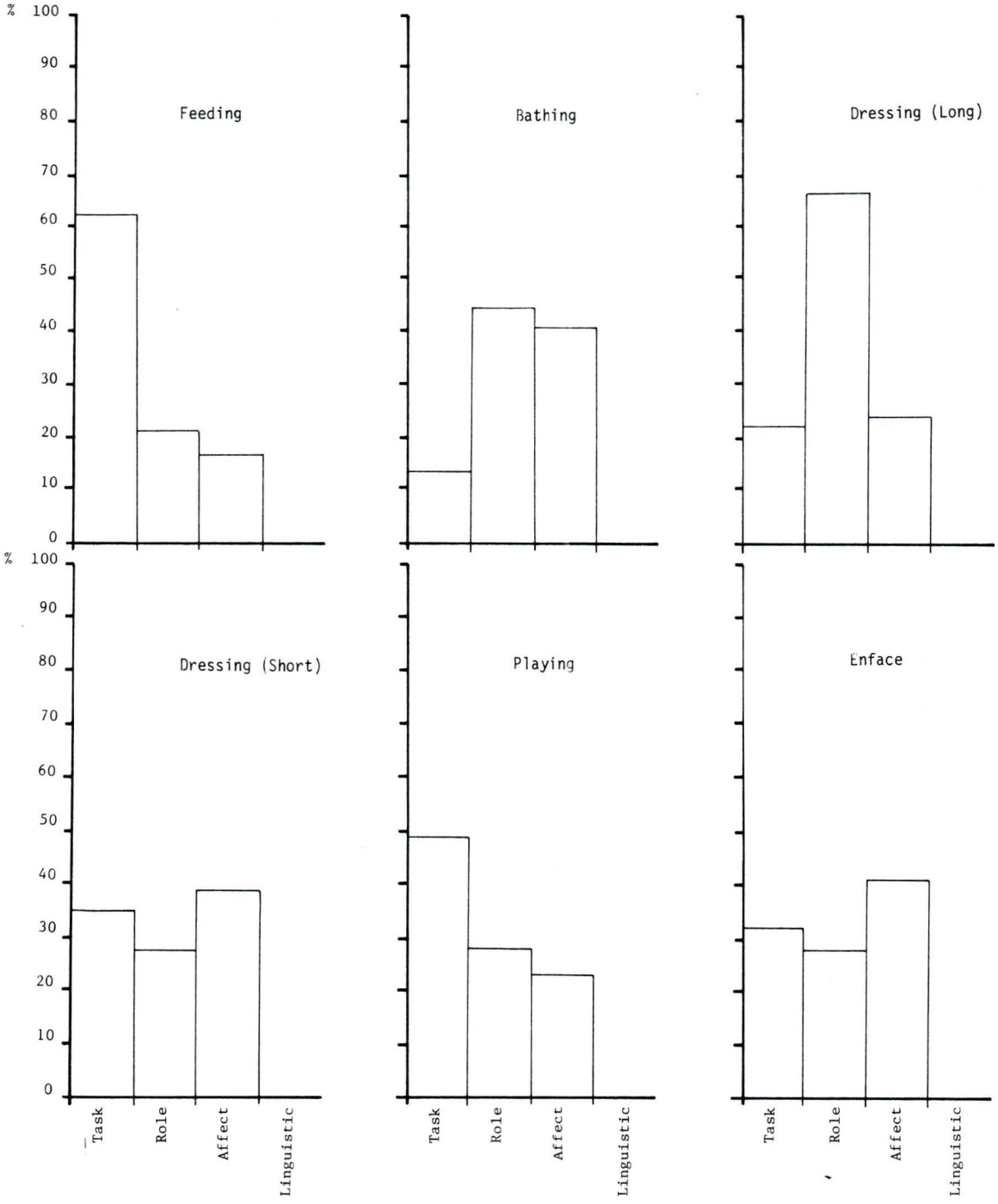


FIGURE 9. Mother: vocal and non vocal operants combined, per activity (percent).



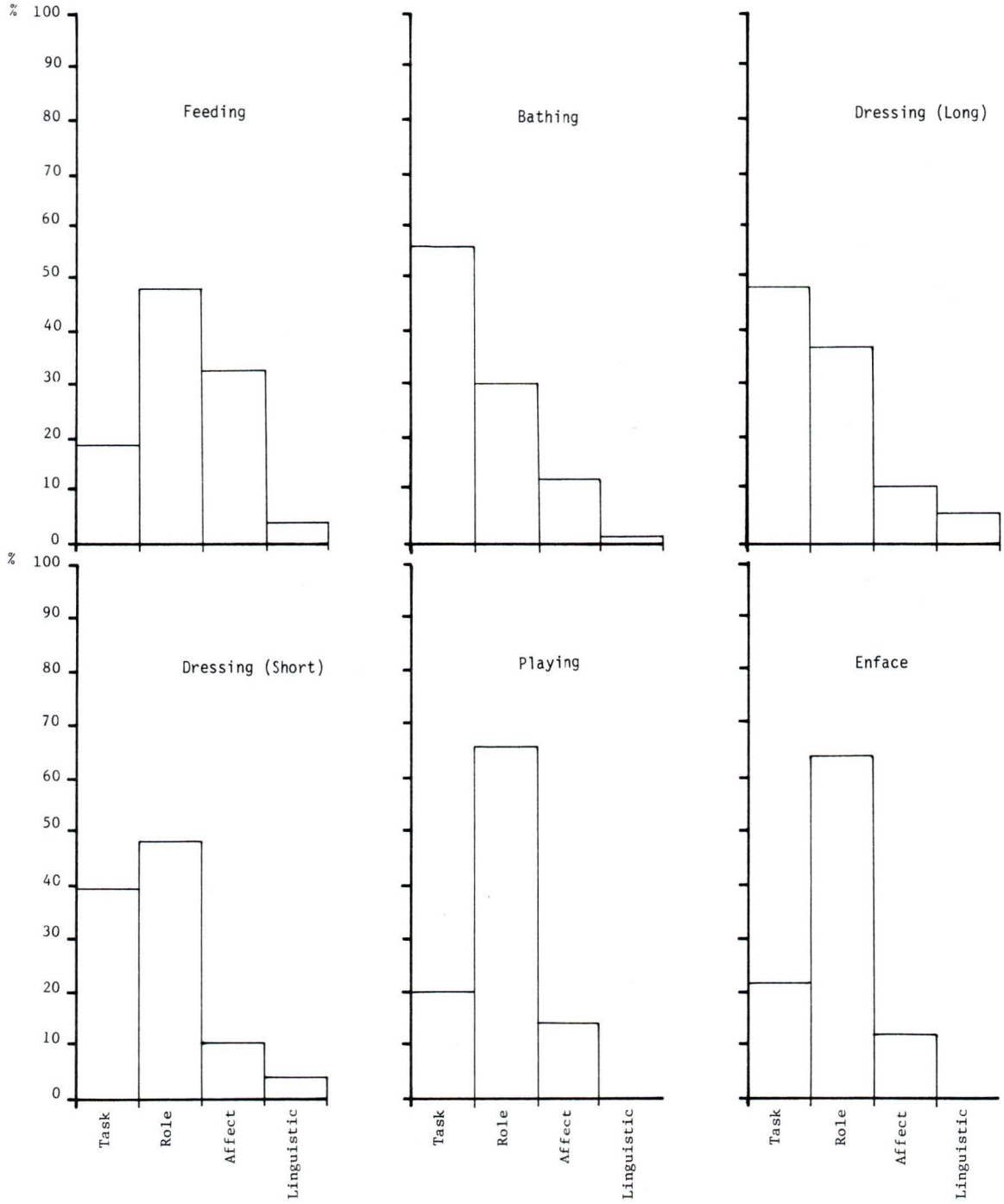
Task = Tact, Extended Tact, Echoic.

Role = Mand, Dominant Control Autoclitic, Submissive Control Autoclitic.

Affect = Positive Affective Autoclitic, Negative Affective Autoclitic.

Linguistic = Intraverbal, Informative Autoclitic.

FIGURE 10. Baby: grouped operants per activity (percent).



Task = Tact, Extended Tact, Echoic.

Role = Mand, Dominant Control Autoclitic, Submissive Control Autoclitic.

Affect = Positive Affective Autoclitic, Negative Affective Autoclitic.

Linguistic = Intraverbal, Informative Autoclitic.

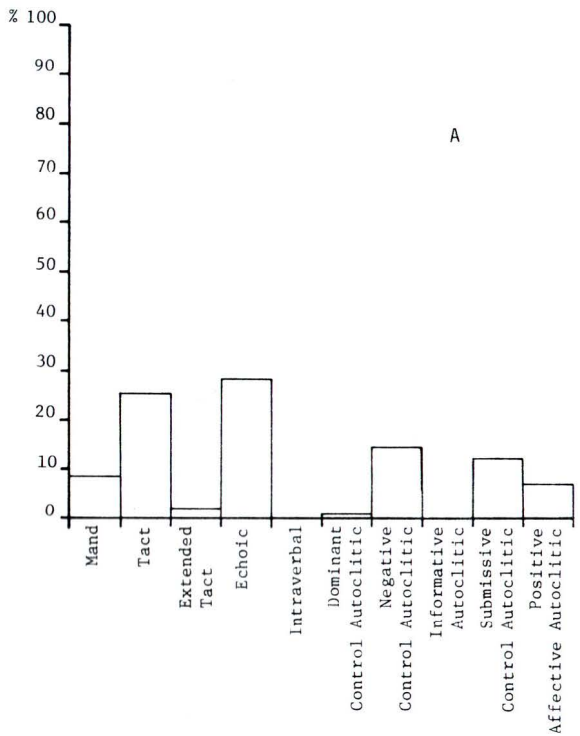
FIGURE 11. Mother: grouped operants per activity (percent).

interesting to note that the mother's behaviours in the enface activity demonstrated a similar pattern to the feeding, playing and bathing (short) activities in which she exhibited a dominant role-directive function. The baby complimented this with a high degree of affective behaviour. In other words, the 'eliciting' behaviours occured spontaneously and the most frequently in the dressing (short) sequences, where the mother phased the interaction through her verbal comments and non vocal directive behaviours. This result parallel that of Bruner:

> . . . language acquisition occurs in the context of an 'action dialogue' in which joint undertakings are being regulated by infant and adult . . . . The kinds of behaviour to which we have been referring take place principally in what can be called a playful ambience. When things become too 'serious' and intention bound, communication regresses to the level of demand and counter-demand. The simulative, conventionalized, and rule-sensitive spirit of play seems to be a sine qua non for language learning. (1977, p. 288)

Whilst the mother tried to stimulate the baby to interact by using 'verbal games' in the enface sequences, she also demonstrated a high degree of control-demand and, secondly, submissive behaviours where she was paced by the baby.

A significant feature emerged from the analysis of the second control activity--baby alone. In this activity, the baby's echoic and tacting behaviours were more prevalent than any others (Figures 12A and 12B). The echoic behaviours



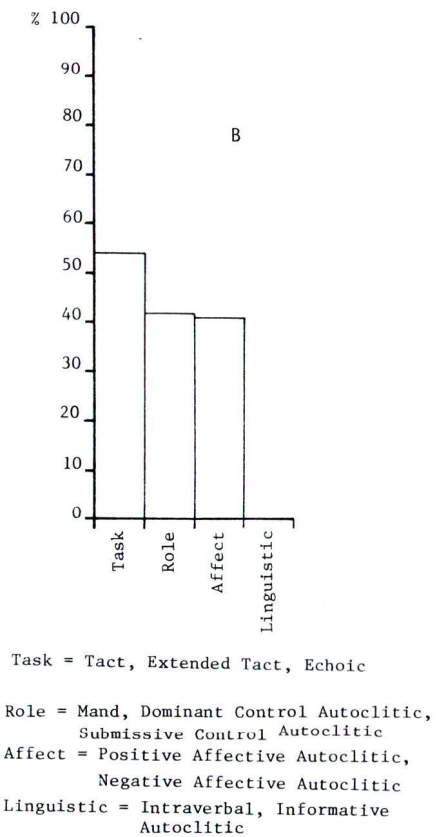


FIGURE 12. Baby Alone: A, vocal and non vocal operants combined, per activity; B, grouped operants per activity.(percent)

were observed in the repetition of non vocal gestures such as looking from one object to another, touching and holding. Also noted were the reproduction of simple vowel sounds (ah, ar and rrr) and syllabic sounds (gah, gah, gah). These echoic periods took on the form of practice sessions in which behaviours began in random and formless sequences but developed into a cyclic and controlled pattern. One cycle of behaviour, involving the mobile above the crib, included looking at, fixating, turning away and looking at it again. Over time this cycle became more regulated as the baby developed motor control and became aware of the presence of the mobile. When the baby was left alone in a wakeful state, she used these times to exercise her behavioural skills. For this reason the alone activity was structurally similar to the feeding and playing activities. In all three, the dominant behaviour was tacting with submissive, positive and negative overtones. These results are in agreement with Schaffer who, in discussing the contributions of experiments with inanimate objects to social development, writes:

> . . . I do not believe in the existence of two quite separate categories of processes related respectively, to social and non social behaviour patterns. These patterns are based on the same mechanisms, and behaviour towards a social object is every bit as much dependent on such cognitive functions as attention, perception, and learning as is behaviour towards an inanimate stimulus. Obviously certain differences have to be taken into account . . . . The relationship with

> inanimate objects tends to be a one-way affair while with social objects it is two-way, thus making it possible to set in motion interaction sequences (1971, p. 263).

Conclusions

The primary aim of this study was an exploratory investigation of the composition of the infant's communicative behaviours at birth, following this through as it developed to 25 weeks. The study was attempted using an observational, naturalistic and longitudinal method. Three recommendations are listed for similar future studies. These include:

1. Data collection should be limited to those activities which can be observed at every visit, in particular baby alone, feeding or bathing, and enface. This would provide a data base more readily comparable across activities and time.

2. The interference factor (from visitors and children) must also be carefully controlled to allow for uninterrupted observation sessions.

3. A method of analysis that takes into account not only contingent behaviours but also simultaneous and overlapping behaviours, would provide a finer analysis of interaction.

The categories of the McLeish-Martin coding system, designed to study the communicative process in student

discussion groups, were interpreted and modified by the author to facilitate the analysis of mother-infant communication. On the basis of the results gathered using this coding system it is concluded that:

1. The coding system allows for the identification of 20 (vocal and non vocal) categories of communicative behaviours. The verbal manifestations of the extended tact, intraverbal, informative autoclitic and submissive control categories were of course, impossible to observe in a prelinguistic child. Of the remaining 16 categories, the non vocal counterparts of the intraverbal and informative categories were difficult to identify without interpreting intent or purpose into the infant's behaviour. More time needs to be spent observing infant non vocal behaviour to rectify this difficulty. Fourteen categories were readily applicable to infant behaviour. Of these, five were observed in the first two days of life, seven by the end of the first week, eight categories at age two weeks, ten at age four weeks, 13 categories at nine weeks, and by four months all 14 categories had been identified. The emergence of these categories included:

2 days:	the submissive (n.v.), negative control (n.v.), tact (n.v.), tact (v.) and negative control (v.). Total, five categories.

1 week: all of the above plus mand (n.v.) and mand (v.).
Total, seven categories.

2 weeks: all of the above plus dominant control (v.).
Total, eight categoties.

4 weeks: all of the above plus positive affective (n.v.) and echoic (n.v.).
Total, 10 categories.

9 weeks: all of the above plus positive affective (v.), echoic (v.) and extended tact (n.v.).
Total, 13 categories.

16 weeks: all of the above plus dominant control (n.v.).
Total, 14 categories.

In this study, the McLeish-Martin coding system, consisting of 20 categories of behaviour was applied with 70% success (14 out of a possible 20 categories were identified).

2. The baby's non vocal acts were dominant during 37 of the 41 observation periods. These acts included the following categories:

2 days: submissive - quiet, cooperative.
negative - turning head away, waving arms and legs.
tacting - sucking behaviours.

1 week: all of the above plus,
mand - rooting reflex.

4 weeks: all of the above plus,
positive - smiling.
echoic - imitating facial expressions.

9 weeks: all of the above plus,
extended tact - looking around for mother.

16 weeks: all of the above plus,
dominant control - kicking feet to gain attention.

The baby's non vocal means of attracting, directing and maintaining the mother's attention stemmed from reflex actions and random body movements. Certain reflexes, in particular the orienting (turning head towards mother), rooting (sucking) and grasping reflexes provided a basis upon which other skills could be built. The orienting and rooting reflexes functioned firstly to bring attention to the baby (dominant control category) then later as demands (mands). For instance, often when the baby was placed over the mother's shoulder she would orient towards the mother. The mother in turn was reinforced by this behaviour, and would respond with either a positive verbal response and/or, by repositioning the baby for a full face-on view. As the baby grew older this repositioning led to eye contact and face to face interaction. It would seem that the orienting reflex facilitated an increase in the baby's awareness of the presence of the mother. This awareness, followed later with eye contact, enabled the baby to attend to either the mother or features in the environment. The rooting reflex observed at times in sucking the fist and later objects, also facilitated the development of awareness. In the first four weeks, the act of bringing the hand to the mouth appeared random, but later through practise, became controlled. This, coupled with the ability to grasp and look at, led later to the development of 'looking for' behaviours (extended tact).

Apart from reflex movements, random body movements also served, through interaction with mother, to aid in the development of communicative skills. Random arm and leg movements (referred to as 'trafficking') were interpreted by the mother as signs of pleasure or discomfort. Invariably she would respond to these with positive affective and directive behaviours, depending upon how she read the infant's state. The initial random behaviours of the face, head, body and limbs developed into controlled behaviours as the baby acquired motor control and the mother reinforced them with positive responses. In the early weeks these random movements appeared in groups of two or three--for example, the baby would turn away and raise her legs. By 16 weeks, a more controlled and declarative sequence included; looking at mother whilst keeping the rest of her body still, maintaining eye contact, smiling in response to the mother, waving arms and legs to initiate further responses from the mother as she paused in her conversation and then babbling to maintain attention.

Apart from the non vocal acts that served to attract and maintain attention, the baby also demonstrated 'affective' communicative abilities. The early affective behaviours were mostly observed in the negative domain and included facial grimaces, head turning and body movements that indicated discomfort. Later, the positive affective category was added and included smiling. This was accompanied by other

repetitive-modelling behaviours (echoic) when the baby would imitate the mother's facial expressions. The non vocal extended tact followed in the developmental sequence after the echoic behaviours. This was observed in those activities where the baby looked for absent toys, or the mother by turning to look for them.

3. The baby's vocal acts did not occur as frequently as the non vocal but showed an increase over time. The vocal behaviours developed initially from the spectrum of crying and sucking behaviours into laughing, babbling and the use of simple sounds. The types of cries ranged from loud demands to half hearted whimpers. These functioned as declarative and negative responses respectively. The times when the infant sucked on her fist or objects appeared to be periods of oral and vocal stimulation. All of the baby's vocal sounds had the function of gaining and maintaining the mother's attention when she was present. The cooing and babbling behaviours were positively reinforced by the mother through eye contact and modelling the baby's behaviour.

In interactive sequences the function of reflex, random and vocal behaviours appeared to be as follows:

Behaviour	Function
Reflexes	
Orienting	gains attention
Rooting	gains attention, demands
Sucking (fist/ object)	increases awareness
Grasping	increases awareness
Random Movements	
Head turning	negative response to mother
Leg and arm movements	negative or positive depends on context
Head turning with eye contact	reinforces mother's behaviour
Touching	increases awareness
Vocal Behaviours	
Loud cries	gains attention, demands
Cries	negative response to mother
Whimpers	gains attention
Laughing	reinforces mother's behaviour
Cooing and babbling	gains and maintains attention

In conclusion, during the first six months of life the infant exhibited patterns of expressive vocal language skills that included:

1. the ability to cry frequently with some variety in force and pattern and to produce random reflex vocalisations from time to time.

2. the ability to signal developing hunger to the mother by the use of a specific differentiated cry.

3. the ability to communicate several states of pleasure or discomfort through specific vocal signals.

4. the ability to babble by repeating one syllable over and over again.

5. the ability to respond to vocal stimulation by babbling and sometimes by attempting to imitate the sounds heard (social babbling).

A pattern of receptive language skills also emerged comfirming the development sequence outlined by Bzoch & League (1978). In this sequence the infant followed a pattern of auditory response behaviour which included:

1. gross reflexive responses to sudden loud noises.

2. the ability to frequently localize the source of sounds or voices.

3. the ability to recognize and distinguish familiar sounds and voices.

4. by six months the ability to understand the general meaning of speech utterances with different rates and inflectional patterns (e.g., loving, angry or friendly messages) as evidenced by the infant's facial and bodily gestural responses.

In using these receptive and expressive language skills, the baby was able to respond to and in turn to initiate interaction with the mother. In the first week their individual behaviours were fairly independent in that the mother was not 'tuned-in' to the baby and vice-versa, but they quickly adapted to each other's responses which developed into reciprocal interaction as effective communication was established.

The effectiveness of that communication was demonstrated in a varied operant profile made up of mands and tacts (McLeish, 1978). The interaction was at all stages facilitated by the positive and negative behaviours of mother and infant. Attending behaviours (submissive) and the echoics provided positive reinforcement especially for the mother. Table XXI lists the mean percent occurrence for each behaviour category from seven activities.

TABLE XXI

Effective Communication (Average Percent of 7 Activities)

Operants	Mother	Baby
Mands	27.2	2.7
Tact	19.9	22.2
Extended tact	9.3	2.6
Echoic	7.9	20.7
Intraverbal	0.5	-
Dominant Control Autoclitic	6.9	1.5
Negative Control Autoclitic	4.5	15.2
Informative Autoclitic	3.4	-
Submissive Control Autoclitic	14.2	27.8
Positive Affective Autoclitic	20.1	15.2

This result parallels that of McLeish who comments on effective teaching:

> . . . The effective teacher is achieving two things--effective communication and effective interaction. Effective communication is a matter of valid tacts and extended tacts, with a proportion of dominant control autoclitics and some positive affective autoclitics. Effective interaction is facilitated by teacher support and approval mediated through the reinforcing operants--submissive autoclitics, positive affective autoclitics and echoics. (1978, p. 219)

The mother as teacher exhibited this varied operant profile. The infant, even without verbal language was able to communicate using gestural movements and vocal sounds. These infant behaviours functioned in the same way as adult behaviours. In other words, the infant is capable of interaction from birth. Communicative skills develop in the context of the mother and infant, and the vocal counterpart of these skills are gradually shaped into the verbal language of the community.

CHAPTER 6

IMPLICATIONS FOR THOUGHT AND LANGUAGE

A secondary aim of this research was an attempt to clarify the relationship between thought and language in the light of the data gathered in the study.

In the context of neonatal development, the words "thought" and "language" need to be redefined. Language, in the infant, is not the symbolic representation of experience through words, nor the activity of speech that uses words, but is comprised of vocal and non vocal behaviours which the infant uses to respond to the environment. Most of these behaviours are a kind of body language to begin with, made up of reflex and random movements which develop, through reinforcement and practise, into coordinated chains of communicative behaviours. This preverbal form of language is transformed into verbal (oral) language through the process of socialization with the mother.

Within the framework of this study, discussion of the origins and indicators of covert thought processes are based upon observations of specific overt behaviours. It is assumed that these behaviours are interrelated with and are evidence for, the covert processes. In Chapter 2, major theories about the relationship of thought and language were outlined

in the work of Piaget, Malinowski and Vygotsky. To reiterate some general theoretical viewpoints: Watson maintains that thinking and speaking are the same process; Piaget and Vygotsky agree that thought and the use of language are two separate processes. These processes develop independently but function reciprocally in a dynamic context, each requiring input from the other to build their structures. Language is viewed as a means of transforming thought into a complex abstract form. Together with Malinowski, Piaget and Vygotsky also agree that the thought process originates in the perceptions and reflexes of the infant but develops in the gross motor stage, depending on action with objects, before language emerges. Piaget places emphasis on the endogenous processes of organization and adaptation and on the concrete activities with objects for the development of thinking. He argues that the first indicator of the infant's ability to think is when object permanence has been established. Vygotsky on the other hand, argues more for the role of language and socialization in the development of thinking and suggests that a more reliable and observable criterion for the evidence of thinking is the first use of words.

Based on the observations and results of this study some of the propositions and emphases of these theorists are questioned. Watson's position is clearly untenable. The covert activity of thinking is not the same process as speech.

Specific infant behaviours were observed and identified in this study as possible evidence of the existence of a parallel endogenous process (thinking) that did not involve words.

Vygotsky, and Piaget in particular, overemphasize the importance of gross motor development and action with objects. It is suggested on the basis of the present results that the thought process originates and develops, not in the gross motor phase, but in the perceptual experiences preceeding this phase. The infant's visual, auditory and olfactory systems provide the initial matrix upon which later tactual and proprioceptive feedback is based. Using these perceptual systems the infant gathers information about the environment by responding to it before trial and error motor involvement. By six months, the infant in this study had achieved the following motor control:

Gross Motor Control

Turned head freely.
On stomach, lifted legs; turned, twisted in all directions; rolled from back to stomach.
Got up on hands and knees in crouch position; moved forward or backward by flinging limbs out.
Crept by propelling self on stomach.
Stood with substantial support.

Sitting

Sat up with help; balanced well.
Leaned forward or to the side.
Sat in high chair; grasped objects with palm.
Sat alone momentarily; slumped forward to maintain balance.

Fine Motor Control

Held bottle.
Rotated wrist; turned and manipulated object.
Reached with arm.

Despite the fact that these abilities reflect a limited range of motor behaviour, the infant demonstrated in her behaviour some elementary form of thinking. The following behaviours were identified as possible indicators of the beginning of the thought process.

1. the ability to discriminate shapes was observed in the orienting of the head and eye movements as the infant followed the mother's face or a toy presented to her. Discriminatory response actions were observed during the first two weeks.

2. the ability to respond to light and sound was demonstrated in 'tracking' behaviours; to respond to water by expressive vocal behaviours, and to respond to taste (juice as opposed to milk) by facial grimaces.

These behaviours were general at first where the infant responded to most stimuli that were presented. However, through the repeated occurence of some stimuli and their subsequent 'recognition,' the infant was able to discriminate between familiar and unfamiliar objects.

3. The ability to differentiate between the familiar and unfamiliar requires that a connection be made between a present experience and the memory of a like experience. In making that connection the infant can be said to have acquired the ability to 'recognize.' Recognition is equivalent, in the formal sense, to the act of categorizing. If the infant demonstrates that she has recognised an object, then some internal representation (built up of past contingencies) must exist. The act of familiarization is probably one of the early indicators of the thinking process, before the infant has developed gross motor skills, and certainly before the first spoken word. This ability to recognize was observed in the infant's affective and submissive-attending behaviours towards mother as she approached and talked to the infant. In contrast to this was the infant's negative responses to unfamiliar faces such as occasional visitors.

4. Paralleling the ability to discriminate between the familiar and unfamiliar, the infant also manifested certain behaviours which suggested that she could not only discriminate but <u>selectively</u> respond to certain stimuli and 'block out' others. This was especially evident in the length of her attention span when either alone or with mother. During periods alone in her crib the infant would fixate on one object (the mobile or play board) and repeatedly turn towards

and attend to it, appearing to block out other salient stimuli. This selectivity appeared instrumental in developing the length of attention span.

5. Piaget suggests that object permanence (the ability to remember an absent object) develops from concrete action with objects. The results from this study suggest that, in fact, the ability to remember absent objects begins in the early interactions with mother long before the infant can grasp and manipulate objects. The 'searching for' behaviours were first observed as early as nine weeks, when the mother left the room and the infant appeared to follow and search for her. 'Object permanence' begins and develops therefore in the presence and then the absence of the mother during interactive sequences and playful games such as peek-a-boo. Motor action with objects further facilitates the development of this concept. Sequences were observed during bathing where the infant would randomly drop the towel she was chewing and look for it or search briefly for a dropped toy.

Based on the evidence in this study, thought is possible without language. However without the influence of the mother, and the oral language and social interaction she brings to the infant, neonatal thinking would remain at this elementary-perceptual level. In disagreement with Piaget, it is suggested that the social (both interpersonal and cultural) factors serve to activate, direct and determine the

quality and functions of the thought process beyond this early perceptive stage. The mother builds on the infant's perceptual matrix by exposing her infant to the two-way process of interaction and communication. Through positive reinforcement and feedback the infant learns to attend and communicate. Through joint attention and joint activity the mother introduces labels for objects and eventually the infant's vocal skills develop into oral-verbal language. Thinking then develops onto a more abstract plane. Bruner writes:

> . . . At first these joint actions are very discrete, specially geared to assistance and comfort. In time the two of them develop conventions and requirements about carrying out joint tasks. The structure of these tasks may shape the structure of initial grammar by the nature of the jointly held concepts it imposes. (1977, p. 274)

Bruner implies that thought and language develop interdependently, not independently. The results of this study suggest that the link between thought and language is not through words which help to organize thought, but through the infant's receptive language skills before the first use of words. Receptive language learning involves the sensory-neural, auditory and visual perceptual systems. These systems facilitate the 'decoding' and 'understanding' of oral language. In interactive sequences the infant learns to perceive associations and connects sounds, expressions and body movements with situations. The mother's rate and tonal pattern of connected speech is understood and responded to by appropriate

affective behaviours before they are imitated in patterns of emergent speech. The activity of associating what-goes-with-what (chaining behaviours) begins at birth. As a result, thought (perceptual differentiation) and language (vocal and non vocal behaviours) are interrelated from birth. The communication system between mother and infant serves to constrain behaviour and therefore give meaning. Meaning refers to the differentiation of the infant's world, be it spatial, temporal, internal or external. Meaning initially relies on the recognition of differences in the external world through interactions with the mother in varying locations and contexts.

These conclusions have important implications in both the education of normal children and in early habilitative and educational intervention with children with specific handicaps. The period between birth and six months is important in shaping the infant's cognitive and linguistic development. Early environmental stimulation promotes this development. One of the most important influences in the first six months is the stimulation provided by the mother. In order to learn, the infant must interact with his environment, and the ability to do so depends on normal maturation and the quality of environmental experiences inevitable. For this development to occur most infants need to be raised in a supportive and stimulating home environment.

The same rationale can be applied to handicapped infants (those with brain damage, genetic or congenitally determined handicaps, or sensory impairment) and delayed infants (who suffer from premature birth, deprivation in the neonatal period due to poor maternal care, poor diet or a lack of adequate sensory environment). The establishment of infant stimulation programmes can provide the environment to excite the infant's visual auditory, tactile and kinesthetic systems. The goal is "to help the infant organize and direct the attentional process" (Viel, 1977, p. 12). As the infant begins to show interest, encouragement is given to act on the environment through learning to use the body to cause things to happen. In cases of physical handicap, where sensory systems are intact but where reflexes keep the body stiff or bent, the children are positioned in ways so that voluntary movements can be produced. Children suffering from deafness, congenital aphasia, or other organic disorders which prevent the development of emergent language can also be stimulated and encouraged to learn the use of those sensory systems that are intact. Helen Keller advocates the necessity of freeing ourselves from an over-reliance on our own auditory-visual world:

> . . . People who think that all sensations reach us through eye and ear have expressed surprise that I should notice any difference, except possibly the absence of pavements, between walking in the city streets and in the country roads.

> The forget that my whole body is alive to the conditions about me. (1954, p. 49)

In the same vein children are alive to the 'conditions about them' long before they have fully developed their cognitive and linguistic abilities. The conclusions of this study imply that the answer to the debate on the relationship between thought and language is to be found in the perceptual, communicative and social development of the neonate.

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APPENDIX A

APPROVAL TO VIDEOTAPE DELIVERY AT VICTORIA GENERAL HOSPITAL

Victoria General Hospital

841 FAIRFIELD ROAD, VICTORIA, B.C. V8V 3B6 TEL. 388-9121

October 31, 1977.

John McLeish, Ph.D.,
Professor, Psychological Foundations,
Faculty of Education,
University of Victoria,
P.O. Box 1700,
Victoria, B.C.
V8W 2Y2

Dear Sir:

Please be advised that permission is hereby granted to Dorothy Edgell to carry out the observational study as outlined in your letter of October 25, 1977.

It will be required that the patient complete a standard hospital consent form re videotaping of procedures. This will be available for her to sign in the unit when she is admitted.

Yours sincerely,

D.R. Carlow, M.D., C.C.F.P.,
Medical Director

DRC/es
cc - Shella Nicolls, Head Nurse
Obstetrics
Encl - Consent form

CONSENT TO PHOTOGRAPHIC OR OTHER RECORDING OF PROCEDURES

In connection with the medical services which I am receiving from my physician, I hereby consent to having any procedures recorded by means of photography, video tape, moving pictures and/or sound recordings under the following conditions:

1. The procedures shall be recorded only with the consent of my physician and under such conditions and at such times and by such persons as may be approved by him.

2. The records of such procedures may, if in the judgment of my physician to do so, would be beneficial to medical research, education or science, be published in professional journals or medical books or used for any other purpose which he may deem proper in the interests of medical education, knowledge or research provided, however, that it is specifically understood that in any such publication or use I shall not be identified by name.

3. If in the judgment of my physician it is decided to publish the recordings then the same may be in his discretion edited or otherwise modified.

Signed:_____

Witness:_____

APPENDIX B

EXAMPLES OF CODED TRANSCRIPTS

Activity: FEEDING
Age: 7 weeks
Location: Livingroom
Tape 8, sequence 043-076.
Time 3.3 mins. Length of example 3.3 mins.
Additional: Son and visitor present. Television on.
\+ non vocal

MOTHER		BABY	
Holds baby. Lifts baby close to face	6+	9+	Quiet
		7	Cries
"When did you ever feed me around here."	3		
		7+	Arms fling out, wriggles
"Oh..."	10		
Looks away	7+	7+	Arms fling out, wriggles
Adjusts sweater ready for feeding	2+		
		1	Rooting sounds
Leans forward and places baby to nipple	1+		
		6	Gulps very loudly
Laughs	10	2+	Feeding
"Oh, I'm hungry."	6		
	3		
Sits back	9+		
Looks at T.V.	7+		
Looks at baby	9+		
Fondles feet	10+		
		6	Loud gulps
Looks to baby	9+	2+	Feeding
Strokes head	10		
Looks to T.V.	7+		
Fondles baby	10+		

MOTHER		BABY	
Looks to baby	9+	2+	Feeding
Strokes baby	10+		
Looks to T.V.	7+		
Examines baby's hands	10+		
Looks to T.V.	7+		
Looks to baby	9+		
Fondles feet	10+		
		6	Loud gulps
"She inhales the food."	3		
		2+	Continues to feed
Strokes baby's head	10+		
Looks away	7+		
Plays with baby's feet	10+		
Looks to T.V.	7+		
		6	Loud gulps
Looks to baby	9+	2+	Continues to feed
Removes baby from breast	1+		
		9+	Quiet and submissive
Sits baby up and rubs back	1+		
		9+	Drowsy
Strokes face and looks at baby	10+		
		9+	Drowsy
Rubs back	1+		
		2	Loud burp
Laughs	10		
		2	(grunting sounds)
Laughs	10		
"She's trying."	2	9+	

Activity: BATHING
Age: 16 weeks
Location: Bathtub
Tape 12, Sequence 008-034.
Time 2.6 mins. Length of example 2.6 mins.
Additional: Son present.
\+ non vocal

MOTHER			BABY
Sits baby in tub	1+	9+	Quiet. Fists clenched, arms close to body.
Laughs	10	9+	Quiet
Splashes water on baby	1	9+	Quiet
"Feel the water."	1	9+	Quiet
"What's this?" (Splashes baby)	1+	9+	Quiet (with eye contact)
"What's this?"	1	10+	Smiles
Turns away	7+	9+	Quiet (with eye contact)
Reaches for soap	2+	9+	Quiet (with eye contact)
"Yes, yes."	10	9+	Quiet (with eye contact)
Tickles tummy	1+	10+	Smiles. Opens mouth
"Come on." (smiles)	1	10+	Smiles
Rubs tummy	2+	9+	Quiet
"Come on, talk to me."	1	10+	Smiles
"Oh, lovely stuff this soap."	6 3	10+	Smiles and watches mother
"You'll smell like a rose"	3	10+	Smiles and watches mother
"Well, its beautiful stuff."	6 3	10+	Smiles and watches mother
"Good for babies."	3	10+	Smiles and watches mother

MOTHER		BABY	
And big guys and little guys	3		
		10+	Smiles and watches mother
All sizes	3		
		10+	Smiles
Soaps face with sponge	2+		
		2+	Tries to eat sponge
"Oh my goodness."	6		
		10+	Smiles
Rubs under arm	2+		
		10+	Smiles
Laughs	10		
"Oh, poo-poo" (playing)	10		
		10+	Smiles
"Yes,"	9		
		2+	Tries to eat mother's fingers
Continues washing	2+		
		7	Sounds of discomfort
Laughs	10		
		9+	Quiet
Rubs face with sponge	2+		
		2+	Tries to eat sponge
Tickles cheek with sponge	1+		
"Put some of this stuff on you"	2		
		7+	Turns away
"You look like Santa Claus with a beard."	3		
		7+	Still turning away
Rinses faces	2+		
		7+	Waves arms in protest

MOTHER		BABY	
Repeats	4		
		7+	Waves arms in protest
Repeats	4		
		2+	Tries to eat sponge
"This isn't soap,"	2		
		9+	Quiet and still
"so don't you worry."	3		
		9+	Quiet and still
Continues washing	2+		
		2+	Plays with water
Sits baby up	1+		
		2+	Plays with water
Looks enface to baby	6		
		7+	Turns away
Washes back	2+		
		2+	Plays with water
		6+	Baby looks to mother
Mother smiles	10+		
Lies baby in water	1+		
		9+	Watches mother
"Whee..ee..ee.."	6		
		10+	Smiles
Repeats	4		
		10+	Smiles
Repeats	4		
		10+	Smiles
"Does that feel good?"	1		
		10+	Smiles
Squeezes sponge over baby	1+		
"Whee..ee..ee.."	6		
		10	Giggles

MOTHER		BABY	
Laughs	10		
Repeats game	4		
		10+	Smiles
Laughs	10		
		7+	Turns away
"Let's get this stuff out of your ear."	1	9+	Watches mother
Rinses ear	2+	9+	Watches mother
"Well....	6		
		9+	Watches
"Are you just going to lie there,	8		
or say something, or swim?"	1		
		10+	Smiles
Washes face	2+		
		2+	Tries to eat mother's fingers
"I'm not interested in anything."	3		
		9+	Looks to mother

Activity: DRESSING (LONG)
Age: 16 weeks
Location: Bedroom
Tape 12, sequence 051-089.
Time 4.7 mins. Length of example 3.8 mins.
Additional: Preceded by long bathing session. Son present.
+ non vocal

MOTHER		BABY	
Dries baby on knee	2+		
		9+	Quiet. Seated with back to mother
"Franciscan Monk"	3		
		9+	Quiet.
"I am going to the change table soon."	3	9+	Quiet
"Get the back of your hair dried."	2+		
		9+	Quiet (Still seated on mother's knee. Back to mother.)
"Look at this fat girl."	1		
Dries baby			
"Takes after her mother."	3		
Continues drying	2+		
"Dad wants to send you to weight watchers."	3+		
Puts baby on change table	2+		
"Tickle, tickle, tickle."	1		
		10+	Smiles
"What is this?" (Points to arm)	1		
		9+	Watches mother
"Get that arm up."	1	9+	Watches mother
Repeats	4	9+	Watches mother

MOTHER			BABY
Dries arm	2+	9+	Watches mother
"Get that arm up over here."	1		
		9+	Continues to look at mother
"Let's have a peek and see."	1		
Continues drying	2+		
Looks to Julia	9+		
"Your face hasn't been washed."	2		
"Did you know."	1		
"Your face hasn't been washed."	4		
"No, no."	6		
"Your face has not been washed."	4		
		10+	Smiles
"We will have to wash it."	3		
		10+	Smiles
"Yes."	9		
		10+	Smiles
"We will have to wash your face and eat your toe." (playful)	3 10		
		10+	Smiles
Kisses toe	10+		
"T...t...t...t"	1+		
		10+	Smiles
Tickles arm and smiles	1+		
		10+	Smiles
Dries legs	2+		
		10+	Smiles

MOTHER		BABY	
Takes cream and rubs on baby	2+		
		9+	Quiet.
Smiles at baby	10		
		10+	Baby smiles.
"Let's make you smell pretty."	1		
		9+	Quiet. Watches mother
Rubs cream into baby's body	2+		
		9+	Quiet. Watches mother
"Hello, hello."	6		
		10+	Smiles
"Yes...t...t...t.."	9 10		
		10+	Smiles
"You are just not interested today, are you."	8 2 1		
		10+	Smiles
"Yesterday, you were talking like a blue streak."	3 3		
		10+	Smiles
"Yes, you were."	3		
		10+	Smiles
"What did you have to say?"	1		
		9+	Looks at mother and watches
"Surely you have something to say today?"	8 3		
		10+	Smiles
"Just one little one?"			
		10+	Smiles

MOTHER		BABY	
"O.K."	9	9+	Quiet
Continues dressing	2+	9+	Quiet
		6	"uh"
"What?"	1		
Watches baby	9+	4	"uh...uh...uh..."
"You mean you really enjoyed that?"	8 3		
		9+	Watches mother
"Go on, tell me more?"	1 1		
		9+	Watches mother
Tickles tummy	1+		
		10+	Laughs

Activity: DRESSING (SHORT)
Age: 4 weeks
Location: Livingroom, couch
Tape 5, sequence 208-237.
Time 2.9 mins. Length of example 2.9 mins.
Additional: Son and visitor present. Background music.
\+ non vocal

MOTHER		BABY	
Removes diaper	2+		
		9+	Quiet
Mother cleans baby's bottom	2+		
		9+	Baby passive and cooperative
"Pretty soon, your mum is going to stop using these."	8 3		
		9+	Baby passive and cooperative
Continues to clean bottom	2+		
		9+	Baby passive and cooperative
Puts diaper on	2+		
		7+	Sounds of discomfort ("ug...ug")
Removes pyjamas	2+		
		9+	Baby is quiet
"Does that feel better?"	1		
		9+	Looks to mother
Tickles baby's tummy	1+		
		9+	Quiet. No eye contact
"Does it...does it?"	1		
		9+	Quiet. No eye contact.
"What's the matter?"	1		
		9+	Looks to mother
"Does it feel better?"	1		
		4+	Opens mouth tries to respond

MOTHER		BABY	
"Can't you smile?"	1		
		10+	Smiles
Tickles tum	1+		
Just for me	8		
	3		
		10+	Smiles
"Just one little smile."	8		
	1		
		10+	Smiles
"Come on, come on."	1		
		10+	Smiles
Whispers	10		
		10+	Smiles
"You've got a crooked nose."	2		
		4+	Opens mouth as if to speak
"Yes, yes."	10		
		10+	Smiles
Removes baby's jacket	2+		
		7+	Turns away and sneezes
		2+	
"Oh, its cold."	10		
	2		

Activity: PLAYING
Age: 24 weeks
Location: Kitchen. Baby seated in high chair.
Tape 16, sequence 007-037.
Time 3.0 mins. Length of sample 1.5 mins.
Additional: Father and mother having coffee in kitchen.
+ non vocal

MOTHER			BABY
		2+	Seated in high chair, eating rubber monkey
Mother watches baby	9+		
		2+	Drops monkey
		3+	Immediately turns to look for it
"Oh...oh"	10		
		7+	Turns away. Looks at hands
Watches baby	9+		
		9+	Looks to mother.
		2+	Looks at camera
Watches baby	9+	6	"ah"
"Do you want your monkey?"	1		
		9+	Looks to Mom
Watches baby	9+		
		2+	Looks to camera
"Julia, Julia."	1		
		7+	No response. Looks to camera
"Julia"	1		
		9+	Looks to Mom
"Hi..."	6		
"Do you want your monkey?"	1		
		10+	A big smile

MOTHER			BABY
		7+	Looks to camera
"No...." (laughs)	10		
		10+	Looks at mother and smiles
"Let's get monkey."	1		
		2+	Eats hands
Mother walks and picks up monkey	2+		
		9+	Baby visually follows mother
Sits in front of baby and holds up toy	6+ 1		
		10+	A big smile
"Who's that?"	1		
		10+	Smiles
"Who is it?"	1		
		10+	Smiles
Squeezes toy. "Oh...."	1+		
		10+	Smiles and looks at toy
Watches baby	9+		
Squeezes toy...	1+		
Rubs toy on baby's nose	1+		
"Oh..."	10		
Watches baby	9+		
Plays peek-a-boo with toy	1+		
		2+	Baby looks for toy
Watches baby	9+		
		10+	Baby smiles
Repeats peek-a-boo game	1+		
		2+	Looks for duck

MOTHER		BABY	
Watches baby	9+		
		10+	Smiles
Peek-a-boo	1+		
		2+	Looks for toy
		10+	Smiles
Mother laughs	10		
		10+	Baby smiles
Watches baby	9+		
Hides toy	1+		
		2+	Baby looks for toy
"Who's that?" (shows toy)	1		
		9+	Captivated by the toy
Squeezes duck	1+		
		9+	Looks at toy
Mother watches	9+		
Moves toy closer	1+		
		2+	Baby reaches, grasps and chews toy
Imitates eating sounds	4+		
		2+	Continues to chew toy
Mother watches	9+		
		2+	Knocks toy off highchair
"Oh..." (laughs)	10		
		9+	Looks at Mom
"Where is monkey?"	1		
Picks up monkey	2+		
		9+	Looks at Mom
Positions monkey in front of baby	1		
		2+	Baby watches
		7+	Then turns away
Squeezes monkey	1+		
"Oops."	6		

MOTHER		BABY	
		9+	Turns to mother and
		10+	Smiles
Watches baby	9+		
Hides monkey	1		
		7+	Looks away
"Peek-a-boo"	3		
		10+	Baby smiles

Activity: ENFACE
Age: 10 weeks
Location: Livingroom. Baby seated in special baby seat on the couch.
Tape 9, sequence 089-117.
Time 2.8 mins. Length of example 1.9 mins.
Additional: Older child watching television in the same room.
+ non vocal

MOTHER			BABY
Looks at baby and smiles	9+		
		10+	Smiles. Eye contact
"These little smiles are not enough." (playful)	2 3		
		10+	Smiles
Makes playful faces (maintains attention)	6+		
		10+	Smiles (eyes crossed)
Laughs	10		
"Don't cross your eyes."	1		
		10+	Smiles. Waves arms and kicks legs
Pauses and watches baby	9+		
		10+	Looks at mother and smiles.
Laughs	10		
"Don't cross your eyes."	1		
		10+	Smiles and waves arms, kicks legs
"What does this mean?"	1		
		10+	Smiles and waves arms, kicks legs
"What does it mean?"	1		
		10+	Smiles and waves arms, kicks legs

MOTHER		BABY	
"Oh...."	9		
		10+	Smiles and waves arms, kicks legs
Bends forward and kisses baby on the nose	6+		
		9+	Looks at mother
Whispers	10		
		10+	Smiles
"Come on...."	1		
		4+	Opens mouth
"Yes..."(very attentive)	9+		
		10+	Smiles
"Say something."	1		
		4	"ah...ah...ah"
Models baby's facial expressions	4+		
		4	"ah...ah...ah"
Repeats baby's sounds	4		
		4	"ah...ah..."
"Yes, its a good sound."	9 2		
		10+	Smiles
		4	"ah...ah...ah. Ah...ah ...ah"
"Yes,...	9+		
I know...	10		
It's a very good sound"	2		
		10+	Smiles
"What was that?	1		
I didn't get it all."	3		
		10+	Smiles, waves arms and legs
"Tell me the rest of it?"	1		
		10+	Smiles, waves arms and legs

MOTHER		BABY	
Repeats	4		
		10+	Smiles, waves arms and legs
"Come on...come on... Yes."	1 9		
		7+	Looks away
Kisses hand	6+		
		9+ 7+	Looks to mother, then turns away
Pauses and watches	9+		
		7+	Turns away
"Oh...."	6		
		9+	Turns and looks at mother
"Look at those crossed eyes."	2		
		9+	Continues to look at mother
"What are you crossing your eyes for?"	1		
		9+	Continues to look at mother
		2+	Sticks out tongue
Watches baby	9+	7+	Looks away
"Oh, Julia..."	6		
		9+	Looks to mother
Laughs	10		
"Yes...	9		
that's phooey!"	3		
		10+	Smiles
"Don't cross your eyes."	1		
		10+	Smiles
"You look so funny when you cross your eyes."	2		
		10+	Smiles

MOTHER			BABY
Rubs nose on baby's head	1+		
		9+	Looks at mother
"I know..." pause	6		
		10+	Smiles
"Yes...come on."	9 1		
		7+	Turns away
Watches baby	9+		
		9+	Looks to mother
"What?"	1		
		6	"ah"
		4	"ah..ah..ah..ah..ah..ah.."
Repeats baby's sounds	4		
		4	"ah...ah..."
"Yes, very good."	9 10		
		7+	Looks away
"Yes, I know. It's very good."	10 3		
		9+	Looks to mother
"Yes." (smiling)	10		
		10+	Smiles
"Yes, I know."	10		
		7+	Looks away
"You're not hungry or anything" (pause)	3		
		9+	Looks to mother
"You're just a happy girl."	2		
		10+	Smiles
Smiles	10+		
		4	"ah...ah...ah"
"Yes, I know."	10		
		4	"ah...ah...ah"

MOTHER		BABY	
"Yes...."	9		
		4	"ah...ah...ah"
"But stop crossing those eyes."	1	4	"ah...ah...ah"
Watches baby	9+		
		7+	Looks away
"Yes..."	6		
		9+	Looks to mother
Pauses	9+		
"Come on..."	1		
		7+	Looks away
"Are we going to have some more?"	1		
		7+	Looks away

Activity: ALONE
Age: 25 weeks
Location: Crib
Tape 16, sequence 120-150.
Time 3 mins. Length of example 3.0 mins.
Additional: Baby in lying position looking at mobile above crib. Playboard attached at side. Dressed.
+ non vocal

	BABY
2+	Looks around the crib
9+	Fixates on mobile
10+	Smiles
4	"ah"
4	"ah"
4	"ah"
4	"ah"
2+	Plays with hands
9+	Looks at hands (8 seconds)
7+	Turns to right
2+	Sees playboard
1+	Reaches out and touches ball on playboard
1+	Rolls ball
4+	Repeats
4+	Repeats
4+	Repeats
4+	Repeats
7+	Turns away to left
2+	Sees toy
1+	Touches toy
2+	Looks at mobile
9+	Fixates
7+	Turns away
2+	Looks at mobile

BABY

9+	Fixates
10+	Smiles
2+	Looks to playboard
2	Hits playboard
3+	Looks to source of sound
1+	Touches ball
4+	Repeats
4+	Repeats
4+	Repeats
7+	Looks away
4	"ah..."
2+	Looks at mobile
4	"ah"
4	"ah"
7+	Turns to right
2+	Sees board
1+	Hits ball
4+	Repeats
4+	Repeats
4+	Repeats
7+	Turns away
2+	Looks at mobile
7+	Turns to left
2+	Sees toy
1+	Touches toy
7+	Turns to right
2+	Randomly touches ball
3+	Follows the sound
1+	Touches ball
1+	Holds ball (19 secs.)
1+	Removes hand

BABY

9+	Still looks
1+	Touches ball
4+	Repeats
7+	Turns away
2+	Looks back at board
2+	Randomly touches board
9+	Looks at board (22 secs.)
1+	Puts hand on ball
9+	Looks at board (5 secs.)
1+	Touches other ball on board
4	Repeats
1+	Touches other toy
4+	Repeats
1+	Touches ball
4+	Repeats
4+	Repeats
9+	Looks at board (13 secs.)
1+	Rolls ball
4	Repeats
7	Cries

APPENDIX C

RAW DATA: BEHAVIOUR CATEGORIES FOR MOTHER AND BABY IN SEVEN ACTIVITIES

TABLE C I

Baby Alone

Age	Length (mins.)	Vocal, non.v.	Operant Categories: Mand m	Mand b	Tact m	Tact b	Extended Tact m	Extended Tact b	Echoic m	Echoic b	Intra-Verbal m	Intra-Verbal b	Dominant Control Autoclitic m	Dominant Control Autoclitic b	Negative Control Autoclitic m	Negative Control Autoclitic b	Informative Autoclitic m	Informative Autoclitic b	Submissive Control Autoclitic m	Submissive Control Autoclitic b	Positive Affective Autoclitic m	Positive Affective Autoclitic b	Totals m, b
		v.	-		-		-		19		-		-		1		-		-		-		20
6 weeks	2.6	n.v	-		20		1		-		-		-		3		-		7		-		31
		v.	1		-		-		4		-		-		3		-		-		1		9
14 weeks	2.0	n.v	3		13		-		-		-		-		8		-		11		8		43
		v.	2		-		-		-		-		-		-		-		-		-		2
20 weeks	1.8	n.v	-		24		4		1		-		-		12		-		13		14		68
		v.	-		-		-		63		-		-		-		-		-		-		63
21 weeks	1.7	n.v	-		18		1		-		-		-		5		-		5		1		30
		v.	3		-		-		2		-		1		9		-		-		-		15
22 weeks	3.0	n.v	24		29		-		1		-		-		20		-		16		-		90
		v.	-		-		-		6		-		-		1		-		-		-		7
25 weeks	3.0	n.v	17		17		2		23		-		-		11		-		8		2		80
Totals	vocal		6		0		0		94		-		1		14		-		0		1		
	non-vocal		44		121		8		25		-		-		59		-		60		25		458
	vocal + non-vocal		50		121		8		119		-		1		73		-		60		26		

TABLE C II

Feeding

Age	Length (mins.)	vocal, non.v.	Operant Categories: Mand m	Mand b	Tact m	Tact b	Extended Tact m	Extended Tact b	Echoic m	Echoic b	Intra-Verbal m	Intra-Verbal b	Dominant Control Autoclitic m	Dominant Control Autoclitic b	Negativw Control Autoclitic m	Negativw Control Autoclitic b	Informative Autoclitic m	Informative Autoclitic b	Submissive Control Autoclitic m	Submissive Control Autoclitic b	Positive Affective Autoclitic m	Positive Affective Autoclitic b	Totals m,	Totals b,	Totals m+b
		v.	4	-	-	-	3	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-	8	1	9
Birth	1.6	n.v	6	-	-	2	-	-	-	-	-	-	-	-	2	8	-	-	-	8	4	-	13	18	21
		v.	1	-	8	-	1	-	-	-	1	-	-	-	-	-	1	-	1	-	1	-	14	0	14
2 hours	1.9	n.v	1	-	3	33	-	-	-	-	-	-	-	-	2	-	-	-	12	-	1	-	19	33	52
		v.	1	-	-	1	2	-	1	-	-	-	1	-	4	-	-	-	-	-	-	-	9	1	10
8 days	3.1	n.v	6	-	4	20	-	-	-	-	-	-	-	-	11	-	-	-	8	16	3	1	32	37	69
		v.	3	-	1	-	2	-	-	-	-	-	-	2	4	-	2	-	-	-	1	-	13	2	15
2 weeks	4.0	n.v	6	2	3	25	-	-	-	-	-	-	1	-	4	1	-	-	6	8	6	-	26	36	62
		v.	5	-	4	7	3	-	-	-	-	-	1	1	3	-	1	-	-	-	3	-	20	8	28
4 weeks	3.4	n.v	9	0	2	15	-	-	-	-	-	-	-	-	1	11	-	-	7	1	6	-	25	27	52
		v.	8	-	1	1	2	-	2	-	-	-	6	2	1	2	2	-	1	-	2	-	25	5	30
6 weeks	3.2	n.v	10	-	-	32	-	-	-	-	-	-	1	-	10	14	-	-	9	7	8	-	28	33	61
		v.	-	1	1	7	3	-	-	-	-	-	1	3	-	1	-	-	-	-	1	-	6	12	18
7 weeks	3.3	n.v	4	-	2	20	-	-	1	-	-	-	1	-	8	2	-	-	8	5	11	-	35	27	62
		v.	5	-	3	-	7	-	1	-	-	-	2	4	1	1	3	-	-	-	2	-	24	5	29
17 weeks	4.4	n.v	11	1	1	33	-	-	-	-	-	-	1	-	4	10	-	-	12	5	13	1	42	50	92
Totals	vocal		27	1	18	16	23	-	4	-	1	-	12	12	13	5	9	-	2	-	10	-			
	non-vocal		53	3	15	180	-	-	1	-	-	-	4	-	42	46	-	-	62	50	53	2		664	
	vocal + non-vocal		80	4	33	196	23	-	5	-	1	-	16	12	55	51	9	-	64	50	63	2			

TABLE C III

Bathing

Age	Length (mins.)	Vocal, non.v.	Operant Categories: Mand m	Mand b	Tact m	Tact b	Extended Tact m	Extended Tact b	Echoic m	Echoic b	Intra-Verbal m	Intra-Verbal b	Dominant Control Autoclitic m	Dominant Control Autoclitic b	Negative Control Autoclitic m	Negative Control Autoclitic b	Informative Autoclitic m	Informative Autoclitic b	Submissive Control Autoclitic m	Submissive Control Autoclitic b	Positive Affective Autoclitic m	Positive Affective Autoclitic b	Totals m	Totals b	Totals m+b
		v.	2	2	1	-	8	-	1	-	-	-	-	-	1	16	1	-	3	-	3	-	20	18	38
8 days	2.4	n.v	4	-	20	-	-	-	-	-	-	-	-	-	-	6	-	-	-	10	-	-	24	16	40
		v.	2	-	5	2	6	-	1	-	-	-	-	3	-	1	1	-	1	-	5	-	21	6	27
3 weeks	2.4	n.v	1	-	20	-	-	-	1	-	-	-	-	-	-	-	-	-	2	31	-	-	24	31	55
		v.	-	-	1	1	4	-	-	-	1	-	1	-	1	3	1	-	-	-	2	-	11	4	15
5 weeks	2.5	n.v	3	-	17	-	-	-	-	-	-	-	-	-	-	12	-	-	-	11	-	-	20	23	43
		v.	1	-	-	-	6	-	-	-	-	-	1	-	-	7	1	-	-	-	1	-	10	7	17
6 weeks	2.4	n.v	1	-	11	-	-	-	-	-	-	-	-	-	-	1	-	-	2	12	1	2	15	15	30
		v.	11	-	3	-	9	-	1	-	-	-	10	1	-	1	-	-	1	-	8	-	43	2	45
16 weeks	2.6	n.v	9	-	12	8	-	-	-	-	-	-	-	1	1	6	-	-	-	19	-	22	22	56	78
		v.	2	-	-	-	2	-	-	-	-	-	2	-	-	2	-	-	-	-	3	-	9	2	11
20 weeks	1.7	n.v	5	-	6	13	-	1	-	-	-	-	2	-	1	2	-	-	-	2	2	-	16	18	24
Totals	vocal		18	2	10	3	35	-	3	-	1	-	14	4	2	30	4	-	5	-	22	-			
	non-vocal		23	-	86	21	-	1	1	-	-	-	2	1	2	27	-	-	4	85	3	24		433	
	vocal + non-vocal		41	2	96	24	35	1	4	-	1	-	16	5	4	57	4	-	9	85	25	24			

TABLE C IV

Dressing (Long)

Age	Length (mins.)	vocal, non v.	Operant Categories: Mand m	Mand b	Tact m	Tact b	Extended Tact m	Extended Tact b	Echoic m	Echoic b	Intra-Verbal m	Intra-Verbal b	Dominant Control Autoclitic m	Dominant Control Autoclitic b	Negative Control Autoclitic m	Negative Control Autoclitic b	Informative Autoclitic m	Informative Autoclitic b	Submissive Control Autoclitic m	Submissive Control Autoclitic b	Positive Affective Autoclitic m	Positive Affective Autoclitic b	Totals m	Totals b	Totals m+b
		v.	4	1	11	-	3	-	1	-	-	-	1	-	-	10	3	-	2	-	4	-	29	11	40
8 days	3.1	n.v	6	2	18	4	5	-	-	-	-	-	-	-	-	9	-	-	-	23	1	-	25	38	63
		v.	1	-	-	-	3	-	-	-	-	-	2	-	-	2	1	-	2	-	3	-	12	2	14
3 weeks	3.4	n.v	9	-	10	1	-	-	-	-	-	-	-	-	-	-	-	-	-	20	-	-	19	21	40
		v.	20	-	4	-	11	-	3	3	-	-	5	1	-	-	3	-	5	-	4	-	55	4	59
16 weeks	4.7	n.v	5	-	12	-	-	1	-	-	-	-	-	-	1	3	-	-	1	37	2	23	21	64	85
		v.	6	-	6	-	14	-	3	1	-	-	3	1	-	-	5	-	5	-	5	-	47	2	49
20 weeks	2.7	n.v	6	-	7	15	-	4	-	5	-	-	2	-	-	4	-	-	1	13	1	1	17	42	59
Totals	vocal		31	1	21	-	31	-	7	4	-	-	11	2	-	12	12	-	14	-	16	-			
	non-vocal		26	2	47	20	-	5	-	5	-	-	2	-	1	16	-	-	2	93	4	24		409	
	vocal + non-vocal		57	3	68	20	31	5	7	9	-	-	13	2	1	28	12	-	16	93	20	24			

TABLE C V

Dressing (Short)

Age	Length (mins.)	vocal, non. v.	Operant Categories: Mand m	Mand b	Tact m	Tact b	Extended Tact m	Extended Tact b	Echoic m	Echoic b	Intra-Verbal m	Intra-Verbal b	Dominant Control Autoclitic m	Dominant Control Autoclitic b	Negative Control Autoclitic m	Negative Control Autoclitic b	Informative Autoclitic m	Informative Autoclitic b	Submissive Control Autoclitic m	Submissive Control Autoclitic b	Positive Affective Autoclitic m	Positive Affective Autoclitic b	Totals m,	Totals b,	Totals m+b
		v.	-	-	4	1	3	-	-	-	-	-	-	-	1	-	1	-	-	-	2	-	11	1	12
2 days	2.6	n.v	1	-	6	5	-	-	-	-	-	-	-	-	1	7	-	-	-	4	-	-	8	16	24
		v.	7	-	2	1	2	-	1	-	-	-	-	-	-	1	3	-	-	-	3	-	18	2	20
4 weeks	2.9	n.v	3	-	8	-	-	-	-	2	-	-	-	-	-	1	1	-	-	13	-	8	11	24	35
		v.	24	-	7	-	10	-	7	20	-	-	4	2	-	3	4	-	9	-	5	2	70	27	97
9 weeks	3.0	n.v	1	-	5	-	-	-	-	4	-	-	2	-	-	1	-	-	-	14	2	21	10	40	50
		v.	26	-	3	-	3	-	12	43	-	-	1	2	-	-	1	-	6	-	4	-	56	45	101
10 weeks	3.1	n.v	6	-	5	-	-	-	-	3	-	-	2	-	-	12	-	-	1	6	4	13	18	34	52
		v.	17	-	10	1	9	-	4	8	1	-	8	1	-	-	1	-	4	-	5	9	59	19	78
15 weeks	3.0	n.v	7	-	9	10	-	-	-	2	-	-	4	-	-	-	-	-	1	25	2	18	23	55	78
		v.	19	-	10	-	2	-	11	12	-	-	13	2	-	1	3	-	7	-	4	5	69	20	89
22 weeks	3.0	n.v	7	-	5	13	-	-	1	1	-	-	3	-	-	2	1	-	5	29	5	35	36	80	116
Totals	vocal		25	-	48	3	29	-	35	83	1	-	26	7	1	5	13	-	26	-	23	16			
	non-vocal		93	-	36	28	-	-	1	12	-	-	11	-	1	23	-	-	7	91	13	95		752	
	vocal + non-vocal		118	-	84	31	29	-	36	95	1	-	37	7	2	28	13	-	33	91	36	111			

TABLE C VI

Playing

Age	Length (mins.)	vocal, non.v.	Operant Categories: Mand m	Mand b	Tact m	Tact b	Extended Tact m	Extended Tact b	Echoic m	Echoic b	Intra-Verbal m	Intra-Verbal b	Dominant Control Autoclitic m	Dominant Control Autoclitic b	Negative Control Autoclitic m	Negative Control Autoclitic b	Informative Autoclitic m	Informative Autoclitic b	Submissive Control Autoclitic m	Submissive Control Autoclitic b	Positive Affective Autoclitic m	Positive Affective Autoclitic b	Totals m	Totals b	Totals m+b
		v.	21	-	6	-	5	-	2	-	-	-	3	-	-	-	1	-	9	-	11	2	58	2	60
17 weeks	3.0	n.v	5	5	1	28	-	2	-	-	-	-	-	-	-	2	-	-	5	19	-	14	14	70	84
		v.	15	-	3	-	2	-	6	42	-	-	3	-	-	3	-	-	1	-	9	2	39	47	86
18 weeks	3.0	n.v.	3	-	-	8	-	-	-	-	-	-	-	-	-	1	-	-	15	22	-	6	18	37	55
		v.	14	3	6	-	4	-	-	5	-	-	3	2	-	2	-	-	1	-	10	-	38	12	50
24 weeks	3.0	n.v	14	-	5	26	-	4	1	-	-	-	1	-	-	7	-	-	18	16	-	15	39	68	107
Totals	vocal		50	3	15	-	11	-	8	47	-	-	9	2	-	5	1	-	11	-	30	4			
	non-vocal		25	5	6	62	-	6	1	-	-	-	1	-	-	10	-	-	38	57	-	35		442	
	vocal + non-vocal		75	8	21	62	11	6	9	47	-	-	10	2	-	15	1	-	49	57	30	39			

TABLE C VII

Enface

Age	Length (mins.)	vocal, non.v.	Operant Categories: Mand m	Mand b	Tact m	Tact b	Extended Tact m	Extended Tact b	Echoic m	Echoic b	Intra-Verbal m	Intra-Verbal b	Dominant Control Autoclitic m	Dominant Control Autoclitic b	Negative Control Autoclitic m	Negative Control Autoclitic b	Informative Autoclitic m	Informative Autoclitic b	Submissive Control Autoclitic m	Submissive Control Autoclitic b	Positive Affective Autoclitic m	Positive Affective Autoclitic b	Totals m	Totals b	Totals m+b
		v.	4	-	7	-	3	-	1	-	2	-	2	-	1	14	-	-	1	-	4	-	25	14	39
Birth	7.5	n.v	1	-	5	1	-	-	-	-	-	-	-	-	8	-	-	-	12	50	28	-	54	51	105
		v.	11	-	3	-	3	-	5	-	1	-	6	-	-	-	-	-	3	-	2	-	34	-	34
4 weeks	2.3	n.v	3	-	-	5	-	-	-	5	-	-	1	-	-	15	-	-	14	17	2	6	20	48	68
		v.	26	-	9	-	10	-	4	53	1	-	6	2	-	-	1	-	12	-	10	-	79	55	134
10 weeks	2.8	n.v	2	-	-	2	-	-	2	2	-	-	5	-	-	7	-	-	10	13	5	36	24	60	84
		v.	24	1	1	5	14	-	8	59	-	-	5	-	-	-	-	-	19	-	5	-	76	65	141
12 weeks	3.0	n.v	1	-	-	2	-	-	1	10	-	-	-	-	-	-	-	-	5	15	6	15	13	42	55
		v.	12	-	1	-	2	-	3	3	-	-	5	-	-	-	-	-	1	-	1	-	25	3	27
15 weeks	2.4	n.v	3	-	2	3	-	-	-	-	-	-	2	-	-	1	-	-	7	17	2	13	16	34	50
		v.	40	-	5	-	7	-	4	1	-	-	8	1	-	2	1	-	6	-	3	2	74	6	80
19 weeks	3.0	n.v	1	-	-	3	-	-	1	2	-	-	2	1	1	10	-	-	10	37	3	19	18	72	90
		v.	12	-	5	-	-	-	5	6	-	-	3	-	1	9	-	-	2	-	2	15	30	30	60
20 weeks	2.0	n.v	11	2	4	3	-	-	4	-	-	-	1	-	-	3	-	-	18	7	2	16	40	31	71
		v.	18	-	3	1	4	-	7	15	-	-	5	2	-	6	1	-	9	-	7	6	54	50	104
22 weeks	3.0	n.v	7	-	1	3	-	-	1	-	-	-	3	-	-	12	-	-	20	19	2	19	34	53	87
Totals	vocal		147	1	34	6	43	-	37	137	4	-	40	5	2	31	3	-	53	-	34	23			
	non-vocal		29	2	12	22	-	-	9	19	-	-	14	1	9	48	-	-	96	175	50	124		1210	
	vocal + non vocal		176	3	46	28	43	-	46	156	4	-	54	6	11	79	3	-	149	175	84	147			

APPENDIX D

RELIABILITY OF McLEISH-MARTIN CODING SYSTEM

TABLE D.1.

Interrater reliability between rater A (author) and rater B (Dr. J. McLeish).

Scotts 'r' Coefficient

Category	A	B	A%	B%	% Diff.	Ave. %	Ave. $\%^2$	Ave. $\%^2/100$
1	53	58	20.8	23.9	3.1	22.4	501.8	5.0
2	66	45	26.0	18.5	7.5	22.3	497.3	5.0
3	16	17	6.3	7.0	0.7	6.6	43.56	0.4
4	13	9	5.1	3.7	1.4	4.4	19.36	0.2
5	3	-	1.2	-	1.2	1.2	1.4	0.001
6	5	8	2.0	3.3	1.3	2.7	7.3	0.007
7	21	21	8.3	8.6	0.3	8.4	70.6	0.7
8	2	-	0.8	-	0.8	0.8	0.64	0.006
9	13	13	5.1	5.3	0.2	5.2	27.0	0.3
10	62	72	24.0	29.6	5.6	26.8	718.3	7.2
TOTAL	254	243			22.1			18.8

$$\pi = \frac{Po - Pe}{100 - Pe} = \frac{(100 - 22.1) - 18.8}{100 - 18.8} = \frac{59.1}{81.2} = .73$$

APPENDIX E

GENERAL PATTERNS OF MOTHER-BABY INTERACTION

Table E I

Mother: Vocal and Non-vocal Operants Combined per Activity: Standardized Data (Percent).

Activity	Operant Categories										
	Mand	Tact	Extended Tact	Echoic	Intra-verbal	Dominant Control Autoclitic	Negative Control Autoclitic	Informative Autoclitic	Submissive Control Autoclitic	Positive Affective Autoclitic	n
Feeding	23.3	10.6	6.6	1.2	1.6	4.5	15.1	8.5	18.6	17.2	343
Bathing	18.2	38.6	15.3	1.7	0.4	7.2	1.8	1.7	3.8	11.3	290
Dressing (L)	24.0	30.9	14.1	3.1	-	5.8	0.3	5.7	7.1	9.0	199
Dressing (S)	30.1	21.9	7.6	9.1	0.2	9.4	0.6	3.5	8.4	9.2	391
Playing	36.4	10.2	5.3	4.4	-	4.8	-	0.5	23.8	14.6	206
Enface	31.2	7.3	7.0	8.4	0.6	9.5	1.0	0.5	23.3	11.2	623
Mean	27.2	19.9	9.3	7.9	0.5	6.9	4.5	3.4	14.2	20.1	

Table E II

Baby: Vocal and Non-vocal Operants Combined Per Activity: Standardized Data (Percent)

Activity	Operant Categories										
	Mand	Tact	Extended Tact	Echoic	Intra-verbal	Dominant Control Autoclitic	Negative Control Autoclitic	Informative Autoclitic	Submissive Control Autoclitic	Positive Affective Autoclitic	n
Feeding	1.0	61.7	-	-	-	3.2	16.9	-	16.7	0.5	311
Bathing	1.0	13.1	0.7	-	-	2.4	30.5	-	41.3	11.0	253
Dressing (L)	1.8	13.4	3.2	5.4	-	1.1	16.6	-	48.7	9.8	160
Dressing (S)	-	8.8	-	25.2	-	1.9	8.0	-	25.4	30.7	362
Playing	3.3	26.3	4.7	17.8	-	0.8	6.4	-	24.2	16.5	236
Enface	0.6	5.1	-	26.7	-	1.0	13.3	-	25.7	27.6	617
Alone	8.7	26.7	1.9	28.3	-	0.2	14.8	-	12.8	6.6	613
Mean	2.7	22.2	2.6	20.7	-	1.5	15.2	-	27.8	15.2	

Table E III

Operants for Mother (m) and Baby (b) Grouped by Function Per Activity (Percent).

Operants	Activity													
	Alone		Feeding		Bathing		Dressing (L)		Dressing (S)		Playing		Enface	
	m	b	m	b	m	b	m	b	m	b	m	b	m	b
TASK														
1. Tact	26.7	10.6	61.7	38.6	13.1	30.9	13.4	21.9	8.8	10.2	26.3	7.3	5.1	
2. Extended Tact	1.9	6.6	-	15.3	0.7	14.1	3.2	7.6	-	5.3	4.7	7.0	-	
3. Echoic	28.2	1.2	-	1.7	-	3.1	5.4	9.1	25.2	4.4	17.8	8.4	26.7	
Group Total	56.8	18.4	61.7	55.6	13.8	48.1	22.0	38.6	34.0	19.9	48.8	22.7	31.6	
ROLE														
1. Mand	8.7	23.2	1.0	18.2	1.0	24.0	16.6	30.1	-	36.4	3.3	31.2	0.6	
2. Dominant Control Autoclitic	0.2	4.5	3.2	7.2	2.4	5.8	1.1	9.4	1.9	4.8	0.8	9.5	1.0	
3. Submissive Control Autoclitic	12.9	18.6	16.7	3.8	41.3	7.1	48.7	8.4	25.4	23.8	24.2	23.3	25.7	
Group Total	21.8	46.3	20.9	29.2	44.7	36.9	65.9	47.9	27.3	65.0	28.3	64.0	27.3	
AFFECT														
1. Positive Aff4ctive Autoclitic	6.6	17.2	0.5	11.3	11.0	9.0	9.8	9.2	30.7	14.6	16.5	11.2	27.6	
2. Negative Affective Autoclitic	14.8	15.1	16.9	1.8	30.5	0.3	16.6	0.6	8.0	-	6.4	1.0	13.3	
Group Total	21.4	32.3	17.4	13.1	41.5	9.3	26.4	9.8	38.7	14.6	22.9	12.2	40.9	
LINGUISTIC														
1. Intraverbal	-	0.5	-	1.7	-	-	-	0.2	-	-	-	0.6	-	
2. Informative Autoclitic	-	2.5	-	0.4	-	5.7	-	3.5	-	-	-	0.5	-	
Group Total	-	3.0	-	1.1	-	5.7	-	3.7	-	-	-	1.1	-	

Table E IV

Vocal and Non-vocal Operants For Mother (m) and Baby (b) Per Activity (Percent)

	Activities													
	Alone		Feeding		Bathing		Dressing (L)		Dressing (S)		Playing		Enface	
	m	b	m	b	m	b	m	b	m	b	m	b	m	b
vocal		28.6	35.1	9.5	47.7	20.5	63.3	10.6	72.4	31.7	65.5	25.8	65.4	34.7
non-vocal		71.4	64.9	90.5	52.3	79.5	26.7	89.4	27.6	68.3	34.5	74.2	34.6	65.3

VITA

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