

The Role of Mothers in the Social Development of their Infants' Facial Expressions

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Submitted in partial fulfilment of the
requirements for the Degree of Doctor of Philosophy

University of London

London School of Economics

July 1993

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To Laila and Samir

Abstract

The present thesis addresses the role of maternal interpretations of infant facial expressions in the development of emotions. Emotion theories explain emotionality in terms of implicitly intra-individual processes resulting in serious conceptual and empirical limitations. In contrast, social constructionist theories reflect the inherently socio-cognitive nature of emotions and propose inter-individual processes to explain emotional development. Using the hitherto neglected perspective of interactional others, a social theory is developed which rejects the Cartesian dualism inherent in current theories of emotional development by assigning a central place to the perspective of caregivers in the development of emotions.

An observational cross-sectional study examining the effect of age and context on mothers' perceptions of their infants was conducted. Twelve normal, primiparous, white, English, middle class mothers, aged between 25 and 35, were filmed interacting at home with their infants (aged 4-6 months (range 4;1-6;3), 7-9 months (range 7;0-9;1), and 10-12 months (range 10;1-11;3)). Mothers were asked to select and describe infant acts they found meaningful in a face to face play, a prohibitive, and a toy play condition. Facial expressions were coded using a standardised coding frame. Maternal interpretations of infant behaviour were collected and analysed. Two further experiments assessed differences between mothers' and observers' selections and interpretations of infant behaviour.

Mothers' *selections* of infant facial expressions differed between age groups and situations. As infants got older, mothers selected fewer positive expressions in face to face play, more negative expressions in the prohibitive episode and more positive expressions in toy play. Differences in maternal *interpretations*, reflecting situational and age related specificity, were also found. While mothers perceived emotions and intentionality in infants of all ages, mothers of the oldest infants accompanied these attributions with descriptions of cognitive and communicative skills. A relationship between selected facial expressions and attributions of emotion states was found to be dependent on situational context. Mothers also differed from observers in both the number of meaningful acts they selected and the types of interpretations they made,

demonstrating the divergence in perspective between caretakers as knowledgeable participants in interaction and external observers.

This thesis demonstrates the dynamics of caregivers' perceptions in expressive interaction and discusses the implications of these perceptions for understanding the process of emotional development.

Acknowledgements

I would like to thank my supervisor, Dr. Julie Dockrell, for her immeasurable guidance, support and critique of my work. I would also like to acknowledge Professor Rob Farr for his concern and help during the Kuwait crisis. Paul Harris, Lynn Murray, Colwyn Trevarthen, and Alan Fogel provided insightful and stimulating discussions on empirical and theoretical aspects of the study. For their assistance and patience in statistical and computational matters, I thank Susannah Brown, and Paul Jackson. I would also like to acknowledge my friends at the Social Psychology Department, especially Vanessa Cragoe, Dan Wright, Hamid Rehman and Steve Bennett.

This thesis would not have been possible without the assistance and encouragement of my parents, to whom I owe a debt of gratitude. Philip was infinitely patient, even during times when all I could think or talk about was babies. My friends, Doke and Robin, were there when I needed a refuge.

Finally, without the help of the Tregaskis Bequest, the Leche Trust, the Vice-Chancellors Discretionary Fund, the L.S.E Student Hardship Fund, and the L.S.E. Student Union Hardship Fund my thesis would have been greatly delayed. I would like to thank them all for their assistance.

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CHAPTER 1

FACIAL EXPRESSIONS, EMOTIONS, AND DEVELOPMENT

"When I look at her face...she was trying to say something..."

(Attributed to mother of baby girl, 4-6 month age group)

1.0 Aims and Objectives

Facial expressions in infancy are central to the development of emotionality. A growing body of research has pointed to the importance of facial expressions in infancy as central regulators of interpersonal relationships (Campos, Barret et al., 1983; Sroufe, 1979; Lewis and Rosenblum, 1983; Kaye, 1982). From the start, mothers respond to infants' facial expressions by interpreting and responding to them as affective states. In this thesis it is argued that, in early infancy, facial expressions are the result of physiological reactions, but with increasing age, they become socio-cognitively mediated and linked to emotional feeling states (Sroufe, 1979; Bruner, 1986; Vygotsky, 1962; Ratner, 1989; Sameroff, 1991; Kaye, 1982). Emotions arise out of an understanding of the social significance of events, a process for which caregivers are largely responsible in infancy. While theories of social development have stressed the importance of instruction (Vygotsky, 1962) and scaffolding (Bruner, 1986) by caregivers as an integral part of social development, little research has been done on understanding the role of mothers in the social development of emotionality. It is proposed that investigating how mothers begin to transmit social rules of what to feel during infancy starts with their perception of the infant's affective state. An essential first step in understanding the nature of emotion and its development is thus to investigate how mothers interpret infant facial expressions. With this aim in mind, mothers' interpretation and selection of infant facial expressions will be examined.

In the following, the predominant paradigms (behaviourism and cognitive psychology) that have characterised research on emotion are examined to assess the ways in which they have conceptualised emotions and facial expressions. Current theories, such as the new organisational approaches, have attempted to overcome some of the shortcomings of these paradigms by presenting a more holistic and functional picture of emotional development. Through a review of these theories and a critique of them it will become apparent that the nature and development of

emotions can be better understood in the light of social theories of emotional development. These theories overcome Cartesian limitations regarding the link between the outward manifestations of expressive actions and the presence or absence of emotion states by allowing for the perspective of interactional others in the socio-cognitive development of emotions. By incorporating this perspective, it is possible to account for emotional development in terms of the social-regulatory function facial expressions fulfil in interactions, how they may gain social significance for the child through the prescriptive nature of the mother's interpretations and responses.

The proposal advanced here is that, from a very early age, emotion rules are transmitted to children through interactions with adult members of a specific culture. In infancy this transmission takes the form of the mothers' role of instruction. Mothers respond to infants' facial expressions on the basis of how emotional reactions are understood and used within specific social contexts. Their responses to infants increasingly come to approximate the feeling rules and displays of the cultural group. Thus, from the start, infants are immersed in a process of socialisation in which they are at first only apprentices and later master and internalise the rules of social conduct. Within this theoretical framework, how mothers interpret their infant's emotional signals within specific contexts becomes an important factor in development.

Support for this theoretical framework rests on examining a number of issues related to the infant's emotional development. In this chapter the relationship between facial expressions and emotion states is discussed. Evidence is presented which suggests that the way mothers respond to facial expressions in interaction is a vital step in the development of emotionality and can be better understood by examining maternal attributions of emotion states. This perspective is presented as an alternative to theoretical and methodological approaches, which account for the development of emotionality and facial expressions in terms of purely cognitive processes or in terms of physiological and behavioural manifestations. It is argued that emotions cannot be accredited to the infant on the basis of adult similarities in facial expressions. Rather, caretakers (referred to as mothers in ~~the~~ this thesis although they can be fathers, older siblings, or child minders, that is, any adult who interacts with the infant on a regular basis) perceive and interpret expressions in terms of their social-regulatory significance and respond on the basis of these

perceptions. This process is proposed as a critical factor in the development of socio-cognitive skills which are essential for emotions to develop.

Chapter 2 examines empirical evidence on the presence of facial expressions in infancy and how expressions differentiate with development. For maternal interpretations and responses to be effective, the perceptual, inferential and social skills the infant possesses at various ages, and how these skills work at the level of the dyad, are examined. In Chapter 3, the theoretical importance of the mothers' role in development is reassessed and expanded in the light of the above issues. Chapter 4 addresses methodological concerns related to the analysis of facial expressions and proposes how maternal interpretations may be investigated. In Chapter 5, the techniques arrived at in Chapter 4 are piloted to determine if the sampling and analysis of facial expressions and maternal accounts tap into the processes under investigation. In Chapter 6 the hypotheses of the study are reassessed and the empirical objectives are synthesised with theoretical proposals. Chapter 7 reports the procedure for the main observational study and presents the results of the analysis. The results of the study are discussed in the light of the theoretical proposals advanced in Chapters 1, 2 and 3, and their implications for understanding the development of emotionality considered in Chapter 8.

1.1 Levels of Meaning for Infant Emotionality

"This hitting herself off the back of the chair... 'I don't want to be here... Oh, well, actually this is quite interesting, so I'll reach forward and play with it after all.'"

Question: How else did you know she didn't want to be where she was?

"Her facial expression, but its difficult to break it down into bits."
(Attributed to mother of baby girl, 7-9 month age group)

Emde (1984) has divided the body of research on infant emotionality into two main domains: the individual and the social. This division of approaches into the study of the individual and of the social has dogged psychology for over 100 years and remains one of differences in philosophical perspective on the relationship between mind and body. The distinction between the individual and the social is still very real in psychological research and never more apparent than in the field of developmental psychology, as will become evident in the following discussion.

The implication of working within the individual domain is that emotion is treated as a purely intra-individual process. This view is best summarised by Clore and Ortony's (1984) statement that:

"...the subjective feeling state has a special status that cannot properly be considered as a *component* of emotion at all-it *is* the emotion." (Clore and Ortony, 1984, p.53, their emphasis)

This definition is consistent with classical theories of emotion (e.g. James, 1890; Descartes, 1911-12) which linked linguistic allusions to feelings of internal bodily sensations, such as 'butterflies in the stomach' or 'lump in the throat'. With the advent of behaviourism, this approach led to a concern with the physical manifestations and stimulus conditions of emotions (Watson, 1930; Skinner, 1953).

On the other hand, if one adopts a social perspective on the study of emotion in infancy, the research emphasis is placed on the inferences surrounding interpretations of emotional expressions. Take, for example, Ichheiser's (1949) distinction between expression and impression:

"Mechanisms of expression are mechanisms operating entirely within the individual personality. Impressive mechanisms and impressive phenomena, on the other hand, are fundamentally socio-psychological in their very nature...(they are) problems of social perception and of human relations." (Ichheiser, 1949, p.7)

In drawing a distinction between expressions and impressions, Ichheiser points out that the manifestation of emotion is an inherently social phenomenon. Expressions are received by others, be they researchers or caretakers, as impressions, and hence the inferential process guiding the formation of these impressions should be an important area of investigation if one is to understand the function of expressions in interaction.

If one's starting point is the individual, such that emotion is viewed as an intra-individual process, questions of concern surround (a) the physiological mechanisms which control processes of emotion, (b) genetic origins of emotions, such as how those physiological mechanisms, as controlling dynamics of emotion, develop both in the history of the human species and in the make-up of the individual; and (c) how the processes of emotion influence the formation of personality. If, on the other hand, one's starting point is social, such that emotion is viewed as an inter-individual process, then the emphasis is on (a) the signalling function of facial

expressions, (b) the role facial expressions play in regulating interaction and what effect they have on the infant-caregiver communicative system; and (c) how processes of others' perceptions result in enduring interactional traits.

For the most part, past theory and research surrounding infant emotional development have focused on its intra-personal aspects. Relatively less has been written about the social and interpersonal nature of emotionality in infancy. Almost nothing has been written about maternal interpretations of infant facial expressions as an important characteristic of the interpersonal aspect of emotional expressions and their socialisation in infancy. It is to this gap that the present thesis has addressed itself. This issue is especially important (although mostly neglected) because of the preverbal nature of the child. Without language, emotional expressions provides the medium of messages in the mother-infant dyad.

A number of perspectives can be adopted in interpreting these emotional expressions. Kaye (1982) outlines three senses in which an expression can be interpreted:

" Consider the sentence 'Expression X shows that person A feels Q', which is equivalent to 'X expresses Q'. These sentences might have three different meanings:

(Sense 1) 'X is a manifestation of A's inner feeling' that is, it is an *accurate* index;

(Sense 2) 'X leads someone to infer that A feels Q' that is, it is *interpreted* as an index;

(Sense 3) 'A wants someone to believe that he feels Q' that is, X is a *gesture*."

(Kaye, 1982, p.141)

Individualistic theories do not make distinctions between the three senses, but generally consider that the presence of an expression is evidence of an emotion state (sense 1 above). However, they overlook the fact that they infer emotion on the basis of facial expressions and thus employ the criteria of sense 2. Parental inferences are regarded as "biased" in such a framework. For example, Campos et al. (1983), in reviewing a study by Johnson et al. (1982) in which mothers' reports of their infants' facial expressions was used to measure the existence of discrete emotional expressions in 3 month old infants, state:

"This study, like all others depending on maternal reports, is *subject to numerous biases*, but several factors lead us to propose that the mothers' reports are valid-that is, the data may be more *an indication of responses by the baby than attributions by the mother*." (Campos et. al, 1983, p.818, emphasis added)

How they are able to differentiate between the mothers' attributions and the infants' facial responses without any independent evidence of the meaning of the infants' responses remains unclear. The meaning of facial expressions in infancy must be inferred. The 'biases' pointed out by the authors therefore pertain to differences in the criteria for inference between trained external observers and mothers. As inferred emotion states in infants cannot be corroborated by asking infants how they feel, the primary concern should be who is inferring emotional states and not who is more or less biased. So called "objective", standardised coding frameworks have their own 'biases' (see Chapter 4) just as mothers' inferences do. As mothers interact with their infants more often than researchers do, it seems reasonable to investigate the criteria mothers' use to interpret their infants' facial expressions.

This is especially important as researchers often look for the early presence of emotions in infancy on the basis of facial expressions. More recently, there has been a growing appreciation that emotions should not be attributed to the infant on the basis of the resemblance of her facial expressions to adult expressions of emotion. As Kaye (1982) illustrates:

"A face does not have to be a human face in order to appear expressive to us. Watch people imitating and interpreting the faces of fish in an aquarium. They simply respond to the configuration of eyes, mouth, and snout, even though it is a permanent configuration having nothing to do with the fish's mood or personality. They project onto such an expression the meaning it might have if a human being wore it. An analysis of these different expressions, then, would be an interesting study of intersubjectivity in human beings, but it would not be a study of fish." (Kaye, 1982, p.142)

The meaning imputed to infants' expressions could therefore be regarded more as a function of adults' ability to project meaning than as evidence that the infant either feels, or intends the other to think she feels, a particular emotion. The infant at some point becomes an adult, at which point we can suspend our scepticism about the meaning of her expressions. When to do so, and on what basis, would depend on a set of behavioural criteria which would indicate that the infant may be said to be intentionally communicating, e.g., gaze, timing of interactions. In the meantime, to attribute emotion states to infants on the basis of adult similarities 'goes beyond the evidence given', as we cannot ask the infant what she is feeling. While experimental paradigms are advantageous in isolating specific influences on expressive development, naturalistic settings provide valuable insight into how emotion displays are

integrated into interaction. A good starting point, towards that end, is to define infant emotion displays in terms of their signalling functions. That is, in terms of projections of meaning by parents, since their interpretations are likely to influence the infants' development.

The present research thus proposes to employ the sense 2 criterion of Kaye, but from the perspective of the primary caretaker. This approach overcomes the conceptual problem of linking particular emotion states to particular facial expressions in infancy on the basis of their physical characteristics or stimulus conditions. Empirical studies which will be reviewed presently have shown that the use of facial expressions to infer emotions is subject to social and contextual influences. Moreover, in cases where facial expressions are coded by trained observers, no clear evidence was found that infants display discrete facial signals that can be linked to particular emotion states. The following discussion also demonstrates that maternal responsivity to infant expressions is selective and based on inferences which cannot be deduced from looking at facial expressions per se.

1.1.1 Maternal Responsivity to Infants

"That's just he's had enough of it. Turning around to me and he looks...his face is starting to crumple and he's about to cry...Now he wants to be with me, for me to pick him up. I could tell by his body movements and him turning towards me and his expression. It's hard to describe with expressions, but its just that's the kind of look he has when he just wants...like if he was in a group of people he didn't know, he'd want to be picked up. He didn't want to be by himself."

(Attributed to mother of baby boy, 10-12 month old age group)

How mothers respond to the facial expressions of their infants has been investigated under the rubric of the socialisation of affect displays or the acquisition of 'display rules' (Ekman, 1980). This body of research has important underlying theoretical assumptions that bear on the interpretation of the findings. It therefore warrants a brief digression in order to address them.

The theoretical assumption underlying research on display rules is that what is socialised is the display of emotion rather than the nature of emotion itself. Socialisation is seen as allowing the individual control over performing expressive behaviours in accordance with cultural and personal rules. The underlying emotion state remains unchanged, and all that is affected is the display itself. However, an

alternative argument is that socialisation affects the emotion itself and not only its manifest qualities. As Barrett and Campos (1987) point out:

"...these [display] rules comprise only one effect of socialisation upon emotionality. Socialisation does not merely change the way emotions *look and sound*; it changes the very nature of emotionality in later development." (Barrett and Campos, 1987, p. 569)

As will be elaborated upon later, the transmission of rules on how to feel is the process of emotional development. This does not take place only through maternal contingent responding to infant expressions. However, to the extent that facial expressions communicate affective states to caregivers and are embedded in interpersonal context, they serve important social-regulatory functions within the mother-infant system.

A number of mechanisms are hypothesised for the socialisation of display rules. For example, as mentioned, contingent responding, such as reinforcing appropriate displays, and ignoring or punishing inappropriate displays, and the modelling of affect displays have been considered by social learning theorists (e.g., Maccoby, 1980). In addition, Campos and Sternberg (1981) propose a mechanism based on social referencing whereby the young child, faced with its own emotional uncertainty in a situation, refers to the mother and, by responding to her affect display, resolves this uncertainty. Campos, Campos, and Barrett (1989) explain:

"...when social referencing or the imposition of emotional signals by the caregivers becomes repetitive, dispositions towards action are created, and these dispositions, at least in part, underlie what we call the 'value system' of a culture." (Campos, Campos, and Barrett, 1989, p. 296)

This explanation is couched in behaviouristic terms. However, it outlines an interpersonal process where caretakers are able to communicate affective information to infants via facial expressions and where infants in turn incorporate this information through processes such as social referencing. It implies that facial expressions are used by caretakers to communicate affective states and attitudes towards other people and events. In addition, it suggests that it is the understanding of the social significance of the situation that determines the emotion both internally and externally in terms of its communicative and interpersonal regulatory functions. This theoretical distinction is important in that developmental differences should not be seen as simply dictated by stimulus response contingencies controlling expressive displays.

A number of studies have documented mothers' responses to infant facial expressions. Malatesta and Haviland (1982) and Malatesta et al. (1986) investigated maternal contingent responding to infant emotional displays between 3 and 6 months. Mothers and infants were observed during play and reunion following a brief separation. Both mothers and infants showed the same categories of facial expression; interest, enjoyment, surprise, knitted brow, brow flash, sadness/distress and anger. Mothers, unlike infants, did not display pain/discomfort expressions although infants did.

They found that, in general, infant facial expression *changes* showed a significant age effect, with older infants displaying significantly fewer expression changes by 6 months of age, although in the later study (Malatesta et al., 1986) they found that by 7½ months the rate of facial expressions increased again. Results also showed that maternal responses were limited to positive expressions, especially towards the younger infants. The predominant positive maternal expressions were enjoyment and interest followed by surprise and brow flash. Mothers rarely displayed anger and, when such expressions were seen, they were usually of 'mock anger' enacted playfully which they tended to show more frequently to older infants. Sadness was also infrequent and was shown more often to older infants. Mothers displayed increasing levels of negative facial expressions to infants, but did not show a decrease in positive facial expressions with infant age.

They also found that contingent¹ maternal responses to infant facial expressions consisted of only 25% of all maternal expressions. Thus, mothers were more active in directing face to face interaction than in accommodating to infants' expressions. There was a tendency for mothers to 'match' infants' facial expressions except for pain, which mothers ignored. They found that 35% of all contingent responses were matches, whereas the remaining 65% were dissimilar responses. As the predominant maternal expressions were of enjoyment, this suggests that mothers matched mostly positive expressions. Mothers' contingent responses for infant sad expressions was higher for older infants, whilst for infant enjoyment maternal contingent responding increased with age for boys and decreased for girls. Significant age related differences for discomfort and knitted brow were also found, i.e., they decreased as babies got older. The above results show that mothers were being

1. Contingent responses were coded when a maternal expression changed within a second following an infant expression change.

highly selective of what they chose to respond to. While there was a tendency for mothers to follow the infant by adapting their facial expressions to match their infants, 75% of maternal expressions were initiators, i.e., occurred before the onset of an infant expression. This demonstrates that, by and large, there is a strong tendency for mothers to lead the interaction.

Age differences also highlighted the changing nature of mothers' contingent responsivity, suggesting that mothers begin to establish empathetic sequences with their infants by matching sad expressions. As infants got older mothers acknowledged fewer expressions, becoming more selective, and discouraged negative expressions by ignoring them. Mothers of older infants displayed less nonverbal and verbal acknowledgment of older infants' expression changes and did not acknowledge certain infant negative expressions. Mothers of younger infants made more references to infant positive affect, e.g., encouragement of positive affect (give me a smile), perhaps indicating the importance to the mother of initiating positive affective contact with the younger age group infants. They found no difference in maternal verbalisation for infant sex.

The results are interesting in that they reveal important changes in maternal responsivity to infant emotional expressions. They demonstrate that mothers, by and large, lead the interaction by initiating facial expressions, rather than follow the infant by matching or responding to the infant's displays. In cases where they responded to infant expressions there were age and sex related differences, suggesting that mothers highlight certain expressions and become more selective in what they acknowledge as infants get older. However, the study did not find significant changes in specific facial expressions over age save for discomfort/knitted brow for infants and brow flash for mothers. The failure to identify more age related changes may have been due to the fact that the study did not distinguish between play, separation and reunion episodes. The three situations would have imposed constraints upon the elicitation of and responsivity to facial expressions for both mothers and infants, and would have affected the way mother and infants interacted with each other, possibly in different ways for the different age groups. Thus, these differences, which may have resulted in an age x situation interaction effect, were confounded and may have cancelled each other out.

Secondly, and related to the first point, the study only looked at maternal contingent responses to infant expressions, that is they only looked at infant facial

expressions *followed* by maternal expressions. They did not address the other contingent relationship, maternal expressions *preceding* infant facial expressions, which occurred for the majority of maternal expressions. As we will see later, mothers' facial expressions are important factors in the types of facial expressions produced by infants. Mothers' definitions of the situations in which they were being asked to interact may have influenced both the types of expressions they directed at the infant and the way they responded to the facial expressions of the infant. This points to the importance of taking into account the mother's perspective in defining what is responded to. What is a contingency to the observer is couched in intentional terms for mothers. As we will see in the following study, mothers' perceptions of infant expressions always imply some course of action on the mothers' part and thus, *ipso facto*, imply that maternal perception of intentionality is at the centre of what they perceive and how they respond to it.

Huebner and Izard (1988) investigated maternal responsivity to the facial expressions of infants aged 2-15 months using slides of 'pure' infant expressions of sadness, anger, distress and interest. All background contextual information was eliminated. Mothers (not those of the infants shown in the slides) were asked to view the slides and report what the expressions were and how they would respond to them, by choosing from a list of reaction statements. The methodological weaknesses of this method present serious shortcomings to the validity of the findings and will be discussed shortly. For the present, the results are briefly as follows. They found that mothers responded differently to the three types of infant negative expressions. When infant distress was identified, mothers endorsed picking up the infant immediately and cuddling it, more so than if the infant was sad or angry. Disciplining and controlling maternal responses were associated more with anger expressions than both distress and sadness. Mothers said they would respond by "keeping their distance" when the infant was sad.

Maternal affective-type reactions also appeared to be differentially elicited by different types of expressions. For example, they stated feeling sad and sympathetic when the infant was distressed. Smiling was associated with infant sadness, whilst feeling annoyed and angry was elicited by infant anger expressions. Lastly, they asked mothers to 'decode' infant facial expression slides by labelling the intensity of the expressions they were shown. Although results indicated that mothers attributed the highest intensity to labelled expressions corresponding to the "correct" emotion

slide, there were a large number of other attributions made of the same expression. Thus, for example, infant distress expressions signalled pain most intensely (7.8 on their scale). However, mothers also reported that the expression signalled anger (7.0), sadness (6.9), fear (6.3), disgust (5.0), interest (1.1), and happiness (1.1). Similar results were obtained for anger, sadness and interest.

The results were interpreted by the authors as supporting the notion that discrete facial expressions of negative affect exist in infancy; furthermore, that they have been further validated as differentiated social signals. Whether the data supports such conclusions is debatable. Mothers made a wide range of attributions concerning each expression. This was so despite the presence of a check-list, static slides of 'pure' emotion expressions and no contextual background or, perhaps because of it. Moreover, vocalisations were not included and hence important information from the vocal modality was ignored. Given these limitations, their results cannot be taken to indicate the universality of differential negative expressions in infancy.

Their findings on maternal responses, although based on hypothetical situations, are nevertheless interesting. They show that mothers respond to what they perceive the infant is feeling in ways that minimise distress and maximise comfort, security and stability. Although such findings are hardly surprising, they indicate that maternal interventions are influenced by their perception of infant state. While the evidence from research on display rules shows what mothers respond to, the above study, by including the mother's perspective, reveals why she responds to it and to what end. It also demonstrates that mothers' perceptions of negative expressions are variable, and do not, by and large, correspond to the researchers' criteria of 'pure emotion expressions'.

The above research highlights the fact that the inferential process of caretakers is an essential component in how infant emotionality is managed and shaped. Implicit in the three senses of the meaning of expressions outlined by Kaye (1982) is a developmental process which is ignored if these levels are not made explicit in research. Emotional expression may well be a reflection of instinctive activity in the newborn. Primary caretakers, however, treat these expressions as true emotional states. Through this process of interpretation and responding, the infant learns what effect their expressions will have on others and begins to use them intentionally, that

is, as gestures. Such a developmental progression is reflected in Vygotsky's views on emotional development as expounded by Bruner (1987):

"What recedes in man is not emotion, but its original links to instinctive actions. In man, with his attenuated instinctual system, *emotion takes on new functions*. Emotion moves from the periphery to the centre, as it were, moves to the cerebral cortex where it has an equivalent status to other cerebral, central processes. It now can interact with those other processes. As with other processes, then, the development of the emotions cannot be understood separately from their connections with other mental processes." (Bruner, 1987, p.12, emphasis added)

Thus, facial expressions, which are at first manifestations of instinctive reactions, become dissociated from these reactions and become mediated by socio-cognitive processes which determine the emotion feeling state and the inter-personal significance of the emotional display. This occurs through a process of social development whereby caretakers incorporate affective signals into interactional dialogues, demonstrating the significance of these signals to the infant in dynamic action sequences.

Most of the theories and empirical findings that will be reviewed below fall into a number of traps: attributing an isomorphous relationship between emotional expressions and emotion; not taking into account the behavioural context of the expression; and working at sense 2, i.e., inference, without taking into account inference as an inter-personal process. Furthermore, by treating emotion as an intra-individual process, they fail to appreciate the functional significance of emotional displays as important organisers of interaction *for the infant's caretaker*. Although the standardised measurements that have been used as indices of emotional states serve as comparative means for exploring various aspects of emotional expressions, researchers would benefit from placing a stronger emphasis on facial expressions in infancy, not in terms of their meaning to the researcher, but in terms of their meaning to caretakers whose interactions with the infant will inevitably influence the infant the most.

In the next section, the main theories which have guided research on infant emotions will be critically evaluated in the light of the above distinctions. It will become evident that the individual orientation of work on emotion, characterised by either S-R or cognitive theories, is inadequate for a proper understanding of infant social development for both the conceptual and methodological reasons highlighted above. Instead, it is argued that some of the new organisational theories provide

more balanced approaches to expressive development, although some of their basic premises will be questioned.

A reading of the literature on emotional development in infancy suggests that emotions (as socially and cognitively mediated reactions to the world) should not be accredited to the young infant, but rather that facial expressions, which resemble adult expressions, are treated by caregivers as if they are meaningful, and responded to in culturally and socially appropriate ways. In this way, emotions, via the signalling function of facial expressions, develop through personal interactions with others. Thus, the present thesis endeavours to examine an important aspect of this process by looking at the way mothers' interpret their infants' facial expressions as an important facet of the preliminary development of emotions in infancy. This framework adheres to the theoretical views of the social interactionists, such as Vygotsky (1962), Bruner (1986), and Kaye (1982). It is argued here that such a theoretical framework is useful in overcoming difficulties inherent in behavioural, biological and cognitive theories.

1.2.0 Individualistic Theories

Historically, the study of emotions and their expression has been closely linked with two dominant paradigms: behaviourism and cognitive psychology. Both these paradigms treat emotions as secondary processes, at best byproducts of other processes. In doing so, they fail to explicate (a) the different levels of organisation required to do justice to the complexity of human functioning (behaviourism), and (b) the central role of expressive processes in development in general and socialisation in particular (cognitive theories).

1.2.1 Behaviourist Theory

"He had had a little cry and looked at the object, and then he looked at me, as though expecting me to do something about it."

(Attributed to mother of baby boy, 4-6 month age group)

Watson (1930) and the behaviourists initially gave emotional reactions a central role in explaining behaviour. Briefly, Watson proposed three innate emotions which

he had observed in neonates: fear, elicited by loud sounds; rage, elicited by restriction of bodily movements; and love, evoked by tactile stimulation. He demonstrated that emotional responses to new stimuli can be learned through classical conditioning. By associating the appearance of a furry rat with a loud, fear-eliciting sound, Watson produced fear reactions (intense crying) to the rat as well as to other white furry objects in a 9 month old baby (Watson and Raynor, 1920). He extended his findings to include all classes of emotional reactions and proposed that the researcher could identify the type of elicitor by viewing the type of expressive response. His theory was discredited by Sherman (1927a; 1927b) and Dennis (1940) whose research led to dissatisfaction with the behavioural and expressive criteria for emotion. Sherman (1927a; 1927b) argued that emotions could only be identified if one knew the stimulus circumstances that produced the emotion. This implied that emotions were a mere rubric for categorising stimulus inputs. Using emotions as unifying constructs seemed unnecessary and erroneous (Bentley, 1928; Skinner, 1953).

The second behaviourist paradigm, in the 1950s and 60s, introduced the notion of operant conditioning. Researchers showed that infant smiling, vocalising, and crying could be manipulated through the careful application of reinforcers and punishments (Brackbill et al., 1958; Etzel and Gerwitz, 1967; Rheingold, Gerwitz, and Ross, 1959). While, at one level, emotional reactions may be acquired according to conditioning principles, the behaviourist paradigm is a reductionist and limited one. It cannot explain why some emotional responses emerge spontaneously, without any prior association with unpleasant experiences. For example, babies reared in normal families often show fear of strangers around 8 months of age. The fear reaction occurs despite the fact that infants previously reacted positively to strangers, and strangers continue to smile and initiate playful interaction with the baby.

Operant conditioning cannot explain the basis on which emotional reactions are managed in interaction. For example, Sternberg et al.'s (1983) experiment, which demonstrated the elicitation of anger in 1, 4, and 7 month old infants by repeated trials of arm restraint, may be interpreted as evidence of behaviourist assumptions (the operant conditioning paradigm that repeated trials resulted in the learning of the anger reaction). However, they also demonstrated that the anger movements were almost always directed at the mother. At 4 months, infants directed the signals at the hands of the person producing the restraint, and, less frequently, at the person causing the anger; at 7 months, infants *looked at the mother while expressing the anger*

face (Campos, Campos and Barrett, 1989). Such eye-contact has been used as a behavioural criterion for "illocutionary acts" (Austin, 1962) which refer to behaviours that *intend* to affect the observer. Without a notion of mental or psychological processing, it is not possible for the behaviourist paradigm to present a coherent picture of emotional functioning and development, either from the point of view of the infant's own actions as intentional or those of its mother inferring an intention from the infant's behaviour, as is illustrated by Bruner (1981);

"Not only will I claim that action in fact has intentional quality, but that it is perceived by others with whom we are interacting to have such a quality. Not *all* behaviour is seen as steered by intentions. Some actions are seen as *caused* by events, regardless of what the actor "intended". The response of others to action is strongly affected by whether it is seen as caused or intended. If it is seen or interpreted as the latter, it will be more often subject to correction of a kind not usually given to action perceived as caused." (Bruner, 1981, p. 42)

The failure of behaviourism to go past stimulus-response contingencies means that it cannot explain such transitions in signalling functions in the child, or how they affect the complex system of mother-infant communication. No doubt, at some level, behavioural contingencies are instrumental in development. However, without development in the cognitive system, there can be no developmental progression to more complex levels of communication. Furthermore, by looking at behaviour from a perspective external to the participants, intentionality is removed from emotional reactions. As Bruner points out above, the perception of intentionality has very important consequences for the way behaviour is responded to.

1.2.2 Cognitive Theories

"She gave another squeal. She really likes shutting the door [of the toy]. It was different the other times, its a matter of degrees. The first time she did it, it was the best, 'Aah!', and then just the time before this one it was 'Ah, I thought of it myself' rather than 'Mummy told me to do it.' This time it was 'Oh, I'll do it again.'"

(Attributed to mother of baby girl, 10-12 month age group)

Cognitive theories of emotional development view the relationship of emotions to cognition in terms of emotion being produced as a consequence of a cognition, such as appraisal theory (e.g., Schachter and Singer, 1962) and discrepancy theories (e.g., Hebb, 1946; Kagan, 1978).

1.2.2.1 Common Characteristics of Cognitive Theories and Problems

Cognitive theories are concerned with inferring mental processes in infancy by using emotional reactions as sensitive dependent variables. Appraisal theories posit that emotion results from the evaluation of a stimulus. The basis of most appraisals is memory, such that a new object will evoke a memory of the feelings associated with past experience with similar objects. Appraisal theories, such as Schachter and Singer's (1962) theory of physiological arousal, cognition and emotion, led to a concern with cognition rather than emotion as the central focus of research. By proposing that physiological arousal was the same for all emotions, but that the cognitive labelling was not, Schachter and Singer's work led to the idea that, in order to understand emotion, one had to first understand cognition. Thus, their work fostered, rather than challenged, the belief that emotions were processes of secondary significance; emotions were then essentially epiphenomena (Campos et al., 1983).² While their theory was intended to address emotion in adults, developmental psychology was influenced by the resulting shift in focus to cognition.

The main cognitive paradigm for emotional development stemmed from discrepancy theories of emotion. Discrepancy theories, which were first advanced by Hebb (1946), regard emotional reactions as the products of certain discrepancies or incongruities between external events and internal representations or schemata (Lewis, Sullivan and Michalson, 1984). Hebb's (1946) discrepancy theory essentially posited that a high degree of discrepancy between past experience and present experience provoked fear. In an attempt to avoid classical conditioning or innateness theories, he proposed that, when stimulation is processed in the central nervous system, it produces neurophysiological circuits called phase sequences. Once well established, these phase sequences are activated whenever the subject encounters a similar stimulus in the future. If the new stimulus is not sufficiently familiar to

2. Harrè (1986) defends Schachter's work by stating that it is a mistake to see the work of Schachter as proof of a cognitive theory of emotions. His work on the presumed causes in identification of emotion is a special case of the point that emotion words or states are intentional. Similarly, Lazarus (1991) points out that cognition and emotion are interdependent and interrelated, as one needs meaning to appraise the situation for its significance in order to know how to react to it emotionally. He states that meaning, and hence cognitive activity, is *always* involved in emotion. His argument is therefore that appraisal is the personal significance of an event. It is unclear how this differs from Barrett and Campos's theory below. The only difference is that they propose some sources of significance that are biological. Although they are explicitly rejecting a cognitive theory of emotion, their arguments in the end fall into an appraisal theory framework.

maintain the smooth activation of the phase sequence, the disruption of neural timing and patterning of the brain is reflected in the periphery by fear (Campos et al., 1983). This theory was extended (e.g., Kagan, 1971,1974; Kagan, Kearsley and Zelazo, 1978; McCall and McGhee, 1977) to include other emotional reactions. The underlying paradigm was that emotions were produced in the process of differentiating stimuli in the environment (Haber, 1958).

Examples from developmental psychology were work done with the Visual Cliff (Walk and Gibson, 1961) and with looming stimuli (for example, Ball and Tronick, 1971). Both paradigms led mostly to an assessment of infants' reactions in what they revealed about depth perception or sensitivity to optical expansion patterns. It is only recently that researchers have begun to relate these paradigms to the development of emotions (Campos, Hiatt, Ramsey et al., 1978; Cicchetti and Sroufe, 1978; Scarr and Salapatek, 1970). Similarly, stranger and separation distress were of interest primarily because of their apparent dependence on cognitive development (Decarie, 1974; Schaffer, 1974). It was believed that separation and stranger distress measured discrepancies from existing mental representations (Bronson, 1968), and the establishment of a permanent image of the mother (Brossard, 1974). Only rarely did those researchers speculate on the possible consequences or functions of these processes in the social or intellectual life of the infant (e.g., Clarke-Stewart, 1978; Dixon, Yogman, Tronick, Adamson, Als, and Brazelton, 1981). By and large, emotions and their expression were studied from the point of view of cognition, in their capacity as indicators of memory, perception and sensorimotor intelligence (Campos et al.,1983; Campos, Campos and Barret, 1989; Kaye, 1982).

Discrepancy theory does not explain why the mother, a familiar stimulus to the infant, does not result in boredom or habituation. Some researchers, e.g., Lewis and Michalson (1983), clarify the role that discrepancy plays in emotional reactions by suggesting that its chief consequence is not to produce a particular affective response, but, instead, to arouse and alert the organism. Specific emotional reactions occur only after a discrepancy is noticed, and they depend on situational context as well as the momentary goal of the individual. For example, a mother putting on a mask is a discrepant event that will capture the attention of a baby but, whether the infant responds by laughing or crying, depends on the situation and the baby's needs at the time. Furthermore, discrepancy theory cannot explain other phenomena, such as why infants show evidence of well-established memories of their mothers long

before they experience fear of unfamiliar persons (Schaffer, 1966). It leaves unexplained why the same or similar stimuli can elicit diverse emotional reactions (Cohn and Tronick, 1982; Sroufe et al., 1974; Sroufe and Waters, 1976). Campos et al. (1983) point out that:

" The postulation of these cognitive capacities has rested on an apparent coincidence in time of onset of the cognitive capacity and the emotional reaction to a specific circumstance. However, in studies in which age is held constant and the presence and absence of the cognitive capacity in question is permitted to vary, the presence of the emotional reaction (typically fear, but sometimes anger) is found **not** to relate to the predicted sensorimotor underpinning (Campos et al., 1978; Scarr and Salapatek, 1970; Sternberg et al., 1983)." (Campos et al., 1983, p.812)

This overemphasis on cognitive developments, to the exclusion of studying emotion in its own right or within social interaction, was a result of the predominant influence of the cognitive paradigm within developmental psychology, specifically Piagetian psychology. For example, Barrett and Campos (1987) state:

" The most influential paradigm in developmental psychology has been Piagetian theory. All of us, entrenched in that perspective, think of development in a particular way... Thus it is only natural that most initial attempts to describe emotional development have tied emotional developments to broad cognitive abilities (e.g., Lewis and Brooks-Gunn, 1979; Sroufe, 1979). Some of our own research provides a vivid example of this, we believe, mistaken, approach." (Barrett and Campos, 1987, p.558)

To give a concrete example, the development of fear, which occurs during the third quarter of the first year of life, appeared around the time that Piaget's stage 4 was predicted to begin. Barrett and Campos (1987) explain,

"Naturally, captives of the paradigm that we were, we thought that the sensorimotor achievement might provide a mechanism for the emergence of fear, at least of fear of the visual cliff. But we were wrong." (Barrett and Campos, 1987, p.558)

They conducted a study in which the role of sensorimotor development in the development of fear on the visual cliff was assessed (Campos et al., 1978). No support was found for any connection between sensorimotor development and the development of fear. Babies were assigned a Piagetian stage based upon their performance on the Uzgiris-Hunt object permanence tasks. When locomotor and pre-locomotor babies at various stages of object permanence were tested on the deep and

shallow sides of the visual cliff, using the direct placement heart rate paradigm,³ results showed that locomotor experience significantly influenced heart rate acceleration on the deep side of the visual cliff, whilst object permanence stage exerted no such influence. The authors believe that locomotor experience was effective in explaining the development of fear because it provided the infants with the kinds of experiences that endowed heights with significance for the infants. This may also be the result of social communication where another person's emotional reactions to an event may teach the infant wariness of heights.

Thus, to date, traditional cognitive theories of emotion have failed to provide a comprehensive account of the development of emotions. As with behavioural mechanisms, cognition is an integral and necessary part of emotional development. However, the focus of research stemming from the cognitive paradigm fails to account for emotional and expressive development as a topic in its own right, using it only as a sensitive measuring device for unveiling cognitive processes. The cognitive focus of research also grew out of the tradition of regarding the "object" in the infant's field as inanimate and passive; "object" as "the other person" was not included. Such an omission leads to the neglect of important aspects in the development of emotionality. As we saw, fear reactions to the visual cliff, which had been attributed to the development of sensorimotor developments, is found to be influenced by locomotor experience and, perhaps more importantly, by mothers' emotional reactions towards the event. It may also be argued that locomotor experience is "framed" within mother-infant interaction, as mothers would assist the infants' exploration of the environment. This would indicate that even locomotor experience is gained within an interactional or parental framework, where the mother transmits to the infant the significance of her actions. The following sections consider models which include the social nature of the development of emotions.

1.3.0 Current Theories of Emotional Development

In recent years, a new *zeitgeist* has emerged which has sought to address the problems of traditional paradigms which focused on emotions and facial expressions

3. The heart rate of the infant is measured as it is lowered into the deep end of the visual cliff. Increase in heart rate is taken as an indication that the infant has developed a fear of the visual cliff.

either as simple manifestations of instinctive or conditioned reactions to environmental stimuli or as byproducts of cognitive processes. This *zeitgeist* has generally fallen under the rubric of what is called the New Organisational Approach to emotional development (Campos et al., 1983; Campos, Campos and Barrett, 1989). The dramatic shift that has led to a reevaluation of emotions, and a rekindling of interest in their investigation, has been partly brought about by advances in audio-visual technology. The recent spate of research on facial expressions especially has been very influential in the emergence of interest in emotions and their development. Recent theories have been concerned with the regulatory and organisational aspects of emotions and facial expressions in terms of both individual and social processes.

Although a number of different organisational theories exist, they are all influenced by general systems theory (von Bertalanffy, 1968) and, hence, they all share an emphasis on emotions as central forces in virtually all aspects of human behaviour.

The Organisational approaches share some common themes:

- The adaptive role of emotion in fostering exploration of the environment, retreat from threatening situations, and bonding.
- Emotions are seen as important in the development of self-awareness.
- Emotion and cognition are intimately interdependent.
- Examination of discrete emotions, and not just the intensity of globally positive and negative states, is necessary to understand the emotion-cognition relationship.
- Emphasise that emotional development includes increasing control over the expression of affect, as well as developmental changes in the conditions under which affect is expressed.

They differ on two main points:

- How early discrete emotional states are present in the young infant.

- What is the exact relationship between emotions and cognition.

1.3.1 Izard's Theory of Emotional Development

Izard (1984) is one of a group of theorists who uses systems approach principles while adhering to a biological view of emotions. His differential emotions theory is an elaboration and extension of two previous theories, Darwin's (1872/1975) and Tomkin's (1962,1963) theories of emotion. These theories stressed the adaptive value of facial expressions. Facial expressions evolved from biologically adaptive behaviours connected with such activities as grooming and fighting. Natural selection resulted in facial movements that initially functioned as associated habits and later came to serve as social cues about internal states and environmental events. One implication of this evolutionary development is that facial expressions are regarded as isomorphic with emotion states.

These "naturalistic theories" (Ratner, 1989) advocate that emotions are products of natural processes which are independent of social norms and intersubjective interpretation. The natural, biological basis of emotions is regarded as proven by the universal existence of many emotions, not only in adult humans, but also among animals and infants who are devoid of social awareness. This argument is advanced to defend the proposal that emotions do not require cognition as these organisms have rudimentary self-awareness. The phylogenetic and ontogenetic universality of emotions demonstrates their primacy over cognition (Izard and Buechler, 1980; Zajonc, 1980). Emotions result from hormones, neuromuscular feedback from facial expressions and genetic mechanisms. For example, Izard (1984) states that:

" Emotion has no cognitive component. I maintain that the emotion process is bounded by the feeling that derives *directly* from the activity of the neurochemical substrates."
(Izard, 1984, p.24)

He proposes that emotions are a function of naturally elicited facial expressions which are, in turn, determined by intrinsic processes in the somatic nervous system. Autonomic arousal and emotional experience are produced by sensory feedback from the face such that a smile creates the emotion of happiness (Izard and Beuchler, 1980).

Thus, Izard postulates that the newborn possesses several quite discrete emotions evidenced by specific facial expressions. The emotions emerge when they first become adaptive in the life of the infant and their developmental onset, although occurring in close parallel with changes in perceptual, cognitive and motoric capacities, do not result from these processes.⁴ He dismisses the idea that perceptual, cognitive and motoric factors may be directly involved in the development of particular emotional reactions or facial expressions. Izard posits that the development of facial expression capacities is a major criterion for the existence of emotional states and also for their experience. In Izard's view, emotions precede and determine cognition, and cognition serves emotions (Izard et al., 1980, Zajonc, 1980; Plutchik, 1980a). Moreover, Izard's naturalistic position stipulates that a few basic emotions underlie and comprise all "emotions". All emotions are therefore essentially reducible to the basic ones: fear, anger, joy, sadness, interest, surprise, disgust (Plutchik, 1980b).

Many researchers (e.g., Barrett and Campos, 1987; Ratner, 1989; Armon-Jones, 1989) have pointed out that one cannot postulate that facial expressions of infants mean the same thing as adult expressions, based on their similarity. Izard's theory falls prey to biological reductionism, both for postulating a basic biological relationship between facial expressions and emotions and, secondly, by proposing that all emotions are essentially innate, and present, in the newborn. These basic assumptions will be criticised in more detail presently.

1.3.2 Sroufe's Theory of Emotional Development

Sroufe disagrees with Izard on the existence of emotions at birth and proposes that the neonate manifests precursors of three emotions: wariness-fear, rage-anger and pleasure-joy (Watson's three innate emotions). What changes with development are the cognitive level of the infant, the systems available to express emotions, and coping capacities, thus ensuring that the infant will experience more complex emotions. True emotions, he argues, are not possible until the child has a differentiated sense of self, which he postulates to be around the third quarter year of life. He bases this on the

⁴For example, he suggests that personality becomes organised at progressively more organized levels with the domination of sensory-affective processes giving way in development to affective-cognitive processes (Izard, 1978).

social-cognitive development of the infant which is characterised as a process of differentiation of self from non-self, of human objects from non-human objects and of one human object from another. This process of differentiation, although it has not progressed very far by the end of infancy, has made a definite beginning (Bretherton et al., 1981). Sroufe postulates the emergence of the first true emotions by the third quarter of the first year based on the emergence of stranger anxiety. Such a phenomenon is taken to indicate that the infant is now able to differentiate between familiar and unfamiliar people, and thus has a rudimentary ability to differentiate self from other. It is also taken to mean that the infant now has a permanent representation of its mother.

"... by 9 months the infant is an emotional being. Now the subject-object relationship is primary. In a new way the *meaning* of the event for the infant is responsible for the affect. Thus, by about 9 months the infant laughs in *anticipation* of mother's return in peekaboo, rather than in response to the completed sequence. It is angry in the face of an obstacle blocking an *intended* act (a particular relationship and a psychological investment)...and it can experience threat in advance of noxious stimulation (fear). This is also the age at which surprise, as opposed to startle, appears...Awareness has become anticipation. While in the second quarter the infant has motor anticipation based on well-established sequences, by 9 months there is cognitive anticipation." (Sroufe, 1979, p.488)

An example of the developments Sroufe posits concerns the precursor of wariness-fear. In the neonatal period fear is observable when certain environmental stimuli produce 'obligatory attention.'⁵ However, once the child is capable of forming representations of prior experience and of detecting discrepancies, wariness becomes possible (at 4 months). As the infant grows older she is able, not only to react warily, but also to assimilate events to negative schemata (learned expectations that something undesirable will happen). At this stage true fear becomes possible because the child has differentiated her self from the outside world, as evidenced by the child's level of object permanence.

Evidence has shown that some of Sroufe's mechanisms for emotional development do not apply. For example, he states that fear at 8 months is based on learning that something is harmful and comes about because of generalisations from past experience. He bases this on evidence of a change in the infant's reactions to strangers before and after 6 months of age (Bronson, 1978). Recent reviews of the

5. Engaging visual stimulation sometimes leads to prolonged cessation of infant behaviour resulting in distress (Sroufe, 1979).

literature on fear of strangers at 8 months down play the importance of learned expectations (e.g., Horner, 1980). Moreover, there has been no evidence to show that the emergence of fear of heights and of looming stimuli results from negative encounters such as falls or other painful experiences (Bertenthal et al., 1983; Yonas, 1981). Campos et al. (1983,1984) maintain that one cannot determine whether or not a cognition will lead to an emotion without considering the goals of the organism.

1.3.3 Campos et al.'s Theory of Emotional Development

Barret and Campos (1987) define emotions:

"As *bidirectional processes of establishing, maintaining, and/or disrupting significant relationships between an organism and the (external or internal) environment*. They are *bidirectional* in that they involve the interdigitating impact of the environment and the organism upon each other. They are *processes* in that both organism and environment are constantly changing in relationship to one another: A change in one evokes a change in the other. They are *relational*: the emotional quality associated with an event is dependent upon how that event affects the organism, and the quality of the organism's emotional responses is determined, in part, by the implications of that response for the environmental event. And finally, the relationships are *significant*: the impact of environment and organism upon each other has implications for that organism's adaptive functioning in that environment." (Barrett and Campos, 1987, pp. 558-559)

They propose seven postulates to describe the most important features of emotional development:

1. There is a set of differentiated core emotion states that are present throughout the life span.
2. As cognitive development proceeds and as new goals appear in the life of the child, complex inter-coordinated emotions become evident.
3. The effectiveness of specific eliciting circumstances changes as the organism develops.
4. The relationship between emotional expression and emotional experience changes as the organism develops.
5. Coping responses to emotions change as the organism develops.
6. Emotions become socialised as the organism develops.
7. Receptivity to others' emotional expressions changes as the organism develops.

Barrett and Campos (1987) state:

"The presence of a particular emotion is determined not by documenting a particular type of response, but rather by documenting a particular *set of functional relationships* between an organism and the environment." (Barrett and Campos, 1987, p.556)

Significant relationships between the organism and its environment are based on the goals of the organism, which may be "conscious" or "unconscious", according to the authors. In connection with this, they postulate three major sources of goal significance: certain event-organism relationships are significant because they are biologically given, that is, they are "prewired" survival goals for the organism. For example, infants' reactions to gustatory substances (Lipsitt, 1979; Steiner, 1979) or negative emotional responses to abrupt sensory onsets, such as loud, sudden noise (Gunnar, 1980) are sources of biological significance. Social communication is another source of significance, i.e., "another organism's emotional reaction to an event". They believe that babies may also be prewired or biologically prepared to respond to this source of significance. For example, another organism's reactions may endow any ambiguous event with significance. Thus, although 'affective contagion' (Hoffman, 1977), 'affective attunement' (Stern, 1985), and 'emotional resonance' (Campos and Sternberg, 1981) may be prewired processes, they provide a means through which an endless variety of event-organism relationships can *acquire* significance. A third source of significance is the event implications for the organism's ongoing goals and striving. This is different from the first source of significance where these goals were prewired and all pervasive. Here, in contrast, the goals in this third source may be learned, and regard ends toward which the organism is striving concurrently. For example:

"This interweaving of event and goal provides an explanation as to why the same unexpected snowfall will elicit joy in someone who wants to go skiing, fear in someone who needs to travel to another city unprepared, anger in an individual who has to shovel a driveway rather than rest, pride in someone who predicted the snowfall with a new theory, and even guilt in the person who interprets it as retribution for a transgression." (Campos et al., 1983, p.812)

For Campos et al., this explains why the same stimulus may evoke different emotional reactions in the same organism depending on its goals and striving at the time. The above three types of goals are regarded by the authors as "significance inducing processes" (Barrett and Campos, 1987, p.560) and they imply a developmental process.

The strength of the organisational approach of Campos et al. is that it overcomes most of the shortcomings and individualistic biases of previous theories. It stresses the functional nature of emotions and emotional development and proposes a relationship between emotion, cognition and socialisation built on the concept of the

goals and striving of the organism/infant and how these are socialised. However, its weakness lies in its failure to be mindful of the distinction between physiological reaction and emotion, by proposing that there is a set of core emotion states that are present throughout the lifespan. In doing so, it fails to appreciate the social nature of emotions. For example, social emotions such as pride, shame and embarrassment, by the nature of their functions, imply that they can only exist if one has a notion of self versus other and a set of social rules indicating that one has transgressed in some way against others within socially defined situations. To the extent that events in the environment are imbued with meaning for the expresser, they will elicit an emotional reaction in that person. Although Campos et al. do not propose as extreme a form of biological determinism as Izard does, their notion of a psychophysiological programme that is intrinsic to the infant still adheres to a biological account of the development of emotions.

Both these explanations, proposing that emotions are innate, or are based on psychophysiological programmes, lead to serious conceptual difficulties. Postulating an innate sense of loss, for example, apart from any specific cause or expression, and arguing that this is filled in by culture (Malatesta and Haviland, 1982; Ekman, 1980) or that an affect, by virtue of its innateness, is independent of the external environment, is improbable. As Ratner (1989) points out, basic affective programmes are too general to be viable. How can we be innately sensitised to an indeterminate thing, and how can we be innately programmed to react sadly in the absence of any specification of what such a response would be? Only specific programmes can be biologically determined because genetic material specifies particular sensitivities and responses. For example, male dogs, stimulated by a specific female scent, copulate in very stereotyped response patterns. Without such specificity, the notion of a programmed basic affect loses any semblance of meaning (Ratner, *ibid*).

The other explanation is to propose a psychophysiological programme. As was stated above, Campos et al. (1983) propose an endogenous psychophysiological programme.⁶ Although they attempt to distinguish between social emotions and what they call primordial or concurrent-goal emotions, they stress that both types of emotion are present *throughout the lifespan* (Barrett and Campos, 1987), implying that

6. The psychophysiological programme dictates that one responds to loss with sadness, the blocking of a goal with anger, and so on.

they regard the social emotions to be present at birth in some form. Thus, Barrett and Campos (1987) state that there are:

" *Intrinsic* but not *invariant* links between specific emotion families and particular (1)... 'hot' cognitions regarding the significance of organism-environment relationships (2) goals that these appreciations usually regard, (3) action tendencies, (4) vocalic patterns, physiological patterns, (5) facial movement patterns, and (6) adaptive functions. That is, emotion families typically are associated with particular patterns of these characteristics; however, particular instances of an emotion (family members) may not be associated with one or more of the characteristics." (Barrett and Campos, 1987, p.557)

The notion of a psychophysiological programme may be too deterministic to accommodate social constituting of later emotions (Ratner,1989). It predetermines sadness as a response to loss when no such cause and effect relationship is necessary. To return to our earlier example, loss of parents should instigate sadness. However, Super and Harkness (1982) have demonstrated that there is wide cultural variation in separation anxiety. They note that any early natural tendency to feel sadness at parental separation or loss is differentially organised into the structure of daily life and ceases to be a general, unconditioned, reaction among older children and adults. Culture not only specifies when loss of parents instigates sadness but whether it will produce sadness at all. As Ratner (1989) points out, "Postulating a psychophysiological program that inevitably links sadness to loss is overly deterministic and overlooks culture's ability to constitute or deny this association" (p.225).

Furthermore, while Campos et al. (1983) reject Sroufe's argument concerning the importance of the role of socio-cognitive differentiation, they do not explain how their account of goal significance is different in principle from his. It would appear that the main distinction they draw between the role of representation and goal significance is that the latter involves biologically preprogrammed capacities. It is argued here that this view confuses physiological reaction with emotional response. Social constructionist theories of emotion provide an important insight into the consequences of not maintaining a distinction between the two processes.

The constructionist argument maintains that emotions are world-dependent. It implies some kind of link between the emotion and an external state of affairs. The naturalists would argue that the external referents of emotions have a natural and universal status and give rise to responses constituted by natural beliefs and desires; hence the literature on the universality of facial expressions. The rejection of this thesis rests on illustrating that the notion of universality of facial expressions outside

the notion of sociocultural contexts is invalid, a subject we shall be returning to shortly.

1.4.0 Social Theories of Emotion

Social theories are essentially derived from the social constructionist approach to emotions. They propose that, in adult humans emotions depend upon social concepts (Averill, 1980a,b; Hallowell, 1955; Harrè, 1986; Hochschild, 1979; Lazarus, Kanner, and Folkman, 1980; Lutz, 1988; Shweder and LeVine, 1984; Solomon, 1980; Super and Harkness, 1982; Vygotsky, 1987; Ratner, 1989). In infancy, however, behavioural reactions are immediate, biologically determined responses to stimuli.

In this framework, the judging and interpreting of internal and external stimuli constitute the quality of emotions. In effect, this means that a physiological reaction is only such until one can interpret it as an emotion. Averill explains:

"Emotions are viewed here as transitory social roles, or socially constructed syndromes. The social norms that help constitute these syndromes are represented psychologically as cognitive structures or schemata. These structures-like the grammar of language-provide the basis for *the appraisal of stimuli, the organisation of responses, and the monitoring of behaviour.*" (Averill, 1980b, pp.305-306, emphasis added)

Emotions depend upon social awareness concerning when, where and what to feel, as well as when, where and how to act. That is, they are a set of guidelines for feelings. Ratner (1989) states:

"These feeling rules delineate social codes. Emotions are so socially functional that violating feeling rules is tantamount to developing a new social ideology and a new social system. For instance, the feminist demand for women to feel and act more assertively is nothing less than a demand for women to take on new social roles." (Ratner, 1989, p.212)

How does the infant change from an organism whose emotional reactions are biologically driven, to an adult human whose emotions are mediated by socially constructed cognitive structures? The social constructionists argue that there are two general classes of human emotions. One class has natural analogues in animals and human infants. Joy, sadness and fear are examples. Even these emotions, however, lose their natural, spontaneous basis in human adults and become mediated by social

awareness as described above. These natural analogues to emotions indicate an original natural basis; however, "natural" emotions in human adults are *qualitatively* different from their counterpart in organisms devoid of social intersubjective awareness. Their correspondence to each other therefore is minimal.

The other class of emotions have no natural analogue at all. Shame, guilt, pride and even anger are all socially constituted emotions because they presuppose a notion of right and wrong. For instance, anger presupposes a notion of intentional responsibility for a misdeed. If I believe that the act was not the person's fault, I would not be angry at him. I might be distressed that the misdeed occurred, but I would not feel anger. Entire cultures, such as the Ennuit, lack anger, according to Solomon (1984), because they do not blame individuals for their actions. Solomon points out that their feelings of annoyance are not equivalent to anger. He suggests that they do not feel it at all. They can feel disturbed, threatened and aggressive, but not angry at someone for what they have done. Shame, guilt and pride are all socially constituted emotions, because they presuppose an ethical notion of right and wrong. Such a view may be criticised for placing too much emphasis on social influences on development.

Social constructionism does not deny the existence and importance of biology in the development of emotions, rather, it recognises the importance of social influences as essential in the development of emotions. Instinctive reactions which are specified by external stimulation, do exist, but they cannot be called true emotions. Only after socialisation has begun are these instinctive responses dissociated from stimuli, and become mediated by socially constructed schemata. Bateson (1985) provides a helpful insight into the distinction by likening the process of development to baking a cake. Although a cake may have distinct constituents in its raw uncooked state, the process of baking creates a qualitatively new object from which the initial parts cannot be reconstituted.

This is echoed in Vygotsky's conceptualisation of the relationship between higher and lower mental functions. He used the Hegelian term *superseded* to designate the transformation of natural functions into cultural ones. Kozulin (1986), a disciple of Vygotsky, makes the same point as Bateson when he says:

"If one decomposes a higher mental function into its constituent parts, one finds nothing but the natural, lower skills...All the building blocks of higher behaviour seem absolutely materialistic and can be apprehended by ordinary empirical methods. This latter assumption does not imply, however, that the higher functions can be reduced to lower

ones. Decomposition shows us only the material the higher functions are built with but says nothing about their construction." (Kozulin, 1986, p.266)

Thus, while the infant displays specificity in its response to stimulation, to label such reactions emotions suggests that the infant is able to comprehend the significance of events through complex socio-cognitive processes that give rise to true emotions. More importantly, it limits the investigation of how socialisation creates a higher, emergent function out of an instinctive one. If it is recognised that all emotion types are socioculturally constituted to some extent, it enables us to investigate how and to what extent both primary and nonprimary emotion types are socially constituted. In adopting this position, concern is directed to how much significance can be attached to natural emotions relative to socioculturally constituted emotions.

Those who adhere to a naturalist view would argue that emotions, primitive and socialised, share the same biological bases, and where applicable, the same natural cognitions. Sociocultural variables, in so far as they feature in naturalist theory, have a peripheral influence, e.g., in reducing the intensity of the natural responses and in determining the manner in which they are outwardly displayed. Thus 'display rules' (Ekman, 1980) are introduced to explain the cultural prohibition and control of natural emotion states.

Naturalists justify the use of the term 'emotion' to both primitive and socialised emotion by suggesting that both phenomena are sufficiently similar to fall under the same term. However, in so far as emotions involve specifically sociocultural attitudes, feature in specific sociocultural contexts and bear a prescriptive, functional relation to such contexts, the naturalist cannot extrapolate his or her account of natural emotions in order to explain them. The application of the term 'emotion' to both natural and social instances of a response leads us to ignore their discontinuities (Armon-Jones, 1986).

Contemporary theories, like those of Campos et al., are, however, consistent with the view advanced here to the extent that they share the notion that the attitudes which constitute emotions can in principle be acquired through learning and can only be differentiated on the basis of the goals of the organism. However, they are inconsistent with the current view in so far as they conceive of all emotions as existing throughout the life span. In a sense, what Campos et al. propose may be modified by reinterpreting the evidence of early emotionality in infancy as indicating the presence of an instinctive reaction rather than an emotion in the adult sense of the

word. It is rather a basic physiological response at first, which is dissociated from innate response patterns to become cognitively mediated. The notion of an innate affective programme, preceding, yet interacting with, culture, clings to biological reductionism. Human biology has a capacity for a great range of emotions, however none of these is predisposed or 'basic'.

Indeed, Ortony, Clore, and Collins (1988) have identified enormous conceptual confusion regarding the notion of basic emotions.⁷ For example, basic emotions have often been defined as universal. They have also been used to mean primary, in the sense of being building blocks for other emotions, and are either posited as adding together to form the derivative emotion, or they are compounded into a novel, qualitatively different emotion, thus creating serious ambiguities as to the latter connotation of the term 'basic'. They have also been used to refer to emotions that appear chronologically early in ontogenetic development.

No justification is provided for the use of this term nor is there agreement as to what it represents. Ratner states that:

"Just as universal is not necessarily basic, neither is the early appearance of an emotion. Initial emotions may be temporary, or insignificant for later life, thus not basic at all. Compounding the ambiguity of the term 'basic emotion' is the lack of agreement as to which emotions are in fact, basic." (Ratner, 1989, p.220)

According to the social constructionists, culture specifies the details of what to feel, when and how we will experience these emotions, thereby concretely realising a very abstract potential. This is not to say that there is no differentiation in emotional state save that which is given by the socially defined situation in which it occurs. Taken to an extreme, such a view would be akin to an inverted version of the James-Lange theory (we are afraid only because we flee) where, in this case, we feel afraid not because we flee but because we recognise that we are in a situation that is culturally defined as dangerous. However,

"...no cultural significance need be attached by persons to a charging bull in order for it to be construed by them as dangerous and warranting fear." (Armon-Jones, 1986, p.38)

7. Campos, Campos and Barrett (1989) substitute the term basic for the term 'emotion families' in their later work. This does not disguise the fact that the term is used essentially to refer to the concept of preprogrammed initial emotional states from which other, more differentiated states are derived.

Rather, as Bruner (1986) (and also Armon-Jones,1986) points out, such an extreme is not necessary, as the general view advanced here holds equally well if we acknowledge, as indeed we have above, that there are primitive or natural emotions like fear, rage, and hunger. It still remains the case that a more specific "affective signature" (Bruner, 1986) is required. The process of emotional development may then be described as the "social contextualisation of emotion" (Bruner, *ibid*).

Socially defined context serves the role of providing this signature. The instinctive physiological reactions that are associated with facial expressions in infancy are not, however, functional in the same way as they are in later life. The notion of 'functional' is of central importance here. It is *an aspect of the emotion* that it serves a social function. The emphasis is not in the ontology of the primary emotions but on their adaptation to particular social contexts and on the function they serve within the context of a particular society. Thus, as expounded by Bruner:

"...emotions achieve their qualitative character by being contextualised in the social reality that produces them." (Bruner, 1986, p.114)

Applying this premise to emotions in the developing infant, the stress thus falls on how her emotional reactions are integrated into the social context of the situation.

This brings us to another important point. Contextualising emotions might imply that describing an emotion as socially functional means no more than merely reinforcing a universal and natural disposition by rewarding its expression in particular situations (Armon-Jones, 1986). This view would not be compatible with the thesis developed here. Prescribing an emotion, such as fear or happiness for example, involves defining it by reference to those symbolic items that compel fear or joy within a social system. In order for a child to be 'afraid' or 'happy' within those contexts, she must understand the significance of such contexts and be able to respond/act appropriately.

The inner feeling of 'joy' is *qualitatively different* from the natural feeling involved in its prototype, the primary emotion of 'enjoyment' in infancy. It is not just the social constraints imposed on the intensity of feeling, the type of display, and the type of context in which the emotion features which change. Armon-Jones (1986) explains, for example, that:

"...'fear feeling' would not remain unchanged but rather would be qualitatively different to the extent that the attitudes constitutive of the emotion feeling are specifically

cultural...for a child to be appropriately 'afraid' she must have a grasp of the contexts, behaviour and attitudes which are expressive of the emotion as [socially] defined." (Armon-Jones, 1986, p.66)

It is in this way that later emotions are qualitatively different, by virtue of their being socio-cognitively mediated, from primary emotions. This is congruent with the statement made earlier by Bruner (1987) regarding Vygotsky's account of the development of emotions and is worth repeating:

"What recedes in man is not emotion, but its original links to instinctive actions. In man, with his attenuated instinctual system, emotion takes on new functions. Emotion moves from the periphery to the centre, as it were, moves to the cerebral cortex where it has an equivalent status to other cerebral, central processes. It can now interact with those other processes. As with other processes, then, the development of the emotions cannot be understood separately from their connections with other mental processes." (Bruner, 1987, p.12)

Within this framework it is maintained that, in order for infants to develop adult emotions, their physiological expressions must be contextualised in some way. It is argued here that this occurs through mothers interpreting, assigning socio-culturally predefined meanings, to what their infants are expressing, and responding accordingly. The meaning or significance of emotions is thus explained and clarified by being used instrumentally by mothers within specific routines. Mothers create and maintain these contextual realities which become the infant's first 'culture'. They create formats for interaction in which they interact according to the social realities that they have created in their exchanges. In the light of this perspective, the primary function of infant facial expressions may be conceived of as providing a signalling system to care givers, since it follows that the development of emotions is in fact their socialisation in the way described above.

In becoming dissociated from natural stimuli and responses and becoming associated with socially specified stimuli and responses (Shweder, 1985), the natural basis of infantile "emotions" is replaced by a new socially constructed basis. Consequently, infantile emotions are not prototypical of adult emotions. Nor do they serve as constant core constituents of adult emotions. Evidence for this may be derived from the fact that emotions are not given in discrete facial responses. As Plutchik (1980b) states:

" At best there is a prototypic facial pattern that may appear briefly under extreme stress or conditions but it is quickly changed, modified, or inhibited on the basis of rules and

experiences that are unique both to the culture and to the individual." (Plutchik, 1980b, p.257)

This socially mediated modification and meaning of facial expressions as indicators of emotion can be evidenced in inconsistencies in data from studies on the universality of facial expressions of emotions. They indicate that innate responses do not, *by themselves*, constitute emotional expressions in any significant way. For example, Ekman, Freisen, and Ancoli (1980) found only low correlations ranging from 0.4 to 0.6 between subjective reports of happiness and various measures of facial smiling response. Feelings of disgust correlated .37 to .55 with various corresponding facial expressions, and a composite of negative feelings correlated from .10 to +.35 with corresponding facial expressions.

Evidence concerning cross-cultural agreement on the emotional significance of facial expressions also shows important contradictory findings. For example, Ekman (1972) found cross cultural agreement in judging photographs which depicted emotions, but agreement was only forthcoming when the stimulus was a highly stereotyped, uniform, posed expression of a single emotion that was explicitly chosen for its lack of cultural display rules. In addition, the emotional adjectives that subjects could use were confined to a handful of terms which greatly increased the likelihood of agreement (Ekman, *ibid*; Plutchik, 1980b). Despite these forced conditions and restrictions, cross cultural judgements of emotional expressions were not unanimous. For example, Japanese and American judges correlated only 60% of the time on photos reflecting stress, only 10% above chance level. Similarly, a fear photograph was judged to be so by 85% of Americans and by only 54% of Argentinians. Moreover, while 90% of Brazilians judged a facial expression as angry, only 45% of Japanese did so (Ekman, *ibid*). Similar variations in results were obtained by Izard (1980). On posed surprise photos, Americans identified it correctly 90% of the time whilst Mexicans correctly identified it 54% of the time. When judges were allowed to describe the photos freely, instead of being forced to use a small number of predetermined adjectives, agreement dropped significantly. An international sample of judges who viewed various photographic expressions of emotions only achieved 50% correct identifications.

Further evidence which highlights the importance of social context and the unreliability of emotion displays investigated in contextual isolation is research showing that the same expression perceived in varying contexts is judged to indicate

different emotions. Although evidence from dynamic, real time stimuli is rare (Wallbott, 1988), it is more ecologically valid, and of importance to the present study as it relies on real time video segments of infants to obtain maternal interpretations.

Those studies that have been carried out indicate that context information influences interpretations of facial expressions. For example, Goldberg, (1951) showed observers one of two film clips consisting of 4 takes, the last take in each being identical (showing a woman screaming). In one film the context information suggested a fear experience and, in the other, a joyful experience. Results showed that the fear context led to more fear judgements while the joy context resulted in more joy judgements. This is not to say that either context or facial expression is *more dominant* in attributing emotions to subjects. The studies rather suggest that context is as important as emotion displays when attributing an emotional state.

In another study, Wallbott (1988) found that, when presented with television and film clips, judges relied on context just as much as they relied on facial expressions in guiding their inferences about the emotional states of an actress or an actor, when the context information was congruent with the facial expression portrayed. When presented with discrepant clips, judges did not use the information objectively given in person takes and context takes, but instead inferred other emotions, probably by 'reinterpreting' both sources of information to arrive at judgements. The results also indicated that the more consonant cue combinations there were, the more intense the main emotion was judged to be and the less ambiguous judgements were with respect to the other emotions. Thus, consonant cue combinations led to more intense emotion judgements, which were less ambiguous and which used information presented both in the person and context domain. When presented with discrepant clips, however, judges were less certain about the main emotion presented in the clips, judging it as being of lower intensity, and they reinterpreted the emotions within the different takes. In other words, the relative dominance of context versus facial expressions as sources of information depends, at least partly, on the discrepancy or consonance of the two types of information (Wallbott, 1988).

More striking results were found for infants. Sherman (1927a) found that, when infants' bodily and facial expressions were observed (by psychology graduate students, nurses and medical students) in the absence of any precipitating circumstances, judgements of the infants' emotions were inaccurate and variable. For example, 20% of psychology students who observed infants immediately after they

had been dropped 2 or 3 feet (without observing the actual dropping of the infant) reported the infants as expressing hunger. Interobserver agreement improved, however, when the observers were shown the precipitating circumstances. Moreover, when hungry infants were shown in pictures as being forcibly held down on a table, observers in this instance attributed fear, anger or some other emotion appropriate to being forced down, but none attributed hunger to the infants. This strongly suggests that facial expressions are interpreted in the light of surrounding conditions, and that sometimes these interpretations are totally at odds with what the expressions "should" denote (Leff, 1977).

The evidence so far, taken as a whole, leads to some important points. Facial expressions cannot be studied in isolation; they occur and develop in cultural contexts, in spatiotemporal contexts, and in interactional contexts, all of which influence the way in which they are produced, interpreted and responded to. The influence of culture and contextual variation also shifts the locus of responsibility from the infant to the caretaker and the context of interaction. The new organisational theories reviewed above have misunderstood the nature of facial expressions and emotionality to the extent that they have neglected this vital aspect. The social constructionists have provided the missing link between natural and social emotions by introducing *as a central mechanism* in emotional development the prescriptive quality of others' perceptions in providing the affective signature needed for emotions to develop. This is the link that has been overlooked by the organisational theories (Campos et al., 1983). By assigning a secondary role to social and interpersonal processes, they have dissociated emotional development from the wider development of the child. Thus, inevitably, they fall prey to behavioural contingencies by studying how different emotional expressions in the infant are contingent upon various environmental stimuli at various levels of functioning.

The above studies have shown that, amongst adults, facial expressions are not synonymous with feeling states. There may be a biological connection between facial expressions and emotions in adults. However, as Ekman (1972) points out, the relationship is surely one in which the emotion engenders the expression, rather than the expression determining emotion (as Izard believes). Facial musculature expresses the individual's cognitively mediated emotional state and striving (Mandler, 1980). The above studies have also demonstrated that the way observers make inferences, regarding the emotional states of others, is subject to contextual information which

may completely alter the interpretation of the facial expressions from one context to the next. These are important findings, especially in the light of mother-infant interaction. How mothers interpret and respond to their infants' facial expressions must be looked at as a vital part of the interplay of the various components of context which influence the development of emotionality. Gottlieb (1991) echoes Bateson and Kozulin's view above when he states:

" The cause of development, what makes development happen is the relationship of the...components, not the components themselves." (Gottlieb, 1991, p.7)

The mother's interpretations of her infant's facial expressions are a vital and essential component of emotional development in infancy. Interpretations of interactional others, the influences of situational context, influences of infant capacities, and the responsiveness of caretakers are all components of an integrated process whose relationships need to be investigated in order to understand this process of development.

1.4.1 Summary and Synthesis: Which Theory?

The discussion above has highlighted vital issues and shortcomings in the study of facial expressions and the development of emotions. As we have seen, social theories reject isomorphic links between emotion and expression as they do psychophysiological programmes. Instead, emotions are seen as transient social roles, and development is thus seen as a process of socialisation. How mothers interpret their infants' expressions becomes a vital issue within this framework. Facial expressions are the medium through which mothers both communicate affective attitudes to infants and respond to perceived affective states. The research focus is turned to inter-individual concerns: How do mothers interpret their infants' facial expressions? Are mothers subject to contextual influences in judging these expressions? If so, do the dynamics of maternal selections and interpretations reflect the way infants become involved in emotional interactions? In what way? It is maintained that at first the emotion is the mother's, the physiological reaction is the baby's. Later on, with the adoption of rules and roles, emotion becomes understood as part of

socially determined action sequences and attitudes and becomes the property of the child.

Behaviourist paradigms present the view of the individual as being at the mercy of autonomic forces, devoid of voluntary control. Cognitive paradigms represent the individual as driven by cognitive maturation at the expense of understanding affective development in interpersonal context. Both paradigms present emotional development as an intra-individual process. The shortcomings of behaviourist and cognitive psychology paradigms have directed researchers to look elsewhere to more holistic and integrated approaches. Despite variations between them, the new organisational approaches have attempted to work within a functional, open system framework. However, although they have stressed the role of emotions within the context of the infant's wider environment, they have not relinquished links with past theories. The dominant theories of emotion development still adhere to the biological or naturalist principles that characterised earlier theories of emotions to one degree or another. Emotions are regarded as voluntary (or involuntary) acts which are reinforced by environmental contingencies. These theories thus appear to adopt classical conditioning and operant conditioning paradigms. The repercussions of this inheritance and that of cognitive psychology (which ignores social aspects of development) is that the development of higher order processes is ignored and hence the role of caretakers in the development of emotions is theoretically marginal. Empirical paradigms point to this by the nature of their experimental designs. The predominant designs investigate the infant in settings where interaction with the mother is either tightly controlled or the caretaker is not present at all. Instead, it is argued here that caretakers are the gateway to the wider culture. Ignoring the important role they play means that we only look at the primary components and ignore their transformation into mature emotions; central processes in Vygotskian terms.

In line with this theoretical perspective, it is proposed that the preliminary step in this transformation is how mothers interpret their infants' facial expressions. Evidence from studies reviewed above has shown that mothers attribute different emotion states to facial expressions. Both in terms of what facial expressions they choose to respond to and how they respond to them, mothers create contextual realities which they use to organise infants' input in interaction. Drawing on evidence from studies on the effect of situational context in identifying infant emotion

states, infant facial expressions are interpreted in line with the observers' representation of the situation. In line with constructionist theories of emotion, emotions are contextualised in the reality that produces them. They are contextualised by mothers through their interpretations of what these expressions mean, which in turn are based on what they perceive as the cause of them, and their implicit attribution of intention to the infant. Mothers respond to facial expressions by selecting what is of significance to them in interaction, and by describing a perspective course of action which addresses the infant's state. Hence, the infant is engaged in an intricate process of interaction where her expressive responses are constantly incorporated into event sequences and consequences. This raises the question of how much of this parental structuring and instruction infants are able to comprehend. For the process of interpretation and responsivity to be effective, the infant must possess some capabilities which allow her to interact with the environment, and to incorporate information from the environment. The following chapter examines how much of the mother's input is processed by the infant.

CHAPTER 2

PRECURSORS TO EMOTIONAL DEVELOPMENT

"I did a certain thing that I knew would catch his attention, which is to say 'Where's Bertie?' (the dog). He immediately looked around."
(Attributed to mother of baby boy, 10-12 month age group)

2.0 The Infant's Repertoire

In hypothesising that the mother's interpretation and response to the infant's facial expressions are a socialising factor in emotional development, we must consider a number of issues that bear on this process: Firstly, how is this information 'read' by the infant? There can be no doubt that the perception of a stimulus and an evaluation of it, with respect to its personal significance for both mother and infant, are contributing factors in the social theory that is being proposed here. In order for maternal interpretations and responses to be effective in socialising the infant's facial expressions, they must be perceived and processed in some way.

Secondly, we need to know the infant's facial expression repertoire at various ages. This may seem inconsistent with the approach adopted here in that it has been argued that facial expressions are interpreted within social and interactional context and, hence, 'objective' studies are not accurate in this regard. However, these studies allow us to assess the types of 'emotional' reactions that are elicited by different stimuli in different age groups, and how mothers may be responsible for this differentiation of behavioural responses. To avoid using inference laden labels I will use facial or emotional expressions to refer to infant expressive responses.

Infant abilities can be represented by different levels of analysis. Just as from an external observer's viewpoint the infant's response to a stimulus is represented as a contingency, while from the mother's view point it is represented as an intention, so, too, different levels of analysis pertain to different schemata we impose on infant behaviour. Retaining the external perspective on infant behaviour, the ways in which infants' expressive capabilities have been examined are discussed. The subsequent section deals with infant cognition, specifically with regard to perceptual and inferential capacities. The communicative and interactive abilities of the mother-infant

system at various stages of development are reviewed, providing the context for the infants' expressive and inferential abilities. Lastly, the importance of maternal interpretations in the light of this research will be discussed.

2.1 Facial Expressions in Infancy

From birth to 4 months newborns show most of the adult discrete emotion expressions including smiling during drowsy states (Oster, 1978; Rosenstein and Oster 1988). While smiling in neonates occurs during REM sleep, starting at the end of the first month these endogenous (internally regulated) smiles gradually decrease and exogenous (externally regulated) smiles begin to be seen. These are elicited by mild to moderate stimulation of the auditory, tactile, kinaesthetic and visual modalities in response to stimuli in social and nonsocial contexts (Sroufe and Waters, 1976). Preferential smiling at social over nonsocial stimuli was found to develop between 6 and 12 weeks, where, by 12 weeks, infants have begun to smile selectively at familiar persons and during newly mastered task activities (e.g. Lewis, Sullivan, and Brooks-Gunn, 1985).

Studies on eliciting stimuli in newborns have also shown that infants respond with different facial expressions to different taste substances (Fox and Davidson, 1985; Cowart, 1981; Ganchrow, Steiner, and Daher, 1983) and to different odours (Steiner, 1979). For example, Rosenstein and Oster (1988) tested two hour old babies' responses to substances which to adults tasted sour, sweet, salty and bitter. Infants responded with higher rates of negative facial expressions to salty substances but there was no evidence of specific facial patterning. Steiner (1979), however, reported that infants' facial expressions to similar taste stimuli became more differentiated during the period immediately after birth and ending three days later, suggesting that Rosenstein and Oster's findings could have resulted from the less than optimal state of the infant after the stress of birth. These studies suggests that newborn infants respond in rudimentary ways to some stimuli.

There have been a number of important studies on the eliciting power of situations on the infant. For example, a comprehensive study by Hiatt et al. (1979) employed six situations presumed to elicit three emotions - joy (peekaboo game, vanishing toy), fear (stranger approach, visual cliff), and surprise (vanishing toy,

covert toy switch). Emotional expressions were compared between the situations presumed to elicit the same emotional reaction and against the other two situations intended to produce different emotional reactions. Comparison of proportions of predicted versus nonpredicted facial expressions in these conditions permitted a comparison of whether the situation elicitors produced the predicted facial movements significantly more than they produced facial movements not predicted for those elicitors. Results showed that the predicted patterning was evident for both joy and surprise but not for either of the fear elicitors.⁸ Their results provided strong evidence that some types of facial patterning were found in 10-12 month old infants.

Their study was followed by one which looked at facial expressions of anger in 7 month old infants (Sternberg, Campos and Emde, 1983). The emotion elicitor was the removal of a teething biscuit just prior to the baby placing it in her mouth. They found strong evidence of facial patterning. Anger components increased after removal of the biscuit from 3%, before, to 29% after, the biscuit removal. After repeated trials this became stronger (prestimulus= 32%; poststimulus=66%). These findings were replicated by Sternberg (1982) using different elicitors (arm restraint), a different coding technique (MAX (Izard,1983) rather than FAST (Ekman and Friesen, 1975)) and a different sampling method (the first negative expression regardless of which type of negative affect). One, 4 and 7 month olds were tested. In all three age groups there were higher levels of anger components after the stimulus than before. The 4 and 7 month olds especially met with all the criteria of facial patterning identified by MAX. A later experiment (Sternberg and Campos, 1988) tested the same aged infants using AFFREX (an alternative coding system developed by Izard) and found that 56% of 4 and 7 month old infants showed the complete anger expressions, while one month old infants displayed expressions distress expressions (differentiated from anger by the closure of the eyes).

Izard et al. (1981) found differential reactions to painful stimuli in 2 and 7 month old infants. Using infants' experiences of being inoculated, he found that two and four month old babies showed distress (crying with eyes tightly shut) when given a vaccination. Seven month old babies, however, responded with more angry

8. Other studies of fear expressions in infants using the 'fear of strangers' paradigm also reported few or no instances of the stereotyped fear facial patterns (eg. Fox and Davidson, 1987; Sroufe, 1979; Waters, Matas and Sroufe, 1975). In both stranger approach and visual cliff studies, nonfacial indicators of fear (avoidance of stranger, refusal to cross the cliff) have been produced (Camras, Malatesta and Izard, 1991).

expressions, crying with open, eyes. Further investigations showed that there was a particularly sharp increase in anger expressions between the ages of 8 and 19 months (Izard et al., 1983;1987). Anger expressions were also found to occur at separation from the mother at 13 months (Hyson and Izard, 1985; Shiller, Izard and Hembree, 1986; McGinnes, Izard, and Phillips, 1984).

Investigations have not produced sadness expressions as a principle expression in research. Observational studies, however, such as Camras (1982) and Demos (1986), found that distress patterns occur in situations in which pain or anger expressions have been produced. In Camras' study, these included aspirating the infant's nostrils with a syringe, moving her suddenly, administering a sour vitamin, bathing her, removing her pacifier, and terminating physical contact with her mother.

These studies are important indicators of the infant's growing differentiation in expression and sensitivity to the environment. For example, Sroufe (1979) suggests that in infancy arousal becomes increasingly a function of the baby's transaction with external events, rather than being a one to one correspondence to the quantity of stimulation, as evidenced by the transition from endogenous to exogenous smiling. Taken as a whole, they show that, while some aspects of infant expressions are clearly elicited by certain situations (e.g., smiling in response to mastery of a task or a familiar face), the findings for negative expressions, i.e., anger, fear, pain and sadness, are less clear cut. Infants appear to produce a combination of these expressions in most of the eliciting situations designed to elicit one specific expression. Nevertheless, the studies do indicate that the baby is able to respond to its surroundings in ways that have adaptive functions for the infant and that would affect the mother-infant system in important ways. They provide evidence that the infant's behaviour is organised in ways that potentially signal to caregivers certain information regarding the infant's state. In the light of the evidence presented in Chapter 1 on maternal responsivity to facial expressions, they are an important indicator of what signals are incorporated into interaction, and the types of contextual routines in which they become embedded. How much significance the infant is able to attach to the mother's responses is a subject we will turn to next.

2.2 Perceptual and Inferential Capacities

"...he considers that funny, looking back at my face. I was probably making some idiot facial expression. He was responding by laughing."

(Attributed to mother of baby boy, 4-6 month old age group)

How much of the mother's contingent responding to the infant's emotional reactions is processed by the infant? The infant's ability to discriminate between various facial expressions has generally been taken as evidence of the infant's sophisticated perceptual abilities. Emotion theories underlying this work have used this evidence as indicating a natural aptitude for understanding the emotionality of others. However an important distinction needs to be made. These perceptual and instinctive capabilities of the infant must not be confused with emotionality. As Armon-Jones (1986) points out:

"The characterisation of emotion as attitudinal and cognition-dependent is crucial to constructionism in the following respects. According to constructionism, a socioculturally constituted emotion is an *acquired response*. This requires that the elements constitutive of the emotions are ones which are capable of being acquired by the agent. Consequently, it is essential to constructionism that an account of emotions be given in which emotions are neither identifiable with, nor have the same ontological status as, phenomena such as sensation and perception. This is so because although perceptual skills, for instance, can be acquired, we also have reason to believe that perception and sensation are not essentially skills acquired by training but are natural phenomena which exist prior to the acquisition of any sociocultural frame of reference within which we might want to explain them." (Armon-Jones, 1986, p.44)

The relationship between cognition, perception and emotion is a complex one and thus one that has not been properly addressed or explicated. For purposes of analysis, the current discussion has separated various components of the infant's behaviour. That is not to say that these processes are independent of each other. Rather the components of emotional development are not emotions, cognitions and actions, each in isolation, but aspects of a larger whole. Cognition is not a form of pure knowledge to which emotion is added, and action is a final common path based on what one knows and feels (Bruner, 1986). For purposes of analysis, these different components are presented separately; however, it is stressed that they are not to be treated separately or independently of each other.

Studies on infant discrimination of facial expressions have been concerned with looking at whether infants are able to detect common attributes of a set of discriminable entities, such as recognising expressions over varying instances (e.g., posed by different models or presented in different ways), and whether infants' discrimination of facial expressions is based on the infant generalising specific features or is attending to the whole gestalt. The latter focus underlies a concern with the development of intermodal perception which is argued by some (e.g., Walker-Andrews, 1986; J.J.Gibson, 1976) to indicate the ability of infants to perceive the intentions underlying the visible and audible behaviours presented to them and respond accordingly. While such conclusions cannot be supported by the presence of such abilities alone, the studies nevertheless provide evidence on what infants are able to perceive and when.

Investigators have studied the ability of infants to recognise or discriminate between different facial expressions by monitoring what they select to look at. One such study was performed by Young-Browne, Rosenfeld and Horowitz (1977). Using the habituation recovery paradigm, they investigated 3 month old infants' ability to discriminate between the facial expressions of sadness, happiness and surprise. Previous studies have suggested that infants are capable of discriminating between different facial expressions at 5-6 months, but there has been a lack of evidence of infants being able to discriminate earlier. Charlesworth and Kruetzer (1973) also found differential responses in 6 month old and older infants, but found no differential responding in 4 months olds. The lack of evidence does not necessarily imply that infants are not able to discriminate, as much as implying that the lack of positive findings may be due to methodological limitations (e.g., in the presentation of the stimuli and in the assessment of the responses made). Previous studies have used questionable representations of the human face, have confounded verbal and visual stimuli or have lacked precision in experimental procedure (Young-Browne et al., 1977).

In the study by Young-Browne et al. (1977), stimuli consisted of standardised pictures of the facial expressions accompanied by background lullaby music. Results showed that infants were able to significantly discriminate between happy and surprise faces and vice versa, as measured by the differences in fixation at each change point of presentation of expression. A large significant difference was also found in the sad to surprise presentation but not the other way around. LeBarbera,

Izard and Vietze et al. (1976) also found evidence of discrimination at 4 months old. Four and 6 month old infants, shown slides of facial expressions of joy, anger and no emotion, looked more frequently at the joy facial expression than at either the neutral or anger expressions.

The results of the Young-Browne et al. (1977) study provide evidence that 3 month old infants are capable of discriminating between happy and surprise faces and, under certain circumstances, between sad and surprise faces. These results suggest that the infants may be exhibiting a preference for focusing on the eyes, as the expression pairs involved widening of the eyes (surprise), and therefore that infants may be discriminating on the basis of specific features rather than on the whole expression. Several studies have found support for this (e.g., Bergman, Hiath and Mann, 1971; Donnee, 1973; Maurer and Salapatek, 1975).

Caron, Caron, and Myers (1985) have suggested that there is a general age related progression in the salience of specific facial regions for the infant. Caron, Caron, Caldwell, and Weiss (1973) found that infants initially start off by selectively perceiving external borders of the face, such as hairline or chin. Then they begin to perceive internal features, initially the eyes, then the nose and mouth area. By 5 months they begin to integrate eyes, nose and mouth into a total face gestalt.

Therefore, 3 month old infants may be discriminating between isolated features of the face rather than features which are affect relevant. For example, Oster (1981) noted that infants pay greater attention to smiling over nonsmiling and suggested that this may be due to the presence of a physical contrast produced by bared teeth. She reported a study by Oster and Ewy which found that 4 month olds preferred to look at photographs of toothy smiles than of sad faces but did not show any preference to nontoothy smiles over the same sad faces (Oster, 1981). In addition, McGrath (1983) showed that 3 month olds could discriminate between photos of happy, surprised and angry expressions whether they were upright or upside down. Thus, discrimination may be due to perceived featural differences rather than affect related discrimination.

Caron, Caron, and Myers (1985) tested 4, 5, 7 and 10 month old infants on their discrimination of happy and angry expressions in which the teeth were present and not present (toothy and nontoothy respectively). Results showed that 4, 5, and 7 month old infants dishabituated to the toothy smiling faces after having been habituated to the two nontoothy anger and smiling faces, but that they could not

discriminate between the toothy smiling faces and the toothy angry faces. The two oldest group infants were, however, able to classify toothy and nontoothy smiles from nontoothy anger faces. Like the younger groups, however, they failed to discriminate between the anger and smiling faces when both were depicted with teeth bared. The pattern of results suggested that infants in all three age groups were more responsive to differences in an isolated feature (mouth-teeth) than to change in emotional expression per se.

Nelson (1987) points out, however, that the interpretation of the findings may be premature in that the infants in the study were not given the opportunity to categorise both toothy and nontoothy exemplars of the *same* expression. Only if infants had been habituated to such a range of exemplars and then tested on a new expression, would such a test have been possible. Secondly, the results suggested that "toothiness" was a more salient feature than other features of the face. Other investigators (Nelson and Horowitz, 1980) have shown that 6 month old infants are able to discriminate between fear and surprise faces when the only feature to change is the eyes, but were unable to do so when either all the features changed, or when just the mouth feature changed. This suggests that the extent to which particular facial features of a given expression becomes the more salient feature to an infant may depend, in part, on how many exemplars are used, the particular expression depicted and whether other features are left to vary with the change in expressions (Nelson, 1987).

Some researchers have criticised the above studies for their use of still-faced representations of the face rather than dynamic real-life facial expressions (e.g., Caron, Caron, and MacLean, 1988). They argue that, based on Gibsonian theory, emotional expressions are not fixed entities but events or happenings in time that serve communicative and regulatory ends (E.J. Gibson and Spelke, 1983; J.J. Gibson, 1979; Klinnert, Campos, Sorce, Emde and Svejda, 1983). They further point out that the way static objects are perceived may be different to the way dynamic ones are selected and perceived.

These results must therefore be supplemented by others which are more ecologically valid, that is, ones which look at facial expressions within temporal and vocal context. In a series of experiments, Caron, Caron, and Maclean (1988) tested the ability of infants between 4 months and 7 months to discriminate between dynamic facial expressions with and without vocal information. They asked women to read

a script using either a sad or happy affective manner. Results showed that, not until 5 months of age, can infants discriminate between naturalistic expressions of happiness and sadness. At 4 months, infants recovered slightly to novel happy presentations following habituation to sad presentations, but did not recover to novel sad presentations following habituation to happy presentations. On the assumption that infants may have been able to discriminate between these expressions because of their marked difference in tempo and animation, the authors tested the ability of 5 and 7 month olds to distinguish between two expressions with similar intensity, joy and anger. Five month old infants could not discriminate between happy and angry stimuli, whereas 7 month olds could. By 7 months this appears to represent at least a 2 month advance over what infants were able to do with photographs of these same emotions (see Caron et al., 1985). A further test examining the role of voice in this discrimination revealed that 7 month olds could only discriminate between the two stimuli in the presence of accompanying appropriate vocalisation. Support for this is found in the Walker-Andrew study (1986) in which 7 but not 5 month olds increased fixation to a facial expression when it was sound specific (angry or happy). On the other hand, the happy-angry comparison, involving as it did stimuli that are quite similar in animation level, may be more difficult to distinguish on a purely visual basis than more disparate emotions such as sad and happy.

Caron et al. (1988) tested this by repeating the experiment with 5 month olds to see if they would distinguish silent happy from previously habituated silent sad episodes. Infants in the no voice group recovered fixation to the novel happy expressions to the same extent as the voice group. Here, therefore, elimination of the voice had no disruptive effect on the ability of 5 month olds to resolve the sad-happy discrimination. Taken together with the results of the above experiment where the removal of the voice completely nullified the happy-angry discrimination, the results suggest that, for some expressions, infants rely more on the voice than the face to differentiate dynamically similar expressions such as happy to angry, but can utilise visual information alone to distinguish more distinct expressions.

The findings suggest that infants are able to form categories on the basis of central features, and associate facial expression with the corresponding tone of voice. Five month old infants are able to differentiate emotion stimuli on the basis of visual stimuli alone if these expressions are distinct; however, for similar emotion stimuli, they rely more on the voice. By 7 months infants develop multimodal perceptual

abilities and require both face and voice to discriminate between emotion stimuli. The gradual ability of infants to process increasingly complex and integrated features of perceptual stimuli and events means that they are able to infer more complex categories of facial expressions and of different events, on the basis of overlapping features of these events. Applying these basic abilities to our framework, suggests that infants become increasingly adept at both perceiving and categorising more complex features of the mothers' responses. It is possible to speculate that, with the development of these perceptual abilities, infants develop a greater receptivity to mothers' responses to them vis-à-vis the external environment. Support for this proposal comes from work done on joint referencing and social referencing, a subject we shall be returning to shortly. The evidence presented here indicates that in social referencing, for example, infants would become increasingly more competent at processing and integrating mothers' facial signals, both in terms of one of a category of facial expression, and as a category of event associated with another external stimulus, e.g., an unfamiliar object, or a steep staircase. In other words, infants are learning about the implications of perceptual information rather than learning to perceive. The findings also suggest that mothers may be instrumental in the increasing ability of infants to process more complex facial and vocal information. As Caron et al. (1988) point out, middle class, 5 month old infants who were not able to discriminate between dynamic expressions of anger and joy stimuli would have been rarely confronted by anger or its consequences prior to becoming mobile, suggesting that discriminatory ability must also rest with the type of emotion stimulation the infant receives in natural, everyday settings.

The above literature deals with immediate perceptual inference, but it is important to look at inference beyond the domain of immediate perception. The reason for this is that facial expressions and events surrounding infants occur in sequence in time and space, that is they are dynamic by nature. The studies above used a static method, relying on two dimensional stimuli. The infant's world is comprised of both stationary and dynamic objects and it is plausible to suggest that these differences in perspective are integrated over time to give some sort of coherent view of the events surrounding the infant (Slater, 1989). An important requirement for infants to pick up the mother's actions is that they are able to make inferences about the behaviour of objects (including the mother) that move fully out of view, and about the identity or distinctiveness of objects encountered at different places and

times. Whereas the above discussion centred on the infant's ability to integrate various features in its environment, the next section deals with the infant's aptitude for integrating these abilities in space and time.

Several important experiments have investigated the ability of young infants to perceive an object that has been occluded from view. Such inferential capabilities are argued to rest on the infant's ability to construct the object in its absence (Piaget, 1954), suggesting that the infant has a schema or representation of the object. Others (e.g., J.J. Gibson, 1979) have argued that the ability of the infant to construe objects in space is an inborn perceptual capacity. Bower (1967) has attacked Piaget's claim regarding the development of object permanence by 8-9 months of age, by providing evidence that infants were able to infer the location of objects not visually perceived much earlier than Piaget had proposed, i.e., by 3 months. More recent work on object permanence is illustrative of the degree of inference the infant possesses at different ages.

Kellman and Spelke (1983) demonstrated 3-4 month olds' apprehension of moving objects which were partially occluded. In this experiment a rod was partly occluded by a block of wood. The rod was moved from side to side behind the block. Infants were habituated to the natural motion of the rod. Kellman and Spelke then asked the question, did the babies perceive the rod as two unconnected bits of wood that happened to move synchronously, or did they see it as a single rod connected by an invisible portion? They tested this by showing the babies either a single complete rod or two unconnected parts. Babies clearly dishabituated to the latter condition, indicating that they found the two disconnected rods a novel stimulus.

Further tests have shown that a critical factor in this apprehension is motion: babies do not perceive the visible parts as connected if the rod is stationary, or if one part only moves. Both parts have to move, although it does not seem to matter in which direction they move provided it is in the same direction (Harris, 1989). This ability appears to be age related. Slater, Morrison and Sommers (1987) tested newborn babies and found a preference for the connected rod rather than the two unconnected parts.

Extending this research further, Baillargeon et al. (1985) conducted a study of 5 month old infants which focused on their apprehension of objects persisting over full occlusion. The test involved a stationary block behind a rotating screen. The screen rotated backwards and forwards in front of the box, hiding it from view. The

critical test was rotating the screen 180 degrees, making it impossible that the box and the screen occupied the same place. With the appropriate controls, infants dishabituated to the impossible rotation, providing evidence that infants represent the continuous existence of the block behind the screen. Baillargeon (1987) found similar evidence for 3 and 4 month old infants. To ensure that infants were not dishabituating to the longer persistence of motion of the screen, 180 degrees rather than 120 degrees, they used a control condition in which the block was placed in full view by the rotating screen and out of its path. Under these conditions, infants looked for an equally long time at both 180 and 120 degree rotations of the screen.

These studies demonstrate that infants as young as 3 and 4 months possess some form of object permanence, are able to perceive differences in shapes (faces), and, by 7 months, are able to integrate information from different perceptual modalities (face and voice). Such abilities indicate that the infant is a very skilled perceiver and information processor. It does not, however, answer questions about why the infant should only exhibit stranger anxiety at 8 or 9 months and not before, a capacity that has generally been linked to the development of object permanence. The point being made here is that these abilities are only the ingredients of infant cognitive understanding. The infant's experiences with intermodal stimulation over the first year are likely to provide the abilities necessary for emotional development. These experiences occur within, and are part of, social interaction. Maternal responsiveness is likely to affect the differentiation and development of these abilities. Thus, to reveal how these skills function, one has to look at the infant in the context of mother-infant interaction.

2.3 Perceptual and Inferential Capacities in Social Context

"She's very much looking at me to see how I was reacting to what was there cause she's not sure."

(Attributed to mother of baby girl, 10-12 month old age group)

At what time does the infant develop the ability to understand another person's facial expressions? There are various areas of research that may shed light on this. One source of evidence is work done on joint attention. Another source of evidence comes from research on social referencing. More recently, Reddy (1991) has

described the infant's ability to engage in 'teasing'. These mechanisms are important in demonstrating how the infant is able to share aspects of the adults' world in ways that influence its assessment of the environment and its ability to share goals and intentions with others.

Important developments occur around 9 months which have implications for the infant's ability to interact with its environment. For example, Trevarthen and Hubley (1978) found that infants under 9 months old could not yet coordinate person and object attention (see also Sugarman-Bell, 1978). The infants either played with a toy or engaged in a social game with the mother. At around 9 months, however, infants began to look up from the toy to mother during joint play and to invite the mother's participation by offering and giving objects.

These early signs of interpersonal communication appear around 9 months, when the infants are able to anticipate familiar sequences,⁹ and develop into more active involvement in interaction by the infant. Between 10-12 months infants combine their ability to form concepts with their ability to use motor skills in a directed way. An example of this may be found in relational play where the infant performs actions that demonstrate a knowledge of the relationship between two objects like putting lids on pots and spoons in cups (Fogel, 1991).

Infants are capable of joint referencing by 6 months of age. During joint referencing the infant uses the behaviour of the mother to infer the existence of objects in space. Such a mechanism is important in demonstrating one of the ways in which an infant's ability to differentiate itself from the outside world may be constructed through the actions and interactions of others. Through joint attention to a topic, it becomes possible for the child to discover links between a sign and what it signifies, and to learn to "use social procedures in concert with one another to assure that the sign and the significant that become linked overlap in some negotiable way with the uses of others" (Bruner, 1983a, p.88). The idea that infants construct their concept of the outside world through actions within the world is found in Vygotsky's writings on the Zone of Proximal Development. Easily the most quoted passage from Vygotsky's (1966) work:

"Any function in the child's cultural development appears twice, or on two planes. First it appears between people, as an interpsychological category and

9. See Sroufe (1979) for example on the infant anticipating mother's face in peekaboo.

then within the child as an intrapsychological category. This is equally true with regard to voluntary attention, logical memory, the formation of concepts and the development of volition." (Vygotsky, 1966, p.41)

Vygotsky's fundamental difference from the Piagetian conception of development was also evident in his disagreement with Piaget regarding the concept of egocentrism. Flavell (1963) states that for Piaget:

"Egocentrism denotes a cognitive state in which the cogniser sees the world from a single point of view only, his own, but without the knowledge of the existence of viewpoints or perspectives and without awareness that he is a prisoner of his own [viewpoint]." (Flavell, 1963, p.60)

Vygotsky, on the other hand, although he agreed that egocentrism implies an unconscious point of origin for experience, would have denied that egocentrism implies solipsism, indifferentiation of experience, or an inability to share in the experience of others (Butterworth et al., 1989).

One important source of evidence of the infant's ability to share in the experience of others comes from studies on joint visual attention or referential communication. The ability of mothers and infants to share a perspective on the world is evidenced by findings that mothers very closely monitor the focus of their infants' attention. Schaffer (1984) has pointed out that the majority of episodes of joint activity arise as a result of the mother monitoring the infant's line of gaze. However, Scaife and Bruner (1975) and Churcher and Scaife (1982) have found that not only does the mother monitor the infant's direction of gaze but infants also redirect their line of gaze to share in the focus of the mother's attention. This is an important discovery as it indicates that the infant cannot be totally egocentric. The baby perceives a change in *another person's* point of view. The findings also suggest that the infant perceives the mother's gaze as signalling the 'permanent possibility of an object' (Butterworth, 1989) at the terminus of their joint lines of gaze. Again, as mentioned earlier, this raises the question of whether object permanence lies at the very root of cognitive development rather than being derived from it (Butterworth, *ibid*).

A series of empirical studies have found evidence for the ability of infants to engage in joint referencing. Butterworth and Cochran (1980) and Butterworth and Jarrett (1980) conducted a series of studies in which the mother and infant were seated face to face in an undistracting environment, with pairs of identical targets

placed at various positions to the left and right of the room. The mothers were asked to interact naturally with the infant and then, at a set signal, to turn silently to inspect a designated target. Infants were between 6 and 18 months old. The results indicated that 6 month old babies look to the correct side of the room corresponding to mother's head direction, but cannot tell on the basis of the mother's action alone which of the two identical targets on the same side of the room mothers were attending to. If the object attended to was the second one along their path of scanning, they were at chance level of correctly turning their attention to it. Infants also only localised targets in their own visual field. If mothers located a target behind the infant they would not turn to search for the object behind them. Other studies have demonstrated this phenomenon (e.g., Landau and Spelke, 1988), suggesting that the inaccessibility of the space behind the infant may be a general cognitive limitation.

At 6 months therefore, joint visual attention is restricted to targets within the infant's view. At this age the ability of infants to localise the target depends not only on the mother's direction of gaze but also on the intrinsic differentiating properties of the object being attended to, by the mother. By adding movement to the target being attended, 9 month olds were able to locate it accurately 100 % of the time as long as the correct target was moving (Grover, 1988). Butterworth (1991) has termed this earliest mechanism of joint visual attention 'ecological', since it is the differentiating structure of the environment that completes the adult's direction of gaze. This mechanism enables a 'meeting of minds' (ibid) in the self same object. Furthermore, it is important in that, what attracts the mother's attention in the natural environment, is likely to capture the attention of the infant, demonstrating how this mechanism enables the mother to structure the environment for the infant.

By 12 months the infant is able to identify targets correctly, be they first or second along its path of vision, even when the target is stationary. Here the infant depends solely on the mother's head orientation towards the target, and would need to extrapolate from this information an invisible line between the mother and the referent of her gaze. Hence, it has been called the 'geometric mechanism' (Butterworth, 1991). Again, however, the geometric mechanism is restricted to the infant's field of vision. The 12 month old infant, and the 18 month old, still do not turn around if the target attended to by the mother is behind them. However, the 18 month olds will turn to look behind them if no other target is in the room save the one behind them. Butterworth (1991) and his coworkers have termed this mechanism

the 'representational' spatial mechanism for controlling joint visual attention, which is now based on an understanding of being contained within space. At 18 months there is an extension of joint reference to a 'represented' space which contains the infant and other objects outside the immediate visual field.

When seen in social context, the earliest 'ecological' mechanism allows communication in relation to publicly shared objects. During the first year joint visual attention remains limited within the infant's visual field. As Butterworth (1991) points out:

"The phenomenon of joint visual attention is ultimately possible because perception, even in the infant, presupposes a world of objects that exist in space held in common with other people." (Butterworth, 1991, p.231)

During the first year of life the baby behaves as if its own field of vision is shared with the adult. Although the infant will not search manually for hidden objects before 8 or 9 months, the mother's behaviour nevertheless signals the 'permanent possibility of an object' potentially within the field of view. Such a mechanism provides important evidence, suggesting that the world of the infant is constructed by others. The ability of the mother and infant to share the same space is followed by the ability of the mother and infant to share the same space even when it is not immediately visually available. Through joint mechanisms such as these, the infant is able to internalise, by attending to, aspects of the world that are selected and responded to by adults. Through such mechanisms one can see how the child learns to represent the world in ways that have been shaped by adults.

Joint referencing of objects is not the only shared activity between mother and infant. Social referencing is also a mechanism whereby the mother and infant can share aspects of events in common. Social referencing is a process of emotional communication in which one's perception of other people's interpretations of events is used to form one's own understanding of that event (Feinman, 1982). The ability of infants to use emotional information expressed by other people begins around 8 months of age. Social referencing occurs under two main conditions. Firstly, in uncertain situations, infants will look at the mother to note her reaction and will take their cue from this. Thus, by 9 to 10 months, infants are beginning to use the emotional information displayed by others instrumentally. When their mothers display negative expressions, one year old infants avoid crossing short visual cliffs

(Sorce et al., 1985), are inhibited from playing with toys (Gunnar and Stone, 1984; Hornick et al., 1987) and are less friendly to strangers (Feinman and Lewis, 1983; Feinman, Roberts et al., 1986). Between 10-12 months infants begin to use social referencing systematically, although it does not occur frequently in naturalistic situations (Hornick and Gunnar, 1988; Nelson, 1985). It has also been found that, in social referencing, negative expressions have a more powerful effect on regulating the infant's behaviour at this stage (Gunnar and Stone, 1984; Hornick et al., 1987; Feiring et al., 1984; Sorce et al., 1985; Zabatany and Lamb, 1985).

Secondly, social referencing has been demonstrated in appraisal situations. For example, infant smiles, turns round to others to appraise their reactions, if they are smiling infant continues to smile. Between 6 and 12 months this is the most common response in social situations and tends to involve positive expressions (Hornick and Gunnar, 1988; Klinnert, 1984; Walden and Ogan, 1988). Lastly, some studies have found that infants will also be influenced by the mother's general affective tone and facial expression (e.g., Termain and Izard, 1988).

Some current theories on social referencing hypothesise that this mechanism involves the infant's understanding of the significance of the parent's emotional signal (e.g., Feinman, 1982; Walden, 1991). While such a suggestion over-attributes capabilities to the infant, as emotional development entails the internalisation of roles and rules which are beyond infant capabilities, it does point to an initial, rudimentary ability to incorporate others' emotional reactions towards events. Social referencing, as another example of referential communication in infancy, is therefore important in that it indicates that the mother and infant are able to share intentions towards particular events. It also means that the parent at this stage can communicate the significance of the event. However, that the infant now has a mind of its own and therefore can read and impute mental states to others, cannot be attributed to the infant at this age. Such a suggestion has been made in the case of infant teasing.

Infants' 'teasing' has recently been documented by Reddy (1989, 1991). The description and explanation of this phenomenon has rested largely on descriptions of small sample case studies (N=7-12). Conceptualisation and operationalisation of this phenomenon are still at an early stage of development and no empirical studies have been run to test the validity of this concept. However, let us look at what has been presented so far. Reddy (ibid) has defined 'teasing, joking or mucking about' as a mode of interaction whose central behaviour is directed to achieve affective

effects on other organisms, rather than for obtaining such things as food or toys. It involves the rapid alternation of metasignals, which create and then remove doubt (Altman, 1988). The range of behaviours described by Reddy are regarded by her as involving the infant's engagement with the intentions and expectations of the adult. She lists a variety of interactions of this nature; *showing off* by performing specific actions which amuse others, *teasing* by opposing another's actions or intentions or by opposing another's directives/expectations with amusement, and *tricking* such as pretending to cry, or performing an action prohibited by the caregiver 'behind her back'. The descriptions of episodes where these sequences occur are phrased in "explicitly 'intentional' language" as Reddy herself points out (Reddy, *ibid*, p.144). According to her, an example characteristic of teasing episodes involves the creating of a false expectation and disrupting it:

" Shamini (9 months) within a chatting session following some showing off with eye crinkling etc., ...offers object to F saying 'ta' and waving her fingers with it as an additional call, looking at F's face intently; F stretches hand out to take it, as F's hand comes closer, Shamini with eyes intently on F's face begins to smile, then withdraws object with smile broadening and turns away, then looks back, F laughs, and says in a voice acknowledging being teased 'You gimme, gimme, gimme' stretching his hand closer to her face; Shamini makes briefly as if to run, but is caught by the high chair she is in, then turns around again, by which time, F has withdrawn his hand. She repeats offer saying 'ta, ta' with her face this time less intent and with a slight smile, F holds out hand again, Shamini repeats withdrawal with smile broadening as F's hand approaches and as she turns rapidly away." (Reddy, 1991, p.145)

Reddy sees the infant's ability to engage in such reactions as evidence that 7-12 month old infants possess a theory of mind. In defending this claim, she points out that alternative explanations, based either on behaviourist or Piagetian theorising create a false division between mind and body:

" ...it is possible to explain these sequences in a purely behavioural way, by making a distinction between understanding physical behavioural contingencies and understanding the psychological meaning 'behind' behaviour. The give and take exchanges and the emerging compliance of the nine month old infant can be explained physicalistically; the knowledge involved can be seen as a knowledge simply of the physical actions involved, with no knowledge of the psychological significance of the actions for the other." (Reddy, 1991, p. 152)

The author questions what she regards as the complete separation of the physical form from the psychological.¹⁰ She sees the development of the infant from a behaviourist infant into a mentalist adult as having roots in Piaget's cognitive theory. Piagetian theory advocates that the infant's knowledge must first develop through her own actions upon other objects, both social and nonsocial, and does not distinguish people from other objects. Thus, the understanding of others as psychological beings similar to self, can come only after the self's actions on the world have allowed the formation of cognitive structures which can yield second order representations; development proceeds along a path whereby cognitive structures must mature before the infant can become a symbolic being. Reddy's alternative suggestion is to regard psychological meaning as intrinsic to the understanding of actions, developing only in complexity. In this regard she is in agreement with Trevarthen (Trevarthen and Hubley, 1978) who imputes innate intersubjectivity to the newborn (see Chapter 3). Intersubjectivity is dependent upon the recognition by infants of the psychological similarity between themselves and separate others. For Reddy, proposing an innate intersubjectivity:

"...avoids the trap of the question: 'When do infants come to understand others psychologically? He [Trevarthen] argues that the capacity to recognise similarity between oneself and other persons is present from birth...." (Reddy, 1991, p. 157-158)

While she is justified in criticising cognitive and behaviourist theories for their mind-body dualism, her adoption of the perspective of the interactional other as the unit of analysis is without objective basis. I would also argue that, rather than calling the question of the development of psychological understanding a trap, it lies at the very heart of understanding infant development. As I have argued elsewhere, by implying that this process is innate, it does away with the need to explain how it arises in development. Although there is no doubt that how and when infants come to understand others psychologically is one of the most difficult questions in developmental research, explaining it away by treating it as a 'biological given' does not solve the problem. Indeed, the very meaning of the word *intersubjectivity* implies a psychological understanding *between* two people.

10. Her solution is to create a mentalistic infant. However, in doing so she is being dualistic herself as such a position ignores behaviour and interaction as an integral part of the developing infant.

Reddy regards the infant's rudimentary communicative abilities, such as joint attention and social referencing, as demonstrating the infant's *knowledge* of the other's capacity to perceive, understand and respond to particular actions by the infant. On this basis she states:

" Infants from nine months of age discover that they have minds and that other people have minds as well (Stern, 1985), and that other people's reactions can be messages about shared surroundings." (Reddy, 1991, p.153)

Such an argument is clearly controversial. She is ascribing a self-reflexive ability to the infant, a position which furthermore is not necessary, if one approaches the problem from a Gibsonian perspective.

J.J Gibson (1979) posits the existence of basic 'meaning-sensitive' perceptual faculties. Meanings in the form of 'affordances' are what the infant begins by noticing. This highlights two important points: Firstly, that organisms have innately constituted propensities to perceive the world in such a way as to engage their own tendencies to action. Secondly, we as observers may define a sense in which an organism perceives an object or event as belonging to a certain conception of action (e.g., as a predator), even if the organism itself is merely reacting in an instinctive-mechanistic manner (Hobson, 1991). Defining perceptual capacities, as with expressive capacities, in this way is to indicate what kind of organism-environment relation this kind of 'perception' or 'expression' entails; it is not to suggest that the organism recognises itself to be 'seeing as' or 'feeling as', much less others.

Hobson (1991) argues that the ability of infants to form categories, to infer, and to respond in 'meaningful' ways to their surroundings should not lead to the presupposition that infants *already* have a concept of their own minds or those of others. Taking his reasoning one step further, it may be said that this 'meaningful' aspect of the infant's response to its environment, that is to other persons and objects, is more a property of observers than in the 'mind' of the infant. Adults impute this meaning to the infant; parents infer intentional and communicative capacities from the infant's activities, they might even ascribe the infant with a mind, but that is not to say that the infant does have a mind, much less a theory of mind.

Gibson and Hobson are arguing that, at some basic level, inferential capacities and concept formation can exist, without representation, as innate, in-built processes

that are built on through personal interactions. These abilities, however, do not constitute 'theories' about others' mental states as Hobson (*ibid*) explains:

"It would seem that an individual theorist needs to formulate possibilities *as* possibilities in order to entertain and appraise alternative constructions of reality...It is relevant to note that theory is 'used' by a person rather than operated by mechanisms at a subpersonal level. This implies that in order to have and apply a theory, an individual must know what it is to theorise, and for this he or she must *already* have a concept of his or her own theory holding mind. In order to avoid an infinite regress, therefore, we should have to acknowledge that a person needs to begin by acquiring a concept of mind on some 'non-theoretical' basis." (Hobson, 1991, p.36)

Reddy's argument presupposes that one has a 'self' capable of reflecting on one's own experiences as an innate capacity. In so far as behaviour (whether of the child or others) is supposed merely to provide 'cues' or prompts for such analogical reasoning, the account misrepresents the relation between experience and behaviour. There must be some form of necessary relation between the outward expressions and 'internal' experiences of at least certain mental states, and under at least certain conditions, for the ability of identifying and ascribing mental states to get off the ground (Hobson, 1991). For example, it is mistaken to suppose that one can identify the same mental states or events, as they recur in one's own private experiences, *without recourse to some form of external confirmation or correction by others* (Wittgenstein, 1958).

If, as Reddy does, one assumes that certain critical aspects of one's theory of mind are innate, this raises the question: How does a child come to appreciate that it is appropriate and necessary to consider 'what it is like' to be another person (Nagal, 1979)? Hobson (1991) maintains:

" If one posits a primary, nonderived and essentially 'cognitive' representational (or in this case, metarepresentational) capacity, then one faces thorny problems in trying to link up the representations not only with subjective aspects of mental life, but also with an outside world which includes bodies and the behaviour of bodily endowed persons or more generally, to render meaningful whatever is supposed to pass 'in and out of the black box' of the computational mind (Hamlyn, 1990)." (Hobson, 1991, p.44)

Infants arrive at knowledge about the nature of persons through experience of interpersonal relations. The ability of a child to apprehend another as a person, who has both bodily and mental characteristics, is mediated through innate capacities

for perceptually anchored personal relatedness such as preferences for facial configurations. In this context, the biologically determined 'biases and preconceptions' (Murphy and Medin, 1985) are those that promote and reflect personal relatedness, and it is through such relatedness that an infant establishes the basic ontological distinction between persons and things. Far from reflective self-awareness preceding the ascription of mental states, it is rather that some form of awareness of other minds is a precondition for acquiring reflective self-awareness. This is because, in order to adopt a psychological orientation towards one's own mental states, one needs to appreciate that there are alternative vantage points that one can assume towards a mind-endowed self (Hobson, 1991).

Thus, in summary, infants' capacity for perceptually anchored person relatedness promote their integration into the world of others. The development of perceptual abilities occurs rapidly, and in the context of mother-infant interaction. The discovery of the ability of infants to engage in joint referencing and social referencing has illustrated that the mother is instrumental in aiding the infant in a greater exploration of the environment and in the increasing differentiation of perceptual and exploratory abilities. It has also shown that, while mothers and infants exert a reciprocal influence on each other, mothers, on the one hand, follow the infant by tracking his/her line of gaze, and lead by directing the infant's gaze towards targets of interest in the surrounding environment. Further evidence of the potency of the mother comes from studies on the effect of maternal affective style on the organisation of dyadic interaction.

2.4 The Dyad at Work

"She's smiling at me, speaking to me...more smiles, and just...we'll smile like that at each other for ages."

(Attributed to mother of baby girl, 4-6 month age group)

Currently, there is growing acceptance of the fact that a major component of the mother's behaviour vis-à-vis her infant is its affective quality (Cohn and Tronick, 1989). There have been numerous studies using the still faced paradigm which indicate how lack of maternal interaction and expressivity has disruptive and distressing effects on the infant and, more recently, researchers have been interested

in the effect of maternal depression on infants. There are also a number of findings that suggest that mothers' positive expressions are essential to the quality and organisation of the infants' behaviour.

For example, Cohn and Tronick (1987) observed mother-infant interaction with 3, 6, and 9 month old babies during normal play. They found that babies at each age were far more likely to display positive expressions *after* their mothers did so. At 3 and 6 months, the probability of the infant displaying positive expressions was 0.33 whereas the probability of the infant displaying positive expressions before the mother was only 0.03. Not until 9 months did infants begin to initiate joint positive engagement, but even then the mother was more likely to do so. Thus, mothers' positive expressions provide a frame within which the infant cycles between neutral and positive expressions (Cohn and Tronick, 1987; Kaye and Fogel, 1980).

More specifically, Cohn and Tronick (1983) tested how infants would respond to their mothers if they acted depressed. They found that simulated maternal depression decreased the probability of play and positive expressions and increased negative expressions on the part of the infant. They also found that it disrupted the organisation of mother-infant interaction, with infants displaying more instances of negative expressions and avoidance behaviour (looking away). In another study Cohn and Elmore (1988) modified the still-faced paradigm by testing the contingent effects of the mother's behaviour on the infant by asking the mothers of 3 month old infants to become still-faced for 5 seconds contingent on their infants displaying positive expressions. Infants became less likely to cycle between positive and neutral expressions and more likely to turn away. These results were replicated using video monitors instead of direct interaction (Gusella, Muir and Tronick, 1988) and demonstrate that infants are highly sensitive to the quality and reciprocity of mothers' emotional responses.

A further study by Cohn and Tronick (1989) looked at the effect of maternal behaviour in multi-problem families. These mothers displayed high rates of self-reported depressive symptoms and had been identified as having high rates of factors associated with risk of childhood behaviour disorders and thus needing intervention. Mothers were found to be withdrawn, or interacted in an aggressive, intrusive way with few positive affective expressions. They found that, when mothers were unable to provide periods of positive expressions, infants' expressions were limited to neutral or negative displays and became less involved with both persons and objects. These

results were found to be consistent across situations. More specifically, the infants of disengaged mothers were distressed and unsuccessfully sought engagement. Those of intrusive mothers looked away, whereas those of mixed and positive mothers had a greater breadth of behaviour and expression.

Thus, infants respond to the affective quality of their mothers' behaviours in a way that is specific to that affect. Put another way, the results presented here indicate the significance that the facial expressions of others hold for the infant. Such results are important in the light of the ability of infants to respond to external stimuli and, especially, their ability to discriminate between different facial expressions. The overall picture created by the evidence presented is that the infant's responsivity to the environment is part of a tightly interconnected system, whereby the infant's responses never occur in isolation from the wider social context in which she exists. At all levels of functioning, be they perceptual, affective, cognitive or behavioural, the child's actions are incorporated into the inter-personal context of interaction. The question now remains as to how the mother's role can be conceptualised within the broader theoretical framework that was discussed earlier.

2.5 The Role of the Mother

In many ways the material already presented has demonstrated the importance of the mother's role. That is, in studies on maternal responsivity to the infant, her differential responding (Chapter 1) and how she is able to direct interaction through joint attention and referencing and in experiments demonstrating how a change in her behaviour and affect can have profound effects on interaction. There have been other studies which have looked at how mothers may have long-term effects on infant development. These studies have been concerned with either infant temperament or cross-cultural variation in maternal interaction styles and their influence on the infant. The latter research focus is more appropriate to our discussion as it demonstrates theoretical points made earlier about the socio-cultural nature of emotion.

The importance of the mother's role in the infant's socialisation is highlighted by the implications of how her beliefs can affect the development of the child. Super and Harkness (1991) argue, for example, that:

"The emotional differentiation of settings in early childhood is part of the culturally regulated sequence of development. Intimately related to differentiation of settings is the way superficially similar developmental transitions can yield divergent psychological meanings depending on the preceding and surrounding experience... The emergent patterning of emotional expression across settings, and the sequence of settings across time, are probably more important for the normal socialisation of affect than learning in any one situation." (Harkness and Super, 1991, p. 69)

Similarly, Rabain-Jamin (1989), reporting on differences in maternal interaction styles between African and French families, points out that:

"...child-rearing practices clearly affect social behaviours. The fact that parents emphasise one type of activity over another in early social exchanges can have long-term effects and even create obstacles later on in adulthood for individuals who are confronted with other social models - for example, in another culture." (Rabain-Jamin, 1989, p.231)

There are many examples of cultural differences in emphasis and style of instruction, although there are also universals in certain patterns of development, such as onset of age of smiling and frequency of smiling between mothers and 3 month old infants. Differences between cultural groups have been attributed to parental values and beliefs and to the structuring of the child's development by the physical and social resources for caretaking. The expression of parental values is not a direct effort to achieve some later effect. Super and Harkness (1991) state:

"Their expression is, rather, a more immediate reflection of adult psychological functioning. That is, values influence behaviour more in the sense of 'This is the way I feel like acting with my baby' or 'This is the way I would like to see my baby act' ... Socialisation values at this age are expressive goals in their own right, not only means to some later goal...The effect of such socialisation is usually to provide the infant..with practice in culturally appropriate social and emotional behaviour." (Harkness and Super, 1991, p.63)

Some examples will serve to demonstrate the above points. One study, which compared American with Japanese mothers, found that Japanese mothers spend large amounts of time soothing and quietening their babies, rather than stimulating them with active 'chatting' as American mothers do. The patterns of social intercourse that result are consistent with the interaction patterns at later ages and with the larger patterns of the social milieu in the two cultures. American mothers encourage open, expressive, independent and assertive behaviour, whilst Japanese mothers seek quiet,

contented babies (Caudill and Frost, 1973). Parents' beliefs about the nature of infants shape the emotional lives of infants. The Kwoma of New Guinea and Zinacantecans of Mexico, for example, believe that the infant is vulnerable to supernatural threats. They keep their babies close and quiet (Brazelton et al., 1969; Whiting, 1971).

The mother's role in socialisation has also been investigated in object related play (Dixon et al., 1984). Important differences were found between American middle-class mothers and Gusii mothers in Kenya, when teaching 6 to 25 month old infants a task. There were pronounced differences between the two groups of mothers in the type of verbal interaction and the type of control over the child. Gusii mothers tend to control their infants visually more than verbally. They use physical contact and physical control to orient their infant toward the task. They use a high amount of instruction and do not encourage the child through praise. American mothers, on the other hand, provide verbal encouragement and their mode of teaching includes more modelling, a considerable amount of remarks on the child's mood as well as reflections on the child's actions.

The authors found that infant behaviours also showed variations. American infants between 6 and 8 months spent more time at play with the toys outside the task structure than did the Gusii babies. There was a trend for Gusii babies to attempt the task more frequently, and social interaction with mothers was more frequent than with the American sample. In the 12-14 month old age groups, they found some differences between American and Gusii babies in specific tasks. For example, a pegboard task elicited more directed attempts by Gusii babies, whereas the American infants used the pegs and board for play outside the task. Similarly, face to face and other social interactions occurred more frequently with a stacking-block task among Gusii infants. In general, they found that the frequency of attempts, or compliance with the teaching task structure, was greater for the Gusii infants than the American infants.

The studies presented above demonstrate, perhaps indirectly, how maternal strategies with their infants have important consequences for the way infants learn to interact vis-à-vis the external environment. More specifically, they highlight how socialisation factors at the level of dyadic interactions exerts influences that go far beyond that level to reinforce cultural and belief systems. The literature also highlights an important aspect of interaction. The mother leads the interaction. The way in which she defines the situation and defines her goals vis-à-vis the infant

determine what she will respond to and how. This must not be understood to mean that dyadic interaction is unicausal, with the mother represented as a conditioning stimulus. Interaction is reciprocal and multifaceted, but the prescriptive quality of maternal interpretation of infant behaviours creates the directionality required to socialise the infant in ways that are congruent with cultural and social norms.

2.6 Theory and Objectives Revisited

We have seen from a review of the literature that there has been a widespread neglect of important social influences on emotional development in infancy. The focus of individualistic theories has been the objective evaluation of emotional responsivity as stimulus-response contingencies. Adopting an external perspective on emotionality has resulted in the neglect of the influence of maternal perceptions on infant behaviour. By adhering to biologically based explanations of the development of facial expressions and emotions, they have ignored the importance of social context in the production and recognition of facial expressions. As we have seen, the perceptual and cognitive skills of the infant are embedded in interpersonal contexts. The evidence on joint and social referencing, taken together with the rapidly developing information processing capabilities of the infant, provide strong evidence for the importance of the mother in the differentiation of infant capacities. Mothers structure interaction by selecting objects for joint focus, providing information on how to feel about these objects and responding to the infant in culturally, socially and situationally prescribed ways. The profound influence of maternal affective style on infants' behaviour and affective responsivity has been demonstrated by research on simulated and actual maternal depression. The precocious ability of infants to categorise and differentiate stimuli, to perceive continuity in action sequences, and to integrate information from multiple modalities, points to the importance of involving the perspective of the interactional other in the differentiation and integration of infant capacities. In the light of the literature discussed above, the evidence on the importance of culture and context in the interpretation of emotional displays places the emphasis squarely on maternal interpretations of infant emotional displays as a crucial factor in the development of emotionality.

The focus of this study is to find out how, in early infancy, the initial rudimentary acquisition of sociocultural frames of reference occurs. This involves investigating how the initial emotion displays of the infant are appropriated by the caretaker within social frameworks that define and constrain the significance of rudimentary skills for the infant. It is hypothesised that infants' facial expressions develop and are socialised through a processes of social interaction in which maternal interpretations of the infants' expressions are instrumental in structuring the environment for the infant in socially meaningful ways, embedding the infants' actions in social frameworks. By selecting specific facial expressions within specific situational and social contexts, and responding to them on the basis of what meaning they have for her, the mother imbues the interaction with meaning both for herself and increasingly for her infant. Her role is one of instruction; instructing the infant on the meaning of facial expressions when they are displayed in specific situational contexts.

We have found evidence of sophisticated perceptual and inferential skills in the infant, which indicate that 5-6 month old infants can discern differences in facial expressions. But by 9 months important developments occur that are believed to influence the infant's emotionality. Social referencing and joint referencing develop and thus pave the way for a greater sharing of events between mothers and infants. At this age the mother's interpretations and responses to the infant take on significance for the infant. It is proposed that, with each new development of infant skills, mothers' perceptions of their infants' change, influencing how they segment the infants' actions and what meaning they ascribe to them. How mothers perceive and understand their infants' facial expressions is an important indicator of what aspects of the infants' repertoire the mothers find important at a given age and in given situations and thus what is salient to them in interaction. One may argue that the process just described involves nothing more than the application of behaviouristic principles whereby the mother's interpretations and selections of infant acts is the result of the mother being conditioned to select certain infant behaviours. In the following chapter it will be demonstrated that the theory advocated here is in direct contradiction to the behaviourist paradigm.

CHAPTER 3

THE ROLE OF THE MOTHER IN DEVELOPMENT

"He saw something on the table he wanted and started calling for that, which I knew 'cause he looked away immediately and then started pointing, going 'Um, um, um', which is his way of saying 'Get me what I want, slave'."

(Attributed to mother of baby boy, 10-12 month age group)

3.0 Chapter Aims

In assessing the infant's effect on the parent, this thesis expands on the role of the active environment in development. The ways in which the developmental literature has addressed the mother's role in development will be discussed and empirical studies which have attempted to examine maternal reports reviewed. It is argued that mother-infant interaction is bidirectional, characterised by reciprocal causality. Models which represent interaction (and development) as linear, misrepresent the nature of development and are unsuitable frameworks for examining the role of maternal interpretations in socialising infant emotionality.

3.1 Theoretical Frameworks and Structural Models

Infant research is often centred around implicit, underlying models of the nature of development and interaction. Overton and Reese (1973) suggest that models perform many functions:

" First, to the extent that theory building is involved, models establish the basic categories which determine the introduction of certain classes of theoretical constructs and the exclusion of others. For example, it is no accident, but rather a reflection of the adherence to a particular model that Erikson (1950), Piaget (1967) and Werner (1948) all introduced constructs which explicitly postulate the direction of developmental change while general behaviour theorists do not introduce constructs of this type. Second, models explicate particular features of theories. Examples are the two-stage or mediational model (e.g., Kendler and Kendler, 1970) operating within general behaviour theory, and the equilibrium model operating within Piaget's theory (Piaget, 1967). Third, models aid in the deployment or extension of theories (Lachman, 1960; Toulmin, 1962). Finally, regardless of whether explicit theories are employed or not, models function to define meaningful problems for investigation, to suggest types of methods for exploring these problems, and

to provide types of explanations for interpreting the data (Fodor, 1968, Kessel, 1969, White, 1970)." (Overton and Reese, 1973, pp.67-68)

In the following discussion, some of the functions outlined above will be discussed; how different models conceptualise the impetus of developmental change, what child-environment relationships they use to do so and how this is illustrated in theories of emotional development. How the role of the environment is conceptualised within the framework of the present thesis will be demonstrated, through expanding and illustrating the role of the mother in development theoretically and empirically.

3.2 Models Characterising Person-Environment Relationships

Riegel (1978) places models of development into four categories reflecting various combinations of passive and active persons and environments. In the passive environment-passive person category, he places mechanistic theories that arose from the empiricist philosophy of Lock and Hume. Such models proposed that combinations of events that occur in the environment in the presence of observers are imprinted on their minds. This view has served as a basis for learning theories, in which factors such as the frequency or recency of stimuli determine how they will be coded in the receiving mind. In a similar manner, naturalist theories of emotional development argue that the infant is born with an innate repertoire of emotions. Any differentiation that ensues over time is attributed to the effect of invariant biological maturation resulting from environmental stimulation. The structures which serve to define the function of emotions are physiological rather than psychological. Physiological processes are subject to stimulus response laws and, as such, the goal of analysis is to reveal antecedent-consequent relations rather than structures, and contingent relations rather than functions. The analysis of structure-function involves the attribution of purpose, goal or function to the organism. Such a position implies that cognition plays an essential role in emotional development, an argument that is rejected by the naturalist theories of emotion.

The second category is the passive person-active environment model. Examples of this are Skinnerian approaches to behaviour modification. The person's

behaviour is actively structured by the environment (the conditioner) in particular directions. The person does not contribute to the outcome. Within developmental psychology, this approach is characterised by its adherence to external causality as the main cornerstone of development. Infants do not mature as active persons capable of deliberate actions, but as organisms adhering to basic cause-effect patterns. Development is explained in terms of simple stimulus-response contingencies and is therefore unidirectional and unicausal. The infant is in a state of inertia until s/he is stimulated by the environment. Emotion theories which propose that the infant can be conditioned to respond to social situations using display rules (Ekman, 1980), adhere to this framework; the infant's emotional reactions to events are 'socialised' by the contingent responses of others. In adopting this position, later forms of emotionality are not distinguished as qualitatively different and irreducible to earlier forms due to their integration into cognitively mediated processes. Furthermore, infant emotional displays are approached from the perspective of the external observer and, hence, there is an implicit denial that any socio-cognitive processes in the mother are responsible for the emotional development of the child.

The third category of models characterises the person as active and the environment as passive. Models of development which retain this concept are those of Piaget and Chomsky. Piaget sees the infant as an active constructor of knowledge based on experience of the environment. Although the environment is a necessary part of development, it has no active role in structuring thought or action. In the same way, Chomsky sees language developing as a result of the child's application of innate linguistic categories to linguistic experience. How this experience is organised is not a determinant of language competence (Sameroff, 1991). The child develops alone in this model (Feinman, 1991). In the Piagetian view, it is direct experiential contact (motor activity) with the world, rather than what is learned from other people that is the primary force which drives the infant's cognitive development. Cognitive growth derives mainly from direct experiential learning rather than from social learning. As Bruner (1983a) has observed,

"The world is a quiet place for Piaget's growing child. He is virtually alone in it, a world of objects that he must array in space, time, and causal relationships...[in which] others give him little help." (Bruner, 1983a, p.138)

Consequently, research paradigms stemming from this model framework have not sought to understand how the wider environment can actively shape the infant's developing capacities through an interplay of forces in which both the infant and the environment are active. Sroufe's theory of emotional development retains the active person-passive environment model characteristic of Piagetian theory. Although Sroufe is careful to differentiate the presence of basic physiological reactions from later emotion states, he neglects to integrate cognitive capacities with the development of emotionality. The missing link is reciprocal social interaction.

Models which combine an active person with an active environment stress that the actions of the individual change reality and changes in reality, in turn, affect the behaviour of the individual. In this view, developmental outcomes are not a product of the initial characteristics of the child or the context or even the combination of the two. They are the result of the interplay between the child, the context and the time, representing development as a dialectic process. Social approaches to development specifically emphasise the importance of interactional social others in the infant's development and in doing so they represent development along active environment-active person models. The theory proposed here argues that, although infants are active information processors, mothers continuously incorporate these skills in everyday contexts and activities by defining and responding to them in socially appropriate ways. Affect develops out of this context, aided by processes of social and joint referencing. The environment, far from being passive, undergoes change and reorganisation which is sensitive to the child's growing cognitive and social skills, and directly influences the further development of these skills. The mother, or primary caretaker, is the agent of this environmental reorganisation.

The social constructivist accounts of emotional development recognise that an essential component of emotion is cognition, and that the development of emotion rests on the infant's active assimilation and accommodation of emotion rules through social interactions with others. Thus, it represents both the child and the environment as active in shaping affect. They reject nativistic accounts of emotion and recognise that infants' expressions are construed within social contexts that influence their meaning and adults' responses to them; hence, they retain the perspective of the 'other' in interaction. The process of emotional development is not seen as one in which basic constituents are added upon to produce the final ingredient. Emotion develops out of the child's growing understanding of his/her role in the context of

the wider social group. As I have argued in Chapter 2, infant skills cannot be understood outside the functions they fulfil within the wider system of interaction. They must be investigated, not only in the way the environment actively shapes the infant's emotionality, but also in the way the infant affects its environment. The mother's schema of her infant's skill is actively shaped and shapes the way she interacts with her baby. Examining the mother's perspective on the interaction recognises the active nature of both pairs in the dyad and thus adheres to an active person-active environment model.

In most of the theories reviewed there is a marked shying away from representing theoretical constructs in terms of direct developmental processes. Emotion theorists represent emotional development along a set of principles and constructs derived largely from characterising emotions phylogenetically rather than ontogenetically. I believe that this avoidance highlights an unwillingness to unravel the implications of how these theories represent developmental change. It is therefore not surprising that the new organisational theorists appear to be unclear on the specific role that cognition and socialisation play in emotional development. Similarly, although they pay lip service to the importance of the environment, at no point is this environmental influence, or how it shapes and is shaped by the child, fully explained. The reader is therefore left wondering how emotional development ties in with other developmental processes in infancy.

The discussion above has highlighted how different emotion theories make implicit assumptions about the nature of development and the interaction between the infant and its environment. Most of these theories have neglected some aspect of development and interaction. The active-person active-environment social theory discussed in Chapter 1 presents a holistic approach to understanding emotional development and interaction, to the extent that it provides the potential for highlighting the importance of both the infant and the environment in producing a developmental outcome. However, in focusing on the regulatory and formative aspects of cultural influences in development, research stemming from this approach has tended to concentrate on more broad-based issues like child rearing practices and how these relate to general cultural patterns. There is a lack of research on the more specific mechanisms of this "cultural code" (Sameroff, 1991). Investigating the way mothers, as carriers of the social code, interpret the infant's facial expressions and emotional state is an initial attempt to integrate an analysis of the socio-cognitive

schemata of the primary caregiver with the expressive behaviour of the infant. Why this is important is explicated in the next section on the ways in which the mother's role is instrumental in the development of infant skills.

3.3 The Environment, the Mother and the Process of Development

"She raised her eyebrows and looked at me which meant that this was quite interesting or good fun."

Question: How would you respond when she does that?

"Just do the same thing or do it more boisterously or something to make it more involved."

(Attributed to mother of baby girl, 10-12 month age group)

The adult's role in development is succinctly summarised by Feinman (1991) in the following way:

"... The infant's development is guided by the adult's provision of both structure and meaning. Through organising, arranging and simplifying tasks, sequencing and ordering activities, offering opportunities, limiting access, managing focus, and gradually transferring responsibility to the child, the adult structures the infant's participation. By conveying information, strategies and definitions, the adult endows the situation with meaning." (Feinman, 1991, p.297)

While most of the ideas on the adult's active role in social development have arisen from work on language acquisition, the general principles are applicable to any action by the infant which serves a social and communicative purpose. Two central assumptions must be recognised when looking at the communicative aspects of infant expressive signals: Firstly, that the human baby comes equipped with a repertoire of proto-social behaviours which are the basic equipment with which she enters into face to face interpersonal communication. And, secondly, that communication is both process and content and that the baby may be involved in the process long before he or she can share in the content (Newson, 1979). The role of the mother may be seen as an attempt to enter into a meaningful set of exchanges with her infant, a view which is supported by the above two assumptions. The mother's role is instrumental in creating a shared understanding between herself and her infant. Such a

perspective on interaction does not conceal the asymmetry of the mother infant relationship. The mother is the agent responsible for the introduction of meaning into the dialogue through her interpretative responses to the baby's facial expressions. By selecting a specific expression from the vague and undifferentiated stream of facial expressions, she marks out the expression as if the child's intention was present in the act of expressing it. Evidence for the importance of the mother's interpretation of the infant is to be found in the fact that the baby's expressions have different communicative significance depending on the different contexts in which they occur and, secondly, by the fact that the infant's signals are only given the status of communicative signals to the extent that the mother imputes that status to them.

What the child does spontaneously at first is selected by the parents as significant gestures and acted upon in such a way that s/he is taught the use of the action in social context. The child is learning a retrospective evaluation of her own behaviour. Far from assuming any process of orthogenesis, the task constraints that the mother imposes upon what she regards as the communicative behaviour of the baby is what leads to the development of communicative abilities:

"His task [i.e., the infant's] in learning how to make sense to others is not so much learning new movements that he has never made before, as that of learning a social use of movements that he makes all the time." (Newson and Shotter, 1974, p.346)

Thus, as has been argued in Chapters 1 and 2, facial expressions of infants acquire their meaning and usage through the everyday situations in which they occur. This includes whether or not a particular expression was instrumental in achieving the infant's goal which, in turn, rests with the parent's socially appropriate interpretation of, and reaction to, the emotion state of the infant within the particular context in which it occurs. Along the course of the infant's development a transition takes place whereby the initial process of interpretation of others is internalised and becomes the internal process which enables the infant to express herself in the knowledge and expectation of how this will affect the other, usually the mother.

The concept of intentionality is central to this process. There are two types of intentions. Firstly, there are intentional acts which animals are capable of. These are signs whose occurrence causes other organisms to infer something from them. Secondly, there are intentional signals which are performed with the explicit purpose that the other should infer an intention from them, i.e., they are gestures. They are

conventional gestures in that they have a shared meaning within the particular social system in which they take place. Emotions arise out of the negotiation of conventional gestures between mother and infant.

Parents structure and organise the signals of the infant persistently and systematically so as to create directionality and intentionality within action sequences. By fitting their own actions around the infant's behaviours adults coordinate the infant's actions with their own in repeated instances of similar situations, and enable the infant to complete tasks that the infant could not complete on her own. Coordination is not arrived at by the infant independently; actions are organised from outside by adults. As no event is entirely novel, the slightly repetitive character of events surrounding the infant allows new events to be assimilated to particular existing schemas of skills and those schemas to be accommodated to them (Kaye, 1982). This ability of skills to become coordinated on the basis of their common factors allows us (and parents) to attribute meaning to them, and meaning to the child's experience of them. A skill develops through the mutual negotiation of the constituents of that skill by older members of the social group. The process through which it is acquired must be based on a shared understanding of the purpose of that skill. In other words, the adult member must have a schema or representation of the infant's behaviour in order to organise their own actions vis-à-vis the infant. For example, Reissland (1990), examining Kaye's (1982) concept of 'frames' which he uses to describe the ways in which parents organise their activities around their infants, found age related differences in the way mothers elicited pleasure and pride in their infants. Similarly, adults initiate face to face games such as peekaboo with their infants. The infant may learn one aspect of this sequence, such as hiding her face, but not expressing surprise when she sees the mother's face. The mother will express surprise automatically as part of the sequence of playing peekaboo. In later peekaboo games the infant will eventually learn to express surprise as part of playing the game, hence mastering the skill in its entirety (Bruner, 1983a). Thus, in order for the infant to learn the whole routine, she needs feedback in the execution of the subroutines from one who is familiar with the skill and therefore with the subroutines. This necessarily must depend on the adult having a representation of the infant's skill at any one stage of development.

Infancy has been conceptualised by many developmentalists as the social negotiation of age related issues (Erikson, 1950; Sander, 1962; Spitz, 1965; Mahler,

1968). Development is viewed as a regulatory process whereby parents build conventions out of the infants' actions and signals. Conventions coordinate schemata and action between the same individuals in repeated instances of similar situations. They develop when participants in an interaction have a coordination problem, the solution being the convention. In this way, conventions arise within development as a part of a mutual partnership between an infant and its caretaker. Socialisation may be represented as a process in which social conventions develop in order to serve as transitional structures between an earlier and a later stage of development of the individual. For example, Bruner (1981) suggests that the mother coordinates her own action with the child's by setting up conventionalised "action formats". These formats provide recurrent opportunities for the child to develop ways of signalling her intentions, and to learn to interpret the mother's signals.

Conventions are thus negotiated in an already conventionalised format and serve as transitional structures for the development of stable routines or games. They are not simply a response to an immediately prior stimulus, but to the whole context in which the stimulus occurs. A change in the context will change the meaning of the stimulus for the receiver. The role of the caregiver in interaction may thus be conceptualised as one of teaching skills to the infant by interpreting the infant's intentions and fulfilling them. In doing so, the adult demonstrates how to perform effectively vis-à-vis the environment. The infant's actions become coordinated through this parental mechanism. Repetitiveness and novelty aid in the child's internalisation of these routines. By negotiating outcomes of actions in systematic and consistent ways, caregivers imbue the interaction with meaning for the child in ways that are appropriate in the context of the infant's wider behavioural actions and the situation in which s/he is in.

The process described above involves regarding both the parent and the infant as affecting each other, and overcomes the one sided responsibility of assigning the task of learning to the infant. Assigning importance to the active participation of adults does not conceal the active nature of the child. Infants play an active part in their development, both in the effect they have on others and by their ability to internalise the initial process of others' interpretations. However, for this dyadic process to work, two important concepts must be combined; the idea that parents and infants constitute a "social system", and the concept of "intersubjectivity" or shared understanding between individuals (Kaye, 1982).

3.3.1 Social Systems

"...he looked at me *before I clapped my hands* 'cause he thought it was what I was going to do...it's the anticipation."

(Attributed by mother of baby boy, 7-9 months)

The concept of "system" as used to describe mother-infant interaction was first adapted for use in infancy research by Bowlby (1969) and Ainsworth (1964). It called attention to how parents play an active part in development by highlighting the infant's effect upon parental behaviour. Its emphasis was in analysing the whole, or the dyad, and rejecting the linear unitary causality of mechanistic approaches which restrict themselves to unidirectional models of the mother-infant system (Fogel, 1976).

Bowlby's ethological orientation has resulted in a growing popularity of conceiving development along general system principles (von Bertalanffy, 1968). The attraction of General Systems theory rests in its ability to provide a common language within which it is possible to integrate different facets of development across multiple domains. Using System's theory terminology, social systems, characterised as "open systems", are defined by their violation of the second law of thermodynamics; entropy. That is, with increasing time, there will be increasing disorganisation. Over the life time of an open system there is "negative entropy", an increasing organisation at decreasing cost in energy and so the system develops so as to function more efficiently vis-à-vis the outside world (Kaye, 1982). All biological and social systems are open systems. However, there are two criteria which distinguish social systems from biological systems. The first of these is a "shared history," shared ontologically rather than phylogenetically, between two or more members within the system such that they know each other individually and can anticipate each other's behaviour. Secondly, the members must be working towards a shared purpose (e.g., bees in a hive). Their ability to anticipate each other's intentions, however, need not rest on a shared individual history but can rest on the common understandings of the species (for example, two people in a lift); they do not necessarily know each other, therefore they do not share a common history ontogenetically, and yet they share a common purpose in that they have both entered the lift with a common purpose of ascending or descending. Thus the two criteria are independent, but essential, distinctions of what constitutes a social system. The mother and infant do not begin to be a social system until the infant too has expectations of how the mother will behave. This

expectation must be based on a shared history together and not on genetically programmed information (Kaye, *ibid*).

An important implication of defining social systems on the basis of these criteria is that contingency functions *per se* are not sufficient to account for the development of the social responses of the infant. For the mother and infant to be a social system there must be a mutual exchange of specific signs which have evolved through a common history of negotiation of the meaning of these signs. Studies which have attempted to justify the idea of a mother infant system as contingent behaviours which occur moment to moment, such as those performed on gaze by Stern (1974) and crying (Bernal, 1972; DeVore and Konner, 1974; Wolff, 1969) have all laid to rest any notion of a one way model of development. However, what they have revealed are mutual contingencies which are provided by evolution, not by the shared experience of the individual mother and baby.

Evolution has provided the infant with predetermined reflexes and adaptive mechanisms which may be seen in the behavioural repertoire of any infant anywhere in the world. However, beyond primary fixed action patterns, each infant will be socialised according to the social and cultural group to which he or she belongs. This does not occur automatically but rests on a shared history or shared ontology between the infant and its caretaker. Experiments which have violated normal interaction patterns have not produced evidence of a true social system. For example Tronick, Als and Adamson (1979) asked mothers to stare blankly at their infants for part of the session, then to show their profiles. Ten week old babies showed marked withdrawal and distress at this and were slow to resume 'normal' interaction with their mothers. Trevarthen (1977) has reported similar results. These studies demonstrate that infants expect face to face interaction to proceed in certain ways. This evidence tells us no more than that these interactions originate from an innate response repertoire that is effectively suited to some kinds of adult behaviour and poorly suited to others which adults do not normally produce. That is to say, these expectations do not depend upon the development of a dyadic relationship with a particular caretaker (Kaye, 1982).

It is possible to violate the rules of normal interaction in a way that adults would find disturbing without upsetting the infant as long as his or her ability to engage in mutual gaze, smiling and vocalising is not disrupted. Bower (1974) used mirrors to present infants with three identical images of their mothers, each inter-

acting with them "live". Up to 6 months, infants did not seem at all surprised, interacting normally with one image and then another. Only at stage IV object permanence did the infants understand that a mother's face should not be at several places at once, at which infants showed signs of distress. It is significant to note here that it is only at this age, 7-8 months, which marks the beginning of the use of conventions (as evidenced by the infant's ability to take an initiatory role in greeting the mother and in smiling in anticipation of the mother's face reappearing in the peek a boo games) that the infant notices the violation in the interaction. The integration of the infant into the social world of the adult comes about gradually.

The gradual organisation and differentiation of face to face interaction is demonstrated in studies which have examined temporal structuring of dyadic interaction. For example, in a study conducted by Kaye and Fogel (1980), 6 week old infants' expressions were found to be random and haphazard during face to face play with their mothers. By 13 weeks, however, there was a clustering of expressions when infants were attending to their mothers. Furthermore, whereas at 6 weeks there were almost no expressive responses to maternal greetings, at 13 weeks, infant smiles were most frequently elicited as responses to maternal behaviour. By 26 weeks, smiling did not depend at all upon elicitation by the mother. Infants were able to assume the role of initiators of greetings themselves. These results have also been demonstrated by Lamb, Morrison and Malkin (1987).

These findings provide evidence that the organisation of face to face expressions in the young infant's behaviour only appears gradually and is not an inborn capacity. They indicate that the mother-infant system is not simply a matter of contingency functions, but rests on the infant's acquisition of the preliminary skills for social interaction. Social systems then necessitate that both interactors have shared experiences and shared expectations of the other partner. While biology has endowed the infant with the basic repertoire of behaviours which ensure its survival, its development beyond these basic processes depends on interaction with others. The caregiver's propensity for interpreting, structuring and organising is utilised by the infant to share an increasingly responsible role in interacting with the environment and making sense of it. As with the organisation of actions, the ability of infants to share a common perspective of the world with adults is also a gradual process which emerges out of mother-infant interaction.

3.3.2 Intersubjectivity

"That's when he fully understands what you mean by no. He wants you to know he still wants to do it anyway. That noise, that kind of 'You're not being fair' noise, and the fact that he kept his finger on the thing. He understood what I was saying to him. If he hadn't understood, he would have carried on anyway. But making that noise is his kind of 'I don't think you're being fair noise.'"

(Attributed to mother of baby boy, 10-12 month old age group)

Intersubjectivity, the gradual ability of the infant to share a common perspective on the world with the adult, the meeting of minds, marks the child's entry into the adult's world. Through a process of mutual negotiation of meaning and dialogue, mothers and infants are able to build an increasingly shared perspective on the world. Intersubjectivity is thus a result of a process of negotiation of meaning and, as such, it is an emergent process. Some developmentalists, however, propose that intersubjectivity is an inborn capacity. One such researcher is Trevarthen.

Trevarthen's work on has had a major impact on mother-infant interaction research. His theoretical stance, however, makes explicit assumptions about the infant's capabilities which have not been substantiated by research findings. Of relevance to our discussion is his attribution of "primary intersubjectivity" to infants (Trevarthen, 1979). He proposes that infants possess a specific and innate kind of sociability which mediates communication between the infant and its caregiver.

He derives evidence for this from the behaviour of babies interacting with mothers, which has a highly organised sequence of adult-like actions that bear a striking resemblance to a turn taking dialogue. For example, Trevarthen (1986) has shown in studies of slow motion video analysis that infant activities are highly synchronised with each other and, secondly, that their action sequences are temporally organised so that they can mesh with a high degree of precision with similar patterns of action produced by mothers. It is not surprising that babies possess this characteristic pattern of response. The baby must come equipped with mechanisms which ensure its survival which surely must depend on maintaining proximity with the mother (Bowlby, 1969). Infants are inherently responsive to those patterns of temporal movement which typically govern the episodic behaviour cycles characteristic of most living organisms. Whilst it seems true that babies do come with certain behavioural, visual and attentional preferences and patterns which fit into the ongoing stream of interaction, attributing intersubjectivity to these primary encounters

is premature. The Kaye and Fogel (1980) study mentioned above supports this view by demonstrating that this organisation is a gradual process rather than an inborn capacity.

Moreover, responsibility for the fine-tuning of interaction does not necessarily fall on the infant. For example, Murray and Trevarthen (1986) experimentally manipulated the behaviours of mothers and 8.3 week old infants in an attempt to determine who is responsible for the temporal fine tuning during vocal engagements. In adults, the avoidance of co-vocalisations (overlaps) is one means by which adult partners jointly manage conversational interaction. From this viewpoint, the occurrence of co-vocalisations is not considered to be determined by one or other of the partners alone (i.e., unilaterally determined). Murray and Trevarthen believe that the presence of this temporal structuring in mother-infant vocalisation is evidence that infants in the first few months are able to temporally adapt to vocal ('communicative') behaviour in terms of their mothers in conversational ways. However, other studies (e.g., Elias, Hayes, and Broerse, 1986; Elias et al., 1988) have shown that the temporal characteristics of inter-speaker silences is the result of mothers attempting to engage 13 to 15-week old infants in turn-taking encounters. Elias et al. (1986) proposed that, if the mother was largely responsible for the temporal structure of the encounters, she would be concerned with establishing and maintaining turn-taking with her infant. One would therefore expect that the mother would take her turn rapidly after the infant vocalised if she was attempting to create a conversation. Conversely, it would be expected that the mother would allow a relatively lengthy silence after her own vocalisation so as to maximise her infant's opportunity to produce a vocalisation in turn. Results showed that, when compared to vocal patterns that were randomised, Infant-silence-Mother silence durations were shorter than the randomised record, while Mother-silence-Infant silence durations were longer. These findings are consistent with the proposal that within the general framework of mutual influence, the fine temporal adjustments are managed by the mother. In this way mothers control the temporal structure of dyadic episodes in their attempts to engage their infants in turn-taking encounters. Such findings clearly indicate that mothers structure the infants' input.

The process described by Trevarthen makes more theoretical sense if it is inverted. Rather than intersubjectivity determining organisation of interaction, organisation of interaction is the precondition for the growth of intersubjectivity

between mother and infant. Preliminary skills aid in the process rather than presuppose it. What may be said to be happening at this early stage is a negotiation by the mother of the joint activities of herself and her baby and a common meeting ground of the perspective of the two actors.

Within dialogue, negotiated meaning becomes shared meaning through a process of mutually shared activities and ritual sequences. Only when the infant is able to use behaviour intentionally, to produce an effect on another, can we begin to speak of intersubjectivity, for it is a necessary precondition of this function that there is shared meaning between mother and child. Viewed thus, the primary structure of the communication between mother and infant may be seen as a precursor of this later development and not an endpoint in development.

The mother must necessarily play a greater role in the interaction. The infant, however, does share an active part in the dialogue by virtue of her capabilities; it is in this sense that meaning is negotiated, for the mother does not have complete control over the interaction and she must modify her action alongside her perception of what she thinks the baby is doing. In doing so the baby is, on the one hand, given a partially autonomous role in interaction whilst, on the other, her behaviour is framed by the mother's calculated response and thus imbued with meaning. As far as the infant is concerned, particular actions are rendered significant by the quality and timing of the mother's gestural and vocal reciprocation. For example, Stern (1974) and Stern et al. (1977) found that mothers' facial expressions and speech when interacting with their infants were in keeping with the infants perceptual abilities at that age. This accommodation was in the form of what they called "infant elicited social behaviours". Adults' behaviour when attending to an infant is characterised by being exaggerated in time and space. Relative to adult facial expressions, the mothers' expressions towards their infants are generally slow to form and are held for a long time. Maternal gaze is also extraordinarily long compared to average adult gaze exchanges (Argyle and Kendon, 1967). Her repertoire of expressions for the infant consist of smiles, expressions of concern and sympathy and mock surprise, all of which are highly exaggerated. These behaviours are also highly repetitious, sometimes turning into runs (defined by Stern as an episode lasting a minute or two during which a definite tempo is maintained). In effect what this creates is a highlighting or marking of certain events as having special significance and hence

punctuates the contribution which the baby is making according to a pattern of meaning which is, to a large extent, being imposed by the more sophisticated partner.

Thus, mothers, while largely accommodative in the early months, play a crucial role in regulating interaction, providing frameworks within which the infant's behaviour is both effective and meaningful vis-à-vis the environment. By creating dialogic sequences which have a highly repetitive character, she provides the infant with a stable organisation. By creating variations in the sequences, she introduces novelty and complexity. Meaning arises out of interaction, as mothers mark off behaviours and respond to them, involving the infant in the communicative process even though the infant is not yet able to understand the content.

Newson (1977) has expressed a methodological concern stemming from this approach which stresses the need to tap into the significance that these dialogues have for the mother. In this connection, he has proposed that the roles of observer and participant in mother infant interaction are separate and distinct. As an actor, the mother cannot pay full attention to her own behaviour as it would seriously interfere with the interaction. She can, however, act as an observer of her infant's behaviours by viewing the infant's behaviours and reporting their meaning in retrospect. Newson believes that there may be considerable advantage in securing this kind of information, specifically as regards the development of intersubjectivity between mother and infant. Maternal reports enable access to the mothers' schemata of infant capabilities and expressive repertoire. Ichheiser states: "Whether something is or is not material of social perception has to be decided not in terms of the expressive but in terms of the impressive function of the particular manifestation" (Ichheiser, 1949, p.15). Wolke et al. (1986) similarly advocate that maternal affective-cognitive processes in the perceptions their infants behaviour should be examined as important indicators of the interpersonal environment of the infant. It is with these theoretical ideas in mind that the mother's accounts of the infant behaviour should be approached. In the following section some of the studies that have investigated maternal interpretations of infant behaviour are reviewed and critically assessed in terms of their methodology.

3.3.3 Empirical studies on Maternal Perceptions of Infant Behaviour

"...it looked like a very grown up thing to do, hit the table in frustration 'cause she couldn't reach it [the toy]. I don't think it meant she was frustrated. I think she just wanted to reach it and she hasn't got the powers to reach it in a controlled way. It was probably an accident that she hit the table."

(Attributed to mother of baby girl, 4-6 months old age group)

The empirical literature on maternal interpretations is sparse. There have been a handful of studies which have specifically addressed maternal interpretations and perceptions of infant facial expressions. Most of these studies used questionnaires to obtain information on maternal perceptions. The impetus for these studies has been to compare mothers as judges of emotional expressions with empirical studies which used objective coding systems in order to discover if mothers are able to identify the same expressions as observers do and to find out if the age of onset of these expressions correspond to empirical findings.

For example, maternal perceptions of infant expressions was examined by Johnson et al. (1982). They obtained concurrent and retrospective estimates of emotion onsets from mothers of infants between 1 and 18 months. Reports were obtained through the administration of an emotion onset questionnaire and two versions of the Differential Emotions Scale II (DES-II) (Izard, 1972). Concurrent reports referred to the perceived presence or absence of an emotion at the time of the survey, whilst retrospective reports were estimates of the month of onset for those perceived infant emotions. The emotion categories looked at were interest, joy, surprise, anger, contempt, fear, shyness, guilt, disgust, distress and sadness. They found that interest, joy, surprise, anger, distress and fear were perceived to be present by a majority of mothers of infants in the first quarter (1-3 months). Sadness, disgust, contempt and guilt, even amongst the oldest infants (16-18 months), were reported by less than two thirds of the mothers. Distress and fear were reported by an increasing number of mothers as infant age increased, and were observed by 68% of mothers by 16-18 months. Mothers' perception of fear displays increased from 58% in 1-3 month olds to 90% for the oldest infants. Perceived shyness increased dramatically from 9% for 1-3 month olds, to 41% for 4-6 month olds, to 66% for 7-9 month olds, to 75% for 10-12 month olds and to 88% for 16-18 month olds.

The other type of data analysed was that of when parents first remembered perceiving these emotions. This data has serious limitations due to biases of parental

memory. The results showed that it lead to clumping of the data towards the earliest ages. Thus, mothers perceived most of the infants' emotions as having begun in the earliest months. The majority of mothers reported interest, joy, surprise, anger and distress as first seen during 1-3 months. Half the mothers reported that fear started at that age as well. To minimise the effects of biases due to parental memory, they conducted another study using one week old newborns. Ninety five percent of mothers said that they had witnessed interest and joy by the end of the first week of the infant's life; 78% witnessed anger, 65% witnessed distress, 68% witnessed surprise, 40% witnessed sadness and disgust, and 35% witnessed fear.

Emde (1984) conducted a similar study using the same questionnaire (DES), reducing the time span of the report to one week to examine perceived emotion states of 2 to 18 month old infants. The results are similar to those reported by Johnson et al. above. All mothers felt that interest and joy were present in their infants regardless of age. Furthermore, there was a high attribution of surprise, anger, fear and distress in the early months. However, shyness and sadness were attributed much less frequently and, throughout the age range surveyed, disgust, contempt and guilt were never perceived as present by the majority of the mothers.

These findings suggest that mothers may be more attuned to the subtleties and individual features of their babies' expressions than observers, as they perceived most emotion state onsets far earlier than empirical studies had found. On the other hand, mothers may also be interpreting undifferentiated states in the light of contextual information. Yet another possibility is that, as mothers, they may be more empathic with their infants than external observers. Lastly, it is possible that mothers project their own emotions onto the infant.

The wide range of possible explanations can be attributed to the method used in the studies. For example, by providing a ready made list of emotion labels in the questionnaires, mothers may have felt compelled to attribute more emotions than if they were asked to think of their infants' emotions themselves. Secondly, the use of questionnaires, rather than a more direct method of eliciting this information, meant that it was not possible to find out if situational or contextual information determined the mothers' judgements. The questionnaire method, like the still-faced photograph method reported in the study by Izard et al. (1988) in Chapter 1, both employ static methods. The lack of more dynamic, real time techniques means that it is not possible to answer the question of how the mother selects the infant's expressions as

indices of particular emotions out of the stream of ongoing behaviour. The Johnson et al. study did not analyse the specific behaviour of the infant which led to maternal perceptions or her responses to them.

Some of these criticisms may also be levelled against techniques for obtaining maternal perceptions of infants in temperament studies (Blurton-Jones, 1974). The literature on infant temperament is outside the scope of the present thesis. Nevertheless, it is of methodological significance in that it attempts to relate maternal perceptions to some measure of infant behaviour. Because of their use of infant temperament scales and maternal perception scales, empirical studies on temperament are dogged by the problem of disentangling the effects of maternal state and infant behaviours/temperament. There has been a growing debate about what temperament measures are actually measuring. A number of studies have compared mothers perceptions of "difficult infants" with trained observers ratings of infant behaviours (e.g. St. James-Roberts et al., 1984 and 1988; Wolke et al., 1987). Results have indicated that maternal perceptions ~~are~~ have good internal consistency but are not generally congruent with objective measures of assessment. In one study (St. James-Roberts et al., 1984) results indicated a 'systematic and selective bias' in maternal reports compared to trained observers ratings of infants who had delivery complications. Mothers who had experienced birth complications were less likely to perceive their infants' behaviour as difficult while those who had optimal deliveries were more likely to perceive their infants as difficult, compared to objective ratings. The authors point out that these findings should be understood as providing important indicators of the influences of the infants' effects on their mothers. Mothers who had difficult deliveries may have perceived the postnatal period in contrast as relatively 'easy', while those who had experienced an easy birth may have perceived the postnatal period as more difficult in contrast. They point out that mothers ratings should be regarded as 'social perceptions' which incorporate parental as well as child factors rather than objective measures of within-child characteristics. Similarly, Harris, Thomas and Elsdon (1992) found that mothers' reports of their infants' temperament was more a reflection of maternal state rather than of the behaviour characteristics of their infants. How the infant is rated by the mother appears to be the result of how well she has adjusted to the infant's needs. Confusing data on attitudes makes it impossible to investigate the relationships between attitudes and behaviour (Blurton-Jones, 1974). Moreover, the use of questionnaires, even when accompanied by more

direct behavioural observation (for example Nover et al., 1984) makes it difficult to pinpoint on what aspects of infant behaviour mothers base their perceptions. The reports (obtained from questionnaires) are usually comprised of broad based characteristics, such as irritability and difficult behaviours, which are hard to relate to specific infant behaviours other than crying, sleep disturbances or feeding patterns.

Whilst a number of researchers have pointed to the importance of the way caretakers selectively mark and interpret actions as intentional (Bruner, 1983b; Lock, 1980; Rogoff, Malkin and Gilbride, 1984), few studies have investigated this process. One study which has, however, was conducted by Adamson et al. (1987). They examined the first step in interpretation, the selection of acts from a stream of behaviour. Using both parents and nonparents (students), they asked observers to view videotapes of 9 to 21 month old infants. Adults were asked to push a button whenever they saw the infant act in ways that were salient to them (a procedure derived from the work of Newton, 1973; Newton and Engquist, 1976; Newton, Engquist and Bois, 1977). They predicted that, as babies develop and their behaviour becomes less diffuse and more clearly marked by defined "points of articulation" (Werner and Kaplan, 1963), adults would select more acts overall. They also predicted that the behaviour of infants viewed during solitary play would be regarded as less salient than the behaviour of babies during joint object play. To see if the way in which infant acts were selected was influenced by the way adults construed the task, instructions were varied. Newton (1973) reported that variations in instructions affected both how often and how confidently subjects marked a stream of activity.

They wished to investigate the validity of the distinction between *true* communicative acts (the sender intends to communicate) and *perceived* communicative acts (the recipient perceives a meaningful act that the sender does not necessarily intend) (Lock, 1980). They argued that true communicative acts, which emerge only gradually during late infancy, are often conveyed by conventional gestures and words. In contrast, perceived communicative acts are less consensually defined as the recipient must *construct criteria* for what constitutes a 'meaningful' act. These criteria may be more or less restrictive than those applied for true communicative acts. Interactional models of communication development assume that parents' criteria for 'meaningful acts' are far broader than their criteria for 'intentionally communicative' acts. The task set for the subjects consisted of instructions to press a button connected

to two audio tracks of the stimulus tape (an electronic recording device stored time codes in minutes and seconds each time a button was pushed), in one case when they felt the baby had done something meaningful (MC), in the other whenever the baby seemed to be trying to communicate (intentional communication (IC)).

Results showed that, while parents and nonparents were equally likely to see intentionally communicative acts, parents were more likely than nonparents to see meaning in infants' acts. They also found that adults identified more acts when viewing older infants, and when viewing infants engaged in joint toy play rather than alone. These results were qualified by the type of instruction parents received. Adults given the IC instructions noted more acts during joint object play than those given MC instructions. When viewing infants alone with the toy, the IC group made fewer selections than the MC group. Interestingly, adults also showed higher levels of agreement regarding IC acts than MC acts and did so to a greater extent for older infants than for younger babies. Thus, their results demonstrate that the emergence of consensual information depends on both developmental changes in infants' behaviour and the interpretative skill of their social partners. They also reveal that what parents regard to be meaningful is more idiosyncratic and seems to depend in part on previous experience with infants.

The above studies, as a whole, may be summed up in two ways: Theoretically, they provide evidence that parents attribute some emotion states to their infants from very early on. They do so in ways that appear to take into account common-sense notions of what infants can and cannot do. The social emotions of guilt and shame, for example, were not attributed until infants were older than 7 months. Parents also select infant behaviours differently according to the type of instructions they are given, the age of the infant and the context in which it is embedded. Moreover, they are much more likely to see meaningful actions in the infant than observers are. Methodologically, the studies on perceptions of facial expressions have serious limitations. For example, they do not take into account context, both in terms of interaction and in terms of situational context. Perhaps more importantly, by relying on questionnaires and still photographs, they are open to criticisms regarding their ecological validity.

The investigation of maternal perceptions of infant expressions must take into account, not only the interactive and social context of the child's behaviour, but the temporal and dynamic aspect as well. It is also vital to examine what aspects of

infant behaviour mothers are selecting for interpretation and how both the selection of these behaviours and the meaning assigned to them may be subject to age related and situational factors. These factors were considered in the Adamson et al. (1987) study. Their technique provided a more appropriate way of securing the interpretative process to the dynamic behaviour of the infants. However, it is possible to narrow down these interpretations further by taking account of the specific facial expressions that elicited them. To do this, an additional methodological factor that must be addressed is how to sample from the behavioural stream of infant expressive activity. This is a subject we turn to in the next chapter.

3.4 A Social Model of Development

In much of the discussion it appeared that a great deal of emphasis was placed on the mother's role. This was intentional. It is necessary to rectify the imbalance between the infant's side of the equation by examining the mother's effect; it is argued that it is not the learning of skills that is important as much as the way in which they are taught. Without the guidance of the adult, the child will not find an anchor in the social world of which she is to be a full member. The theory developed in this thesis is multimodal in the sense that it does not simply look at the biological basis of facial expressions as manifestations of an internal state, but also deals with how these biological reactions are assimilated into the social context of the particular situation to become transformed into qualitatively different phenomena, partly through maternal interpretations and reciprocal interaction. In doing so, it is proposed that it is not sufficient to assess the effect of the environment upon the infant, but also the effect of the infant upon its environment. This is represented in looking at how, as the infant develops, the mother's attitude and interpretation changes toward the infant's expressive behaviours.

At the same time, by examining maternal interpretations in the context of infant facial expressions, it is possible to elaborate on how the cultural code influences development at more microanalytic levels. This enables the social theory elaborated in the present study to be applied to the more developmental issues, rather than to the more broad based anthropological ones that have characterised research. A substantial body of literature has elaborated upon how important parental participa-

tion is in the infant's acquisition of behavioural and communicative skills. The development of intentionality, co-ordination, organisation and intersubjectivity are argued to arise out of joint activities between the infant and its caregiver in ways that highlight the essential meaning component which parents carry into their exchanges with their infants, and which define what task constraints to impose upon the infant's activities at different stages of development.

In this way, the proposed perspective incorporates the active person-active environment model framework discussed above. Whilst in this chapter we have examined how maternal interpretations are one essential component of the development of emotions, they cannot be studied in isolation. In keeping with the principles of dynamic models, it is not sufficient only to examine maternal reports but also the facial expressions which give rise to them. How to sample infant expressive behaviour is a subject we will turn to next.

CHAPTER 4

METHODOLOGICAL ISSUES

"When he had tapped on the table, and I had gone back to [playing with] him, tapping back on the table, just him finding that amusing and tapping backwards and forth, copying. Copying me or me copying him, and then him copying back again."

(Attributed to mother of baby boy, 4-6 month old age group)

4.0 Chapter Aims

In Chapter 3 it was pointed out that, by and large, theories of emotional development tend to focus on one aspect of the relationship between the child and its environment at the expense of other aspects. In particular there is a pervasive neglect in assessing how the active environment (mother) is affected by the child, i.e., in assessing the infant's effect upon the mother. This is reflected in the sparsity of empirical research on maternal perceptions and interpretations of infant facial expressions. It was argued that to overcome methodological weaknesses in these studies requires, a primary step, linking expressive interaction with maternal reports. In Chapter 3 the role of mothers in development was highlighted and studies which have specifically investigated maternal interpretations of infant behaviours were reviewed. It was pointed out that a consistent problem with empirical studies of maternal perceptions of facial expressions was their failure to include the actual behaviours of mother and infant in their analysis, making it difficult to determine what was being selected and whether the contexts in which it occurred affected the interpretations. Related to this was the criticism that the studies either relied on questionnaires or static photographs of infant expressions, devoid of situational and behavioural context. Whilst these restrictions limited the number of alternative explanations of the results, in some cases they raised more questions than they answered. For example, are mothers projecting meaning onto infant acts that is not present in the physical characteristics of the infant's behaviour? Are maternal attributions of infant states influenced by contextual factors? In what way? Do maternal interpretations change with infant age? What factors may influence these changes? It is therefore argued that facial expressions must be examined in conjunction with maternal interpretations. To this end, the first part of this chapter will focus

on models of interaction in order to arrive at a method of sampling infant expressive behaviour. Different models of interactions make different theoretical assumptions about developmental processes. Whilst the choice of interactional model must rest with the particular research aims of the present study, a review of the various social interaction frameworks that have been developed will elucidate important aspects that need to be taken into account when sampling from behavioural sequences.

The classification of social interaction is fraught with definitional ambiguities. Attempts to study the communicative value of emotions are accompanied by difficult problems in the assessment of particular expressions and in the categorisation of interactional contexts for the purpose of interpreting their potential meaning. Other major difficulties in the developmental approach to interactional emotionality are related to the selection of situations that are comparable across age groups (Papousek and Papousek et al., 1986). The study of non-verbal communication is compounded by the fact that the mother-infant system is in a continual state of transition. The particular factors or parameters that control development at one stage are not necessarily those that control transitions to other stages. These considerations point to the necessity of carefully assessing how to represent mother-infant social interaction in ways that are theoretically and empirically congruent with the aims of the present study. Thus, in the following discussion, decisions on how to define and sample behaviour are presented.

A number of dynamic interaction models have been devised by researchers to this end. Theoretical assumptions underlying models of interaction will be discussed as they will directly affect how the following issues are resolved:

1. Should the sampling and analysis of interaction be comprehensive or should specific segments be selected? On what basis would they be selected and why?
2. Should the interaction model incorporate temporal context, or assess structural aspects? Why?
3. Should interaction be defined from the point of view of the interactors or from the point of view of an external observer or both? Why?

These issues will determine how behaviour is sampled and defined in the present study. Having arrived at a method of sampling, the hypotheses of the study will be presented. The remainder of the chapter will address methodological considerations surrounding the design of the study; for example, where and how to conduct the study, and issues relating to data coding.

4.1 Models of Interaction: Sampling Behaviour

The Concise Oxford Dictionary defines the verb to interact as "to act reciprocally; to have an effect upon each other". This definition is not usually adhered to by students of infant development. Instead, closed system models are the underpinnings of much of the modern developmental psychology of infancy (Feinman, 1991). Valsiner (1984) has suggested that developmental psychology embraces a "social closed model" of child development in its emulation of the hard science models of classical mechanics ('physics envy' ?), in which the richness of environmental factors are sacrificed in favour of a cleaner but simplified experimental method. This leads to a closed model in which social factors do not play a significant role; interaction is not seen as the reciprocal effect of the child upon its environment and vice versa, rather, the mechanistic or closed system paradigm separates the child as the object of investigation (O) from its environmental context (C). The infant, despite predisposing genetic factors, is regarded as a passive recipient of external causes rather than an active organism. The aim of research is to report exactly which factors affect O and proceed to investigate C, i.e., different effects of C on O. Causality is attributed to unitary sources rather than to an interrelated causal system that includes both O and C. One way causality is maintained, despite the term interaction, as is evident in the work of Bijou and Baer (1961):

"An interaction between behaviour and environment means simply that a given response may be expected to occur or not, depending on the stimulation the environment provides." (Bijou and Baer, 1961, p.1).

Because of this unidirectionality principle, different portions of the variance are "accounted for" by different "effects". And what is "accounted for" is only arrived at by the attribution of the "share" of that outcome to some unitary source of causality.

There can be no information from this type of analysis of how these "interacting factors" are related in reality. In the following discussion some models of interaction which implicitly assume S-R sequences will be reviewed and rejected. Whilst behaviour can, at one level, be reduced to stimulus response chains, this places strict limitations on understanding the development of higher order processes when interpreting interaction. Methodologically, interaction models are open to criticism on a number of issues. Some models look for the growth of communication in biologically based processes such that it is not possible to extend their use past early infancy. Models which look at sequences of interaction as stimulus response chains face problems in terms of deciding who is the initiator of the chain. Structural models which attempt to code interaction in terms of conceptually meaningful units ignore the significance of these interaction units for the interactors and do not incorporate the temporal organisation of behaviour. It is argued that analysing interaction in these ways is not appropriate to the aims of the present study as the perspective of the interactors, which is essential in understanding what is salient in interaction, is ignored.

Theoretical assumptions translate into models of interaction at the level of the mother-infant dyad. A number of models representing interaction have been suggested. They fall under broad categories, for example, the learning models derived from behaviouristic approaches (e.g., Bijou and Baer, 1965; Gewirtz et al., 1976), structural formal models, (e.g., Piaget, 1952), psychodynamic models (e.g., Ainsworth, 1964; Spitz, 1950), ethological models (eg, Blurton-Jones, 1972) and dynamic interactional models (e.g., Chappell and Sander, 1979; Lewis and Lee-Painter, 1974; Kaye, 1982; Fogel, 1976; Newson, 1977). Theoretical assumptions dictate the emphasis placed on certain aspects of the interaction. For example, some models highlight the biological basis of interaction, others represent social interaction linearly, i.e., as one behaviour following another in time, whilst others analyze social interaction in terms of a structured system of units of behaviour. Each category of model sets criteria for what to analyze and how to analyze it. In the following, the models highlighted above will be discussed respectively to reveal the one best suited to the present study.

4.1.1 A Biological Model of Development: Levels of Reduction

As I have pointed out repeatedly, social systems are not built solely on biological systems. Some theorists have used biology as the basis of the development of the social system. However, they have done so to different degrees; thus, for example, one may postulate that the biological system is all that is needed to explain the development of the social system. Such a view would stress the physical and biological maturation of the organism above all else. There are alternatively those who believe that biology is the basis upon which social development rests; such a view would hold that the biological system of the organism is extended after birth to encompass the social system through organism-environment interaction. And, lastly, there are those who propose that biology is only part of the social system albeit a very important and essential part. In this view, maturational processes are important in providing the capacity to acquire developmental mechanisms which will enable the organism to acquire the social mechanisms that are essential for its integration into a wider social group. The first two of these developmental propositions may be regarded as reductionist and quasi reductionist respectively.

One model which represents the latter view is that proposed by Chappell and Sander (1979). They have emphasised the biological system and have extended it to exist after parturition. It is their belief that biorythmicity can account for the growing communicative abilities of mother and infant. They address the way in which interactions which are achieved in the caregiving situation relate to the ontogeny and differentiation of the more specific communicative process. They have proposed a biological system in which both its maintenance and its changes depend upon regulatory mechanisms which govern the interaction between participating elements or components (Chappell and Sander, 1979).

The central premise of this hypothetical system is timing based on biorhythms. The framework of temporal organisation of these biorhythms lays the groundwork for the more specific sequences of behaviours of each participant in relation to the other. At the level of sequential interactions the behavioural sequences become based on the time course of the infant state over whole awake periods. Regularly recurring infant-caregiver behaviours become related to that time course. Directionality is introduced by the course of changes in infant state that influences which event is likely to lead to which next event. For example, if in the care giving situation the

infant cries after waking up, this may be construed by the mother as an indication of hunger. If, however, the infant cries after a feed the interpretation is more likely to be regarding a wet diaper or tiredness, depending on the time of day in relation to the infant's own peculiar cycles. Chappell and Sander (*ibid*) state:

" As the direction of mutually shared sequences becomes familiar it provides the basis for interpretation of meaning or intentionality in specific actions of the partner." (Chappell and Sander, 1979, p.94).

They conclude that it is the interactive regulatory system shared by both infant and mother that subsequently differentiates into an increasingly complex sequence which, in providing basic elements of context, provides a framework for the interpretation of intention in the behaviours of the partners.

The model seems to conflate the biological system with the social system. In most animal species postnatal care of the young depends upon completely different behavioural patterns than those of reproduction and gestation. Even granted that there appears to be a period in infancy when the mother and infant are interacting at the level of shared rhythms, it is not possible to retain this approach beyond the period of early infancy and one would run into difficulties when faced with the analysis of social processes (Kaye, 1982). Indeed, although the model makes intimations about intentionality and shared meaning, there is no attempt to present a systematic methodology for their study and analysis.

Empirically it concerns itself with contingency based on frequency counts of maternal and infant behaviour related to state regulation of the infant occurring within 15 second epochs. The sequencing of events and the content of the sequences are not given any attention at all. Lewis and Lee-Painter (1974) have criticised the reductionist perspective of such models as the above in assuming that interaction follows cause-effect patterns. By postulating that there is an interdependence between the biological and the social systems, Chappell and Sander have implied a direct causal link between biological and social processes. No evidence for this is presented and it appears that they too are unclear as to the exact nature of this hypothesised interdependence. The lack of any systematic attempt to come up with a method for analysing the social aspects of this development seems indicative of this.

4.1.2 A Mechanistic Model of Development: Causality; Linear or Systemic?

The interactive model expounded by Lewis and Lee-Painter (1974) assumes that all behaviour is interactive, but that we cannot observe the direction of interaction. They acknowledge that a proportion of mother-infant behaviours cannot be specified within an interaction as either initiated or response behaviour. Those events which initiate behaviour, i.e., which are responded to, are specified within the model as an interaction which continues as long as behaviours can be identified as elicitors and responders. Once a specified initiation leads to an unspecified response (one which does not lead to a further interaction), the interaction is considered to be terminated:

"...A proportion of both infant and environment (maternal) behaviour cannot be specified as to interaction both as initiated or response behaviour. That is, we assume that all behaviour is interactive, but we cannot observe the nature or direction of the interaction...Consider a specified infant initiation; this can lead to an unspecified maternal response (MR). This then terminates the series. Alternatively, a specified infant initiation can lead to a specified maternal response which then acts as a specified maternal initiation. This has two alternatives, leading to either an unspecified infant response (IR) and termination of the interaction, or to a specified infant response. This specified infant response in turn becomes a specified infant initiation which then has two alternatives. Thus the flow can continue to cycle as long as infant and maternal behaviour remain specified (i.e., remain directed toward and effective on one another). As soon as this ceases, we are led into either a MR or IR and termination of the sequence. As expected, the response of either member of the pair also becomes the stimulus initiator for the other." (Lewis and Lee-Painter, 1974, p.24)

There are several methodological problems with this model. In the first place, the point of entry into the flow may be very misleading, more so as the model assumes a Markovian sequence. The Markov model assumes that the probability of occurrence of a given event depends only on the last preceding event. Such a model becomes tenuous when one takes into account knowledge based on shared experience and context as playing a part within interaction. This suggests that the Markovian assumptions become less valid the older the infant becomes within the dyad. It must also be pointed out that specified behaviours do not have the same consequences, although this can be accommodated for within the model by transitional probabilities. Still the Markov model does not allow for the fact that the occurrence of an event may be affected by a series of prior events, as in "tonic" communication (Schleidt

1973), when a response is elicited only after a repeated series of stimuli. The problem of how to judge the initiator of the chain of interactions in the first place thus rests on the assumption that responses are elicited by the immediately preceding event, rather than by something else further back as is suggested in the notion of "tonic " communication. The model therefore assumes that behaviour is determined by single events. Ordering the data in this way fails to do justice to the hierarchical organisation of behaviour and leaves aside intentions or longer term goals that may explain the form of a particular sequence, especially as goal directed behaviour is motivated by the end of the process rather than the beginning of it. Finally, Schaffer (1984) has pointed out that the model places restrictions on the length of the sequences. The above model is mostly used to study very short sequences which are analyzed for contingency which, although not posing a serious threat to the analysis in general, nevertheless limits its applicability.

4.1.3 Structural-Interactive models

Some models have sought to overcome the linearity of such models as the above by structuring behaviour into units (Bakeman and Brown, 1977; Tronick, Als and Brazelton, 1980; Tronick, Als and Adamson, 1979). The monadic phases model of Tronick et al. (1980), for example, defines face to face interaction as:

"A structured system of mutually and reciprocally regulated units of behaviours." (Tronick et al., 1980, p.4)

Interaction is segmented into units of behaviour which contain information about who is acting, what they are doing, and when they are doing it. These units are called Monadic Phases. Expressive behaviours based on the face, voice, head and eye orientation, body posture and specific gestures are categorised on a scale according to criteria of what interactive phase the action units fall under. That is, each second by second combination of expressive modalities is transformed into one of seven monadic phases according to predefined categories for each participant separately. This enables the calculation of the proportion of time spent in each of the monadic phases. The segmentation is based on two assumptions. Firstly, the Darwinian (1872) principle that opposite emotions are expressed by opposite behaviours. That is,

behaviours are organised into patterns which characterise opposite states. For example, a playing infant sits up straight, smiles, etc., whilst a distressed infant turns away, cries, frowns etc. Secondly, they assume that single behaviours do not define a monadic phase but, rather, different expressive behaviours in combination can result in the same phase. Protest, for example, can be conveyed by crying or turning away or frowning or any combination of these behaviours.

The limitations of this model centre on two issues. Firstly, it is not possible to assess the significance of the predefined categories for the interactors, as Fogel (1988) points out:

"Ostensibly, the scale is meant to reflect the level of interactive 'participation' or 'engagement', at least as viewed by the observer. It has not been demonstrated, however, that this construct has functional significance for the participants. Do the phases have psychological significance?" (Fogel, 1988, p. 394)

Thus, for example, behaviours defined as conveying protest may do so to the experimenter, but may not be regarded as such by the mother. A frown may be understood differently by the mother depending on other situational factors. Furthermore, and along the same lines, expressive behaviours or combinations of expressive behaviours may assume different meanings as infants get older and develop other modes of communicating. Secondly, the model is uni-dimensional and obscures the hierarchical temporal organisation of the interaction. Fogel (1988) states:

"Individuals in social interaction operate on a number of distinct and embedded time scales. Higher frequency shifts between, for example, infant gaze at and away, or mother and infant smiling onsets are embedded in relatively long duration behaviours, such as maternal maintenance of the baby's body position or maternal gaze at the infant." (Fogel, 1988, p.394)

Thus, although the model overcomes limitations of linear models by providing structured units for the analysis of behaviour and avoiding S-R chains, it nevertheless has limitations in that, by doing so, it obscures temporal organisation of behaviours at more microanalytic levels. Both types of models have advantages and disadvantages. Whilst temporally dynamic models have problems defining who initiates an interaction sequence and who responds to it, they do not obscure the way behaviours are organised in relation to each other. As was already mentioned, structural accounts of interaction, on the other hand, in attempting to overcome problems of

defining interaction in S-R chains, obscure the temporal organisation of behaviour. However, both types of model may be criticised for defining social interaction only from the point of view of an external observer. None of the models reviewed so far provides any method of finding out what the actors understand of the behaviour of the other actor. One advantage of eliciting maternal accounts of what is significant, for example, is that it overcomes difficulties in deciding on what actions are significant for the interactors and on what basis. Thus, the process of selection need not rest on predefined structural units nor on arbitrary S-R chains. The selection and definition of the interaction can be made to rest with the actors directly involved.

4.1.4 Social-Interactive Models

Coding schemes provide a way of segmenting the stream of behaviour into meaningful units. These units are not inherent in the behaviour but rather something imposed upon it in order to make sense of it. Collett states:

"A physical continuum is transformed into discrete categories... and the units are not, as it were, in the world, but rather in our construction of the world."
(Collett, 1980, p.153).

There are two ways in which this may take place: One can use a set of distinctions set by the layman or 'native', as the person who is directly involved in the interaction and hence the units are meaningful from his or her perspective. This has been termed an 'emic' description. Alternatively, behaviour can be segmented according to the investigator's criteria, in which case they are 'etic' (Collett, 1980). Obtaining both accounts is essential for a number of reasons. Firstly, it allows comparison between objective and personal descriptions of behaviour. Secondly, it addresses the question of whether infant expressions always signify the same meaning to the mothers, regardless of situational and behavioural context. Finally, it allows us to assess whether mothers' interpretations of 'objectively defined' expressions remains constant despite differences in infant age.

Social conventional approaches to interaction recognise the value of obtaining the mother's definition of a social interaction. Newson's (1979) model of social interaction is an example of this. It incorporates the bio-rhythmic feature of the

Chappell and Sander model by proposing that events which are developmentally created by caregivers for infants will have a time course which is sensitive to the way in which the infant reacts to those events. That is, it recognises that infants are normally subjected to social programming as a consequence of the biological necessity for nurturing. The mother will continuously make attempts to make these events meaningful and entertaining, often embedding them in game-like rituals and thus securing the cooperation of the infant (Newson, 1979). In effect, she breaks down the ongoing stream of behaviour into temporal chunks with a beginning and an end. Due to their daily recurrence they become established familiar sequences to which the infant can show his recognition by motor anticipation, also providing feedback to the caregiver. The intentionality in these action patterns is initially built into the interaction by the mother, and the ensuing dialogues are what eventually lead to mutual understanding.

Being naturally highly repetitive, these expressive dialogues enable the infant to play an active role in them by virtue of her increasing participation in the same ritual sequences. Soon she begins to act in ways which are required of her to sustain reciprocal exchanges, smiling in anticipation of the mother's face appearing in peekaboo, greeting the mother as she walks into the room. Developmentally these biorhythmic sequences are the preliminaries for the establishment of socially appropriate rules of social interaction. They will increasingly come to depend not only on the mother infant pair, but on external social events that have social meaning for the mother and will come to have a similar social meaning for the infant.

Unlike Lewis and Lee-Painter there is an emphasis on intentionality which manifests itself in a particular concern for the context of the dialogue. It recognises that the mother and infant do not signal to us as observers that they have seen or heard cues. Newson has observed the mother's natural tendency to present a verbal commentary on the infant during interaction (e.g., "Are you hungry? You're hungry aren't you?"). He states:

"The procedure which we are describing thus relies heavily on our ability to exploit the mother's natural tendency to record indirectly her own spontaneous comments, and indeed for certain purposes we may even find it useful to re-play the video recording to her and ask her to explain exactly what her intentions were at certain points in the dialogue." (Newson Ibid, p.55)

He thus proposes that what is defined as an interaction should rest partly on the perspective of the mother. The attribution of responsibility for initiation and termination of the interaction becomes less problematic in Newson's model, given the postulation that mothers capitalise upon "proto-social" behaviours. The mother acts upon the non-initiatory and unpremeditated action of her baby, responding to it as if it were deliberate. Asking the mothers to report on what these actions are and when they occur sidesteps the problem of stimulus-response contingencies and focuses on what the mother thinks she and her baby are doing.

This approach assumes that all action is meaningful. However, what mothers select as meaningful will allow us to see what behaviours have functional meaning for the mothers in an interactional context. Thus, mothers can be asked to look at the tape of their infants and comment on behaviours they found salient; facial expressions accompanying these behaviours can then be coded. This overcomes the methodological weakness of neglecting analysis of meaning, from the perspective of the interactors, in studies of social interaction. More importantly, it limits the analysis of interaction episodes to segments that are defined by the mother rather than predefined by the experimenter.

However, as Blurton-Jones (1974) has pointed out, objective criteria are also needed which are context and inference free. Facial expressions can be coded using a commonly employed ethological technique based on Kendon's (1982) "Behaviour element approach". He views behaviour as a type of "Mosaic" (Kendon 1982), with the fixed elements constituting the pieces of this mosaic. Behaviour, made up of elements, is arranged in repeatable patterns that constitute building blocks whose combinations and clusters would create more elaborate sequences or structures. This must presuppose a very simple view of structures as clusters which ignores temporal context. It is interested only in the clustering of frequencies of behaviour elements within a specific observational period. For example, the infant element is a set of infant behaviours which vary as a function of the age of the child. The environment element can either be inanimate objects or people. The model assesses how much of a type of behaviour the infant produces. This model becomes implicitly interactive when we start to look at either individual differences or developmental consequences. When we find differences in the behaviour of infants in different situations we are implying that these differences may be because the caregiver does things differently

in different situations. Assessing the infant's effect on the caregiver, we may look for differences in maternal interpretations between the different situations.

Although the behaviour element approach has the same drawbacks as the structural approach, it has several advantages in the light of the aims of this study. While facial expressions can be defined and coded in great detail, maternal interpretations are more gross units of description. Thus, the units used to define expressive episodes must assume compatible units of analysis to allow for comparison between the two types of data. Secondly, because of the variable nature of infant facial expressions, it is difficult, if not impossible, to create a set of predefined interaction categories into which they could fit. This would also appear contradictory to the line of thinking adopted here in that we would again have to determine what is to be considered significant and what is not. The alternative is to let the mothers decide which behavioural elements are significant within the interaction. These behavioural elements, i.e., facial expressions, can then be coded second by second using an 'objective' and 'context-free' coding scheme. Firstly, this would allow us to compare a 'context-free' analysis of facial expressions with the mother's 'subjective' interpretation. Secondly, by filming babies in different situations, it would allow us to test the ways in which facial expressions derive part of their significance for the mother from the context in which they occur. The technique would allow us to differentiate between the expressions which the external observer believes exist and the reality of the mother infant situation *in the eyes of the mother*.

The complexity of the mother infant system is partly reflected in the numerous models that have been created to describe it. However, in keeping with the main focus of the study, maternal interpretations of infant emotionality, it is appropriate to study the whole range of behaviours in contained units defined by mothers as overall proportions. This is especially appropriate given the elusive nature of both the communicative aspect of facial expressions and the level of detail to be expected by asking mothers to comment on interaction. Thus, it is proposed that films of mothers and infants interacting in different situations be obtained and mothers asked to comment upon the tape of their babies. Based upon their comments, segments of tape defined by the mothers as significant will be coded and analysed.

4.2 Hypotheses and Aims of the Study

The thesis proposes that an important part of emotional development is maternal interpretations of infant facial expressions. By selectively marking and treating actions as if they were intentional, adults support the current interaction and guide infants towards more sophisticated means of communication (Bruner, 1983b; Lock, 1980; Rogoff, Malkin, and Gilbride, 1984; Kaye, 1982). The infant learns from the mother's reactions to his or her expressions what the meaning of these expressive states are and how to employ them to convey intentions and to obtain goals. The impressions of the mother influence the behaviour towards an end state, that being the approximation of socially appropriate skills to obtain socially appropriate goals (see Chapter 3).

Several observational studies of adult infant interactions show that adults, once an act has been selected, can interpret infants' acts in a manner that is finely tuned to developmental change (e.g., Lock, 1978; Tronick, 1982). In contrast, surprisingly little experimental research has systematically examined the way in which adults select acts for interaction in the first place. Given the ambiguity of the task, it is reasonable to assume that selections may depend not only on what an infant does, but also on the context, the adult's understanding of the situation and the adult's previous experience with the infant.

The task of the present study will be to test the above assumptions. Maternal interpretations will be compared to a context free, objective coding of infant facial expressions. The following questions will be addressed:

1. On what basis do mothers select meaningful acts from the stream of infant behaviours? Are their selections influenced by contextual factors and infant age? Do they select more infant behaviours as infants grow older and their behaviour become more clearly defined?
2. Do mothers make the same number of selections as external observers?
3. What is the content of mothers' selections, i.e., what types of facial expressions do mothers select, and do these selected expressions vary between different situations and age groups?

4. What types of attributions do mothers make concerning behaviours that they have selected?
5. Will the context of the interaction influence the way they interpret infant facial expressions?
6. Do maternal interpretations undergo changes with infant age, in line with developmental capacities?

Maternal attributions of meaning between 4 and 6 months are hypothesised to be more situation and context dependent. By 7-9 months mothers' accounts are expected to reflect the developing infants' interest in their surroundings. By 10-12 months accounts are expected to be less context and situation dependent and more reliant on expressive conventions that will have been negotiated between mothers and their infants.

4.3 Research Strategy

Having identified the key questions to be researched and the model being adopted for their investigation, it now remains to outline how they will be empirically examined. By and large the explication of developmental processes and mechanisms remains a difficult and elusive task. A cross sectional sample is usually valuable on its own as a means of revealing age related changes that occur within a sample of children, where repeated measurements would confound the variables under study. Interviewing the same mothers over many trials would result in reports being confounded by earlier interviews, and would also alert the mother to the true nature of the study, resulting in experimenter effects both during the interactive episodes and in the maternal accounts. In the present project, the decision to use a cross-sectional design rested on the advantage of this sampling procedure in ensuring that maternal reports were accurate and unbiased by parental memory. Moreover, comparison of maternal selections and interpretations of facial expressions between age groups allow for the investigation of how maternal interpretations change, depending on the infant's developing abilities.

Mother-infant pairs will be filmed interacting in different situations and an account will be taken of the mothers' interpretations of their infant's facial expressions. Based on the review of infant capacities in Chapter 2, the critical phase in which face to face interaction becomes the predominant mode of interaction occurs around 3-4 months. Development of face to face interaction undergoes important changes during the next few months, with such capacities as joint referencing and social referencing developing around 8-9 months. By 12 months there are the rudimentary skills of social communication between the mother and infant. Beyond 12 months, language development begins and would confound the study of facial interaction. Thus, the study will concentrate on infants between 4 and 12 months.

The behavioural data will be gathered by means of video filming. Decisions concerning the method that would be used for the filming centre around where to film, what situations to film, how often to film them and for how long. These issues will be dealt with consecutively.

4.3.1 Home versus Laboratory

In view of the sensitivity and delicacy of the interaction that is being sought, rather than taking the mother-infant pair to the unfamiliar surroundings of the laboratory, it is more authentic to restrict movement in the home. Filming in the laboratory may bias the natural occurrence of facial expressions and the type of facial expressions produced. The one constraint imposed on the mother and infant is to restrict the play session to a sit down session with the mother and infant facing each other. Mothers would be visited and filmed twice, once to familiarise them with the equipment and to put them at their ease and, the second time, to take the actual film data, after which they would be interviewed. Whilst it is unavoidable that filming has inherent problems in the form of experimenter effects, it is arguably the least obtrusive method of collecting this type of data.

4.3.2 Filming Situations

Regarding the situations that would be filmed, Stern (1974) found that the two situations which elicited the highest levels of face to face activity between mothers and babies were the play situation and the feeding situation. It was therefore decided to pilot those two situations to determine how appropriate they were to the analysis of face to face expressive interaction. These situations are also representative of the everyday contexts in which mothers and babies interact. In line with the hypotheses of the study, more than one social situation needs to be included, as maternal attributions of meaning to infant expressions are hypothesised to change according to the situations within which the expressions occurred. The decision to make the filming sessions 7 minutes long rested on previous observational microanalytic research which had chosen between 2 minutes and 10 minutes (Brazelton et al., 1974; Fogel, 1985; Sylvester-Bradley, 1985; Schaffer and Crook, 1979; Tronick et al., 1978; Cohn et al., 1989). The sessions must be as short as possible in consideration of the amount of coding time but they also have to allow enough time for mothers to comment on the interaction.

Two cameras would be used alongside extra lighting when necessary. The cameras would record the behaviour of the mother and of the infant on separate tapes.¹¹ Facial expressions of mothers will also be collected for comparison. Using two cameras would capture most of the interaction on film with little loss of data due to obscuring of the faces. Verbal data from maternal accounts would be gathered whilst mothers watched videotapes of their infants taken during the previous session. Behavioural data will be obtained from video tapes of mothers and infants during interaction and coded, using a facial expression coding framework.

The use of film to record behaviour has the advantage of providing sequential data which the mothers can comment upon. Presenting babies' actions dynamically to mothers is essential for the ecological validity of the study. Coding the data will be an extensive procedure and one which may affect the results of the study. It is therefore worth discussing facial coding techniques in some detail to explain how data will be coded and why.

11. To synchronise the two video tapes it was suggested that a time clock be placed on the two videos corresponding to the same point in time on the two videos and running for 7 minutes, so that the 7 minutes would coincide in the two tapes of mother and infant.

4.4 Facial Coding Techniques

Facial action coding schemes provide a way of analysing behaviour reliably. Save for only two coding frameworks, most facial coding schemes are not diachronic (coded in time), i.e., are synchronic (static codes). The only two systems to date that include the onset, offset and duration of expressions as part of their codes are MAX (Izard, 1983) and FACS (Ekman and Freisen, 1978). They will therefore be discussed in more detail below.

For the purposes of this study we need to consider facial coding schemes with reference to their theoretical assumptions, their criteria for sampling behaviours to be coded, their reliability and, finally, in terms of their advantages for this study. That is,

1. What is defined.
2. How it is defined.
3. Why it is defined in this way.

4.4.1 The Theoretical Basis of Facial Action Coding Systems

Theoretical assumptions influence the methods of selection of the target facial expressions and construction of the coding scheme. Such assumptions directly influence the validity and reliability of the schemes. It is therefore worth reviewing the theoretical bases of facial coding techniques. There are three types of system classified by Ekman (1982); those which are *ethologically or inductively* based, those which are *theoretically* based and those which are *anatomically* based. These distinctions are not clear cut and most of the coding schemes are based on identifying universally recognised facial expressions.

The first of those, the ethologically based system, is one which concentrates on the social or communicative aspect of facial codes. Listings of facial expressions are derived by observing spontaneous behaviour. These systems create "ethograms", or catalogues, of salient behaviours in the communicative repertoire (e.g., Blurton-Jones, 1972) . For example, Young and Decarie's (1977) system catalogues the global facial and vocal expressions of 75 infants to six different stimulus situations. The facial movements are categorised into expressions of distress, anger, interest, fear and

joy, using four separate regions of the face (brow, eyes, mouth and other). Their system only codes those expressions that are part of the infant's repertoire of expressions at the end of the first year. Each unit is purported to have a social, emotional and communicative function. Ekman and Oster (1979) have identified several weaknesses in these coding systems if considered as general purpose measurement systems. For example, they do not have any criteria for explaining the exclusion of certain facial movement patterns. They all include both simple muscle actions and complex movements involving several independent actions without explicitly stating why they are coded together. Moreover, some behavioural units are given inference-laden names (e.g., "an angry frown") making objective coding of the action difficult. Many action units are also vaguely defined, so that coders cannot know if they are coding the same actions. Many of the actions are anatomically incorrect. Lastly, individual, racial or age related differences in physiognomy may make it difficult to identify certain actions described in terms of static configurations (e.g., "oblong mouth").

Theory-based coding systems, such as FAST (Ekman and Freisen, 1975), are constructed on the basis of previous research which identifies the distinctive components of six universal affect expressions. It is useful in studies which relate the facial expression of subjects to autonomic responses, experimental conditions and observer's judgements. Actions other than those specified are not included and there is no justification for why they are excluded.

Izard's system (MAX) is sometimes regarded as a theoretically based system (e.g., Ekman and Freisen, 1978). It was constructed by recording facial expressions from different cultures and selecting those which appeared and were understood by more than one cultural group. Decisions of what facial movements to define were based on inspection of still photographs of posed emotions that had yielded high agreement among trained observers of an earlier complimentary coding system, AFFREX.

Ekman and Freisen (1978) have criticised MAX on the basis that it is not anatomically based. Anatomically based systems score actions in terms of the minimal muscle actions that collectively produce the movement. However, this is contrary to what Izard and Dougherty (1982) say about this system:

"The Maximally Discriminative Facial Movement Coding System (MAX) (Izard 1979), a coding system *anatomically* based on movement units, was developed

as an objective system for identifying exclusively the discrete changes in facial appearance necessary for identifying the fundamental emotions. " (Izard et al., 1982, p.105, emphasis added)

Ekman and Oster (1979) state that FACS (Facial Action Coding System (Ekman and Freisen, 1978)) is anatomically based as it was designed to code all visible facial behaviour in any context, not just actions related to emotions. Moreover, the movement codes were also constructed in terms of which actions can be reliably distinguished. However, aside from the fact that the system is slow to learn and use, it suffers from more serious problems. Ekman and Oster state that FACS includes more distinctions than may be needed for any particular analysis. This necessitates collapsing some of the elementary measurement units or disregarding subtle distinctions, which, given the purported comprehensive nature of the system, would be a complicated and time consuming process. The question of comprehensiveness versus selectivity will be discussed below.

A further consideration for the present study is that the coding system needs to identify facial expressions in infancy. The system devised by Izard is the only one to date which was designed specifically to code facial expressions of **infants**. Guidelines have also been given which enable the system to be used to code adult facial expressions as well. Malatesta and Haviland (1986), who used the system to code both adult and infant expressions, pointed out that MAX was a good system to use when analysing adult infant facial interactions because adults' expressions frequently mirror the infants' expressions during interaction. This is an important consideration which provides strong justification for its use.

4.4.2 Comprehensiveness Versus Selectivity

The criteria for comprehensiveness rests on three dimensions; (a) the type of action coded, i.e., what movements of the face are coded, (b) the intensity of action, and (c) the timing of action such as the onset, offset and duration of the movement. Each of these dimensions is important in the theoretical implications it carries for the analysis of facial expressions.

In the case of the first dimension, type of action, a technique which claims to be comprehensive in terms of measuring action is claiming that each and every

movement is codable. For the purposes of most interaction research a comprehensive coding system poses certain problems; firstly, in that it makes the study of specific expressions more complicated, and secondly (should the researcher wish to study all the movements of the face), in providing evidence that the system is indeed comprehensive. The reason for wishing to choose a comprehensive system is if one is seeking to answer research questions which are essentially exploratory in nature. If the researcher is unable to determine the exact character of the expressions that he or she wishes to investigate, then the first step must be to find out the forms of the expressions that will need to be looked at, using more selective techniques, which have the advantage of economy of time and are not so labour intensive. The important consideration regarding a selective technique is to know what has been excluded. This must depend on the theoretical approach of the creator and what he had intended to use the system for in the first place. Ekman and Friesen's (1978) system (FACS) is claimed to be able to code all visible movements of the face. They derived their list of facial codes from measurement units that were based on what the muscles allowed the face to do. The time cost of using such a system, however, is such that it should only be used when the researcher is uncertain of the types of facial movements to expect. It therefore has two disadvantages. Firstly, it has not been proved that the system is indeed comprehensive, and secondly, it does not define emotion expression. MAX does not claim to be comprehensive. It specifies the basis on which facial expressions are coded, and it defines emotional expressions.

With regards intensity of action, there have been very few packages to date that have included it in their analysis as explicit codes. Ekman and Friesen's FACS includes intensity of action in its codes. Izard's (1983) MAX, although it does not have explicit codes for intensity, does incorporate intensity of facial expressions. For example, code 38, raised cheeks, is an indicator of how much the mouth is open either in a smile or in an angular distress shape. This and other codes can indeed be used as indices for inferring the intensity of particular expressions, if it is necessary to the analysis. By including specific intensity codes, Ekman and Friesen's (1978) system is also sacrificing reliability to a certain extent. This is because there has not been any evidence that intensity of some actions can be extended reliably for all actions. Thus one is not sure whether or not the various parts of the face that have action intensities are independent of other muscles of the face. This means that the coding of various action intensities cannot be used reliably as codes for only those muscles of the face.

Timing of action is important in revealing concurrences between mother and infant expressions, i.e., overlap of facial expressions. Onset and offset times or expressions are important in revealing durations, and concurrences and co-onsets of expressions which are hypothesised to change with age and to have certain temporal characteristics within certain age spans. This feature is present in both FACS and MAX.

In the light of the above considerations, it was decided to use Izard's (1983) MAX (Maximally Discriminative Facial Movement Coding System). It is a template based coding system which identifies 27 components, consisting of universally recognised emotional expressions and blends of expressions. As was mentioned earlier, one of its advantages over other coding systems is that it is specifically designed for use on infants, whereas most systems to date were designed for use on adult faces and later adapted for infants. Furthermore, the system has been adapted by the authors for use on adult faces by substituting movements which identify bulges in the infant with furrows in the adult.

It was designed to test universally recognised facial expressions, making it useful in comparing facial expressions either cross culturally or within a specific culture. As this study is concerned partly with the recognition of specific facial expressions within English culture, it will be appropriate to compare the infants' facial expressions, using MAX, with the mothers' interpretations. Although the validity of some of MAX's facial configurations has not been established, there has been extensive work done on the reliability of the package as a whole in contrast with FACS (Facial Action Coding System), the reliability of which has not been established altogether. Izard tested the inter-coder reliability of MAX and found it to range between 75%-85%. Others who have used it, such as Hiatt and also Haviland (Izard, 1983), have also stated that they have achieved 80% reliability or higher. Validity is more difficult to establish since the emotions underlying the facial expressions cannot be validated in infants. However, the construction of the facial codes framework relied on anatomical charts and texts on the relationship of muscle movements. The other advantage of MAX is its efficiency. Although each minute of video tape takes one hour to code, MAX is still not as time consuming as some of the packages available for coding expressions. In view of the amount of data to be analysed it is important to use a system which is not excessively time consuming.

4.5 Verbal Reports as Data

The other methodological consideration that must be taken into account for the purposes of the present study is the validity of the maternal accounts that will be obtained. Verbal reports have been fraught with methodological controversies historically and even up to the present day. When Wundt established the first experimental laboratory at Leipzig in 1879, his method of experimentation was based on "controlled introspection". Later on this method was to be misused by his contemporaries for the explication of language processes and higher mental phenomena, thus bringing it into disrepute. With the advent of behaviourism and its characteristic onus on "Off with the head, nothing below the spinal chord", verbal reports became totally unacceptable. Only observable phenomena were studied and what they could not see was simply not there.

This historical mistrust of verbal reports has remained to the present day. Nisbett and Wilson (1977) conducted a series of experiments with the aim of refuting the proposition that verbal reports may be accurate representations of cognitive processes. They believe that conscious awareness is limited to the products of mental processes and that the processes themselves are beyond the reach of introspection. When people are asked to report on their cognitive processes, they do not rely on an introspective knowledge but make use of implicit cultural or personal beliefs and a general judgement strategy which the authors term "the representativeness heuristic", a concept adopted from Kahnemann and Tversky (1973)

Ericsson and Simon (1980), White (1980) and Smith and Miller (1978), amongst others, have attacked Nisbett and Wilson's article on both theoretical and methodological grounds. Of relevance to the present study is the proposal by Ericsson and Simon that verbal reports can be considered valid if certain conditions are met. For example, if the nature of the task allows for the accurate reporting of subjects' experiences. Similarly, subjects need to be 'blind' to the experimental design; if they are informed of the advent of a verbal report before the task, this will change the nature of the task and the possibility of it influencing the cognitive processes cannot be ruled out (Ericsson and Simon, 1980). Prompts can also shape the type of information received in verbal reports. For example, Ericsson and Simon report that probing by using prompts, although it inevitably depends on the aims of the research, is more

accurate when it is directed towards a specific topic rather than probing for general states (Ibid).

Nisbett and Wilson (1977) state that verbal reports are only reflections of common-sense notions of the world:

" When reporting on the effects of stimuli people may not interrogate a memory of the cognitive processes that operated on the stimuli; instead, they may base their reports on implicit, a priori theories about the causal connection between stimulus and response. If the stimulus psychologically implies the response in some way or seems 'representative' of the sorts of stimuli that influence the response in question the stimulus is reported to have influenced the response. If the stimulus does not seem to be a plausible cause of the response it is reported to be non influential." (Nisbett and Wilson, 1977, p.233)

The arguments as to whether or not verbal reports accurately reflect cognitive processes is outside the scope of the present study. What is of relevance is that the attributional and socially evaluative data that reports will yield are in fact precisely what is required from the verbal reports of the mothers. The purpose of the reports will be to record the mother's impression of the infant's expressions in interaction and, secondly, to derive justification of her own behaviour towards the infant. Developmentally, this means testing the following assumptions:

- 1) That as babies get older there will be a change in maternal interpretations, reflecting the increasing abilities of the infant.
- 2) That there will be a change in maternal attributions in concordance with the contexts in which infant behaviour occurs.

Nisbett and Wilson's (Ibid) point that verbal reports will not accurately determine the stimulus or responses that actually influenced the subjects in their behaviour is a testable hypothesis. Maternal reports and the stimulus behaviours that prompted them are both available and it is possible to compare them. The verbal reports give us an interesting insight into mothers' impressions of what the baby does and how they are likely to respond.

Indeed, processes operating within the mother-infant system work on many different levels. There is a hierarchical structure in the routines and subroutines that shape mother-infant interaction. The same may be said for the inferential processes

that operate to shape the mother's behaviour towards the child. In speaking of 'mental processes' without defining the theoretical assumptions regarding them (Smith and Miller, 1978), Nisbett and Wilson have laid the way open for the criticism that their premise for concluding that they are not available for direct introspection is untenable. For example, White has pointed out that there is no distinction between mental process and mental product, i.e., what gets into mental awareness. He states that:

"It is easy to fall into the trap of calling everything that gets into consciousness 'product' and everything else 'process'; if we decide to use consciousness as the criterion for making the distinction then the product process viewpoint becomes true by circularity." (White, 1980, p.106)

Moreover, it is not clear where one makes the distinction between one process and another. All processes have sub-processes, and this divisibility continues down to the level of neurons. If processes are large scale entities then almost nothing can be conscious, and if they are small scale then a comparatively great deal can be conscious.

A problem that does appear here is with the nature of maternal impressions. Most of the interaction between mother and infant is automated and comes naturally to the mother. Automated processes, highly practised routines, are executed rapidly and with little reflection. They will therefore be unavailable for verbal reports (Ericsson and Simon, 1980). Although the focus of these verbal reports are not the processes of evaluation but their contents, there still remains the possibility that due to the automated nature of the interaction, the contents of the processes will be unavailable as well. This might mean that verbal account might be scanty when concerned with long established routines. Using probes overcomes this problem and helps to structure the maternal accounts so that classification and coding are made easier. New interaction patterns would not have had time to become automated and therefore might be more accessible to verbal accounts, therefore reducing the magnitude of the problem further.

Ericsson and Simon (*ibid*) also pose the issue of emotionality as an interfering factor in verbal accounts and suggest that information given under emotive circumstances or on emotive subjects would be less complete than reports of an orderly process. However, unlike the studies conducted using retrospective reports to record the processes of cognition, this study differs in two essential ways. Firstly, it is not the cognitive processes that are important in this instance as much as the socio-

emotive attributions of the mother. As was stated above, this does not enter into the controversy of whether or not the reports reveal mental processes. Secondly, and more importantly, the reports will be accounts given during a play back of video tapes of the mother interacting with the infant. What is therefore expected is that the mother will report the salient features that she perceives within the interaction. Implicit in these reports will be the social values and beliefs that shape such attributions. This partly solves the problem of automation for, although the interactions may be largely automated, the verbalisation model (Ericsson and Simon, 1980) assumes that only information in focal attention can be verbalised.

As far as the validity of obtaining verbal accounts of mothers is concerned, from the above discussion one can draw the conclusion that, despite the historical and present day controversy surrounding verbal reports as accurate data, there are cases where they may fulfil a function within research strategy. With the shift in emphasis away from the behaviourist paradigm, psychology has become increasingly concerned with social forms of behaviour and the meaning this holds for its actors and participants.

Finally, it should be recognised that demand characteristics will inevitably play a part in how mothers describe their infants. This may affect the way mothers will describe their infants, and the way they describe themselves ("good mothers"). It is also expected that mothers will attempt to present their infants in the most positive light during the interaction by trying harder than usual to engage the infant in positive interaction. It is possible to minimise these effects, however. In order to explore ways of doing so most efficiently, the procedure will be piloted.

4.6 Pilot Study Outline

The analysis of behaviour, with particular emphasis on expressive communication, presents several methodological issues which have been dealt with in the light of the theoretical perspective of the present study. As was pointed out, studies of nonverbal behaviour, perhaps with the intention of simplifying the issues in order to deal with them better, have made use of rather restrictive research strategies. In defining interaction, researchers have focused on either the sequential or the structural aspects of behaviour. However, in both cases, they have been confronted with the

awkward task of deciding what aspects of behaviour count as communicative interactions and which fall outside it. It is suggested that the solution to this problem is to select behaviours on the basis of the interpretations of the interactors regarding what is communicative and significant. This is also congruent with the theoretical aims of the thesis, in addressing the oversight in the literature on emotional development, by assessing the infant's effect on its environment and on the mother in particular. This particular focus falls out of the theory that mothers' select, interpret and respond to their infant's facial expressions in ways that support the current interaction and guide infants towards more sophisticated means of interaction. Obtaining maternal reports on what is happening during interaction is a first step in redressing the 'decontextualisation' (Valsiner and Benigne, 1986) which occurs in developmental studies that ignore meaning as it arises in interaction and in the context of social situations.

The study aims to examine maternal selections and interpretations of infant facial expressions. Coding the segments interpreted by the mother, using a standardised facial coding scheme, allows for comparison between the meaning mothers attach to infant expressions and a context free coding of the same segments of behaviour. In this way, it is possible to assess situational and age related influences on maternal perceptions of infant emotionality. It is hypothesised that expressions hold different meanings for mothers, depending on the conditions that elicit them, and are not based solely on the facial expressions of the infant. Demonstrating such contextual influences highlights the importance of obtaining maternal accounts and elucidates their characteristics.

The technique to be used, and the research design, need to be piloted for several reasons. Most importantly, the method of eliciting maternal accounts of dynamic infant behaviours must be able to provide information on specific infant behaviours rather than global descriptions. Furthermore, the technique must allow the data from the reports to be integrated and compared to the facial expressions of the mother-infant pair. A second and related consideration is in testing out the technique of sampling behaviour, by relying on maternal interpretations to define what segments of infant behaviour to select and code. Other aspects of the study that need to be piloted are the appropriateness of the two situations, play and feeding, the length of the filming sessions, and the appropriateness of using MAX. We will turn to these issues next.

CHAPTER 5

THE PILOT STUDY

5.0 Levels of Analysis

The pilot study was set up to address two central concerns: Firstly, to assess whether the method and procedure outlined in Chapter 4 are feasible and reliable and, secondly, to examine what different data reduction measures reveal about the interaction and which would be most appropriate for data analysis. For the behavioural data, issues concerning filming subjects, coding facial expressions and potentially analysing them are addressed. The method of obtaining and coding of data will be assessed to determine whether it allows the identification and classification of the facial expressions of mothers and infants. At the level of maternal interpretations, the pilot study set out to assess whether interviewing mothers whilst viewing the tape would elicit adequate accounts of how mothers were interpreting their infants' behaviour.

5.1 Pilot Study Aims

The pilot study was set up to address the following questions:

1. **Age groups:** Is the method of data coding and analysis sensitive enough to tap differences between the three age groups? What measures for reducing data are most sensitive to these changes?
2. **Appropriateness of interaction situations:** Do the feeding and play situations provide an adequate sample of behaviour for maternal interpretations and facial expression analysis?
3. **Duration of session:** Will 7 minutes of filming be an adequate amount of time to sample the variety of facial expressions?

4. **Reliability of MAX:** Can an adequate level of reliability be reached using MAX and what modifications needed to be made to increase reliability?

5. **Account technique:** Is the method proposed for maternal accounts effective in eliciting maternal interpretations of infant expressive behaviour?

The following sections contain the method and procedure for the pilot study. Following this, issues concerning data coding are addressed. The results of the coding are presented and their implications for the main study are discussed.

5.2 Method

5.2.1 The Sample

Health visitors at London NHS child health clinics were asked to identify primiparous mothers whose infants matched the sample criteria for age and sex. Mothers had no previous history of involvement with psychologists or psychiatrists. They were told that the study was concerned with normal infant development. Twenty mother-infant pairs were obtained. All the mothers were English, primiparous, in their mid 20s to early 30s and came from mixed socio-economic backgrounds. An equal number of boys and girls was obtained and infants were divided into three age groups: 4-6 months (mean 4;4, range 4;0-5;1), 7-9 months (mean 8;0, range 7;1-9;2), 10-12 months (mean 11;1, range 10;3-12;4).

5.2.2 Procedure

The data was collected at subjects' homes during normal play and feeding times. Two cameras were used, one focused on the mother, the other on the infant. At first the play and feeding sessions were unrestrained.¹² Later, infants were placed

12. Mothers were left to sit wherever they pleased and place their infants wherever they wished. However, this posed difficulties for filming. Mothers of younger infants placed them on the floor and knelt over them making filming of faces impossible. Mothers of older infants

in the baby chair as it became increasingly difficult to film older infants who were very mobile. Following the second filming session,¹³ mothers were asked to view the video of their infants and instructed to give an interpretative account of the infants' actions. They were not told before the filming that they would be asked to comment on their infants' behaviour on video. Mothers were given the following instructions:

"You know your baby better than I do, would you mind helping me by telling me what s/he is doing when s/he does something that you recognise?"

The baby tape was then viewed and maternal accounts were taped on an audio-recorder.

5.3 Data Analysis

5.3.1 Coding

All 7 minutes of both situations were coded for each mother and infant using MAX. Four volunteers including the author conducted the coding. Before coding the tapes, all trainees achieved the criterion reliability (85%) with a range of 81% to 100% (see Appendix 1). In order to achieve the criterion reliability for coding the pilot study tapes, some decisions had to be made concerning the codes (see Appendix 1). These modifications arose mainly as a result of the difference between the training video provided by the MAX manual and the pilot study contents.¹⁴ Ambiguities were resolved and the inter-coder reliability increased from below 80% to 85%.

sat them on the floor and infants turned away, crawled or tried to get up, obscuring their faces and those of their mothers.

13. A preliminary 'desensitisation visit' was made in which mothers and infants could become acquainted with the procedure.

14. The expressive behaviours of the infants in the training segments were derived from infants in two situations: during vaccinations in clinics and during play. There was therefore a predominance of practice segments showing very upset infants. The facial expressions in these tapes were very intense and followed in quick succession. The pilot study tapes, on the other hand, were taken in the relaxed surroundings of the home and the activities filmed were mundane and low keyed. Babies expressions did not change as frequently and were more subtle than the expressions coded during the training segments.

5.3.2 Data Reduction

Due to technical errors, inadequacy of film and lighting problems, only 11 mother-infant pairs were used. There were 2 girls and 2 boys in each of the three age groups except in age group 1 where there was 1 girl and 2 boys.

The data was reduced to the following measures, taken from Fogel (1976):

Time [T] (%) : Time taken up by a particular category, calculated by adding all the durations of one category and dividing by total time of the session in seconds.

Mean Duration [M.D]: The average duration of each expression, calculated by adding the total time that an expression was 'on' and dividing by the total number of onsets of that expression.

Rate [R]: The rate per minute of a particular category occurring. This was calculated by dividing the total number of onsets of a particular expressive category and dividing by the total time of the session in minutes.

Co-occurrence (Co): The total time during which two categories of expression are on simultaneously expressed as a proportion of the total session time in seconds.

5.4 Results of Behavioural Data

5.4.1 Individual Measures of Facial Expressions

Analysis of the facial expressions of mother and infant revealed age and situation trends. The feeding situation could not be analysed. Four to six month old infants were breast fed. Their faces were obscured by the mothers breast. In the older age groups, facial expressions could not be seen clearly because of spoons and food on their faces. Therefore, the feeding session was dropped. The rest of the pilot results are devoted to the analysis of the play session data.

The diversity of facial expressions found was in line with developmental studies on mother-infant interaction (Oster, 1978; Bremner, 1988). For purposes of

comparison and analysis, facial expressions were grouped together to reduce the high variability created by different expression blends. The categories were grouped on the basis of whether expressions were positive (all blends containing EJ (enjoyment) and SA (surprise) expressions), negative (expressions and blends which included any of the negative expressions; sadness, anger, disgust, contempt, pain and fear provided the blend did not contain an EJ code in the mouth which is identified as a smile). The third and fourth categories were those containing neutral expressions (O) and interest (IE). The averages of these results for each age group may be seen below (Tables 1-3) .

5.4.2 Infant Expressions

Coding and grouping of facial expressions revealed clear differences between age groups using measures of proportion of time, mean duration and rates of infant expressions (Tables 1-3 and Figures 1-3). Positive facial expressions comprised the largest proportion of total session time and occurred with the highest rate in age group 3 (10-12 month old infants), compared to age group 1 (4-6 months) and age group 2 (7-9 months). However, age group 1 infants held their expressions for longer durations than the older infants (Figure 2). Furthermore, positive expressions occurred with the highest rate per minute for age groups 2 and 3 compared to negative, interest and neutral expressions (Figure 3).

Interest expressions for age group 1 infants occurred 48.2% of the session time and had the longest mean durations of any facial expression (8.29 seconds). This may have been due to the presence of the cameras and the author which was an unusual occurrence for the infants. Older infants were not as affected by the presence of the cameras as the younger babies, although they too displayed keen interest in the equipment and myself. Thus, the predominance of interest expressions may have been an artifact of the experiment.

Compared to all other expressions of age group 2 infants, still faced expressions were held for the longest duration (4.35 seconds) and comprised the largest proportion of session time (30.87%, see Figure 1). Comparing age group 2 infants to the younger and older infants, their interest expressions occurred with the lowest rate, with the lowest mean duration, and took up the smallest proportion of

total session time. At 7-9 months infants are preoccupied with the external environment. Playing with their mothers when strapped to a baby chair may not have provided them with adequate stimulation. The predominance of neutral expressions and the low incidence of interest expressions for this age group may be indicative of this. Mothers in that age group commented on the infant disliking the baby chair for long periods of time (e.g., Plt 4 in Appendix 1).

On the whole, the results of different reduction measures reveals that differences exist between age groups in the amount of time, the length of time and the number of times an expression occurs. While the variation in expressions is apparent in all three measures, the least variable measure appears to be that of mean duration of infant expressions. Apart from the long mean duration of interest expressions for age group 1, there is little variation between age groups in the mean duration of different facial expressions. Comparing %T with mean rate per minute of expressions gives a similar profile, the noticeable difference being that expression of positive states occurs frequently, but does not take up a large amount of total session time (between 11.98% and 21.6%), due to the fact that it is not held for long (i.e., short mean duration).

The different measures reveal that infant expressions overall are characterised by a predominance of interest, and neutral, expressions which are held for long periods of time, and by frequent positive expressions with short mean durations. The short mean duration may be due to mothers' attempts at keeping the infant engaged in positive face to face play. In the next section maternal expressions will be examined to find out if the various reduction measures used were sensitive enough to pick up differences between age groups and whether the profiles they yielded could be compared meaningfully to the profile of infant expressions.

Table 1: Facial expressions of 4-6 month old infants

Sample	Expression	% T*	MD	R
PS1:BOY	positive	19.40	1.52	7.64
	mean	11.98	2.81	5.65
	negative	2.94	1.76	1.09
	mean	3.53	1.12	2.0
	neutral	17.77	2.36	4.91
	mean	20.3	3.89	3.09
	interest	38.73	2.34	10.72
	mean	48.20	8.29	5.98
PS16:GIRL	positive	9.33	5.60	1.00
	negative	0.98	0.59	1.00
	neutral	6.40	2.45	1.57
	interest	68.50	17.97	2.29
PS9: BOY	positive	7.20	1.30	8.30
	negative	6.70	1.00	4.00
	neutral	36.70	6.07	3.20
	interest	37.38	4.55	4.93
Average number of different positive expressions=6.7				
Average number of different negative expressions=8.3				

*Remainder of %T=Expressions which were either obscured from view or did not fall into any category defined by MAX (non-codable)

Table 2: Facial expressions of 7-9 month old infants

Sample	Expression	%T	MD	R
PS2:BOY	positive	4.25	0.95	2.67
	mean	18.03	1.91	5.25
	negative	1.91	0.61	1.63
	mean	5.68	0.96	2.35
	neutral	25.03	2.88	5.21
	mean	30.87	4.35	4.15
	interest	32.72	2.61	6.55
	mean	27.10	2.79	4.66
PS7:GIRL	positive	13.95	1.36	6.14
	negative	0.19	0.40	0.29
	neutral	57.05	8.26	4.14
	interest	17.88	2.35	4.57
PS13:BOY	positive	28.30	2.48	6.84
	negative	1.78	1.07	1.00
	neutral	32.40	4.26	4.56
	interest	29.45	2.48	7.13
PS21:GIRL	positive	25.62	2.85	5.39
	negative	18.85	1.75	6.50
	neutral	9.03	2.01	2.70
	interest	28.36	3.71	4.58
Average number of different positive expressions=8.5				
Average number of different negative expressions=6.7				

Table 3: Facial expressions of 10-12 month old Infants

Sample	Expression	%T	MD	R
PS20:BOY	positive	30.90	2.70	6.86
	mean	21.60	1.75	7.20
	negative	1.09	2.30	0.29
	mean	4.40	1.37	2.26
	neutral	14.55	4.36	2.00
	mean	24.80	4.06	4.17
	interest	50.4	8.55	3.60
	mean	34.20	4.1	6.10
PS4:GIRL	positive	3.60	1.26	1.71
	negative	10.9	1.17	5.57
	neutral	31.5	2.37	8.00
	interest	38.81	2.47	9.43
PS10:BOY	positive	16.83	1.22	8.29
	negative	0.74	0.31	1.43
	neutral	32.1	5.62	3.43
	interest	29.52	3.76	4.71
PS6:GIRL	positive	35.25	1.76	12.00
	negative	5.04	1.73	1.75
	neutral	21.17	3.91	3.25
	interest	17.92	1.59	6.75
Average number of different positive expressions=7.7				
Average number of different negative expressions=4.7				

Figure 1: T% of infant expressions

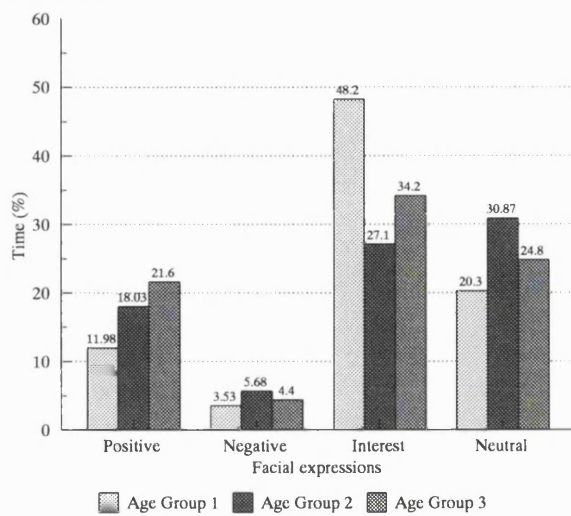


Figure 2: Mean duration per second of infant facial expressions

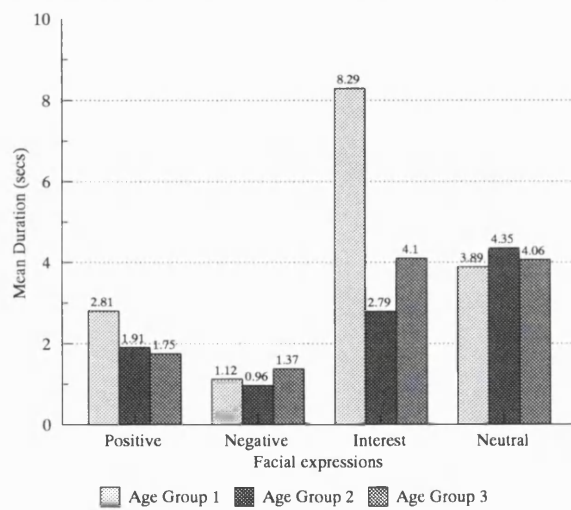
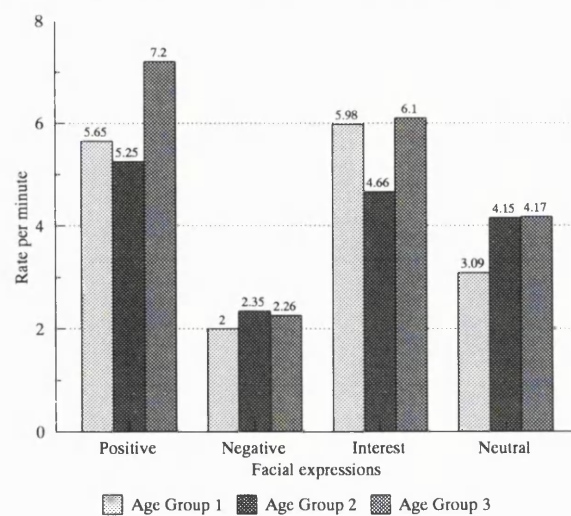


Figure 3: Mean rate per minute of infant facial expressions



5.4.3 Maternal Expressions

The different measures of maternal expressions appeared to be sensitive to differences between mothers in the three age groups (Tables 4-6). In general, all three measurements showed that mothers predominantly displayed positive and neutral expressions overall (Figures 4-6). While mothers in age 1 and 3 appeared to interact more with their infants, i.e., displayed frequent onsets of positive facial expressions which took up the largest proportion of total session time (approximately 50% of the session), age group 2 mothers appeared to be less positively interactive, spending less time displaying positive facial expressions (33.6%, see Figure 4). This is further supported by looking at the amount of time (Figure 4), length of time (Figure 5) and rate (Figure 6) of age group 2 maternal neutral expressions. The three measures all indicate that age group 2 mothers display more still faced expressions than the rest of the sample. This is further substantiated by the rate of maternal positive expressions in age group 2, which also indicates that positive maternal expressions occur less frequently and take up less of the total session time than the rest of the sample.

Unlike their infants, mothers' interest expressions did not occur as frequently, were not displayed for as long, and did not take as large a proportion of session time. Mothers may have been aware of the effect of the cameras on their infants and were trying to attract their infants' attention away from it. This may partly explain why there was a wide variation in different maternal positive expressions for age group 1, where infant interest was predominant (11 different positive maternal expressions, see Table 4).

Table 4: Maternal expressions in the 4-6 month old age group

Sample	Expression	%T	MD	R
PS1:BOY	positive	58.60	1.9	18.7
	mean	41.70	2.1	12.54
	negative	2.40	0.86	1.75
	mean	1.53	0.72	0.92
	neutral	0.067	0.20	0.17
	mean	27.9	5.88	1.93
	interest	17.68	1.45	7.83
	mean	16.51	2.46	4.82
PS16:GIRL	positive	46.24	2.00	13.86
	negative	2.19	1.31	1.00
	neutral	20.40	4.50	2.70
	interest	26.86	3.13	5.14
PS9: BOY	positive	20.26	2.40	5.06
	negative	0.00	0.00	0.00
	neutral	63.20	12.93	2.93
	interest	5.00	2.04	1.50
Average number of different positive expressions=11				
Average number of different negative expressions=3.8				

Table 5: Maternal expressions in the 7-9 month old age group

Sample	Expression	%T	MD	R
PS2:BOY	positive	34.81	2.61	8.00
	mean	33.60	3.10	6.55
	negative	1.12	0.67	1.00
	mean	0.34	0.35	0.32
	neutral	20.00	2.21	5.43
	mean	44.70	9.96	3.65
	interest	25.43	2.48	6.14
	mean	13.50	1.85	4.30
PS7:GIRL	positive	17.88	2.60	4.14
	negative	0	0	0
	neutral	71.14	21.34	2.00
	interest	9.67	2.26	2.57
PS13:BOY	positive	36.7	4.16	5.28
	negative	0.00	0.00	0.00
	neutral	46.40	9.28	3.00
	interest	6.60	1.11	3.57
PS21:GIRL	positive	45.05	3.03	8.91
	negative	0.25	0.55	0.27
	neutral	41.61	5.97	4.18
	interest	12.26	1.51	4.86
Average number of different positive expressions=4.7				
Average number of different negative expressions=1.5				

Table 6: Maternal expressions in the 10-12 month old age group.

Sample	Expression	%T	MD	R
PS20:BOY	positive	76.95	5.10	9.00
	mean	49.00	3.80	7.40
	negative	0.57	0.80	0.43
	mean	2.84	0.91	1.70
	neutral	9.02	4.20	2.85
	mean	19.50	4.20	2.85
	interest	7.40	2.40	1.90
	mean	12.30	1.80	4.10
PS4:GIRL	positive	49.43	3.84	7.71
	negative	0.60	0.50	0.70
	neutral	25.00	3.80	4.00
	interest	15.10	1.80	5.00
PS10:BOY	positive	46.72	3.76	7.46
	negative	0.77	1.13	0.57
	neutral	29.00	5.85	3.10
	interest	6.96	0.99	4.20
PS6:GIRL	positive	23.87	2.60	5.50
	negative	9.42	1.20	5.00
	neutral	15.00	3.00	3.00
	interest	19.63	2.20	5.25
Average number of different positive expressions=7.5				
Average number of different negative expressions=5.0				

Figure 4: T% of maternal facial expressions

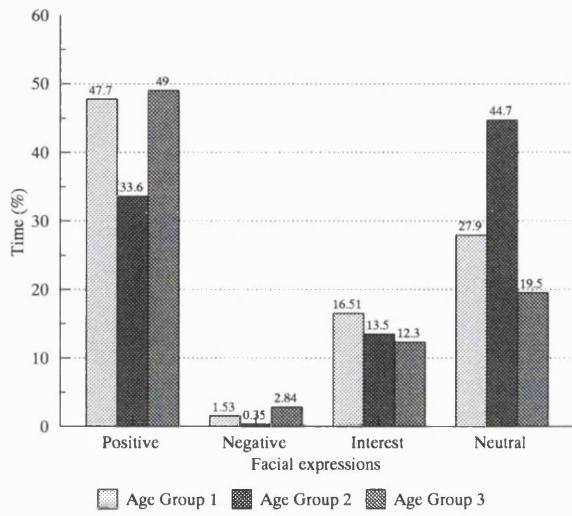


Figure 5: Mean duration per second of maternal facial expressions

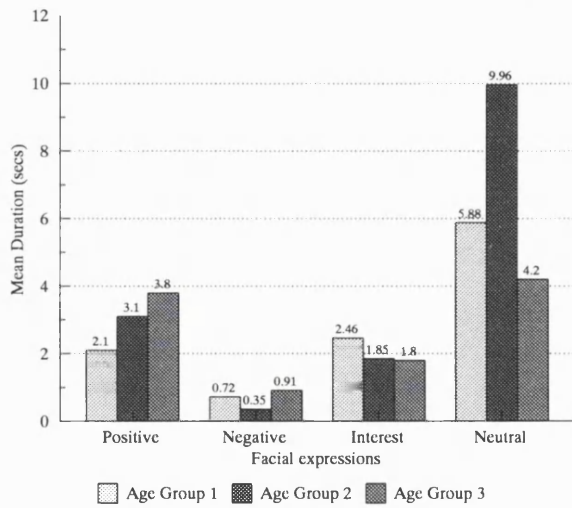
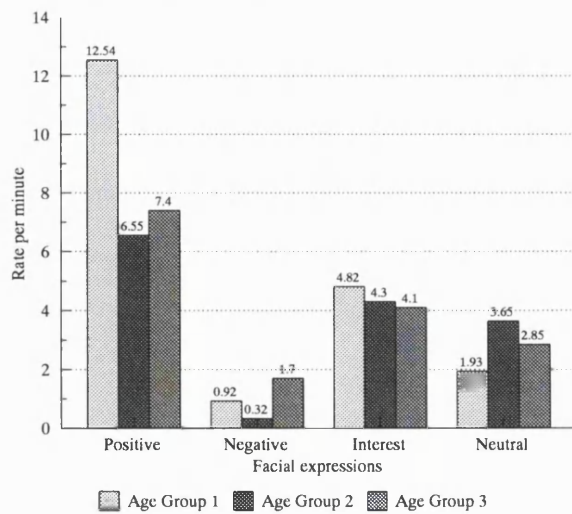


Figure 6: Mean rate per minute of maternal facial expressions



Comparing mother and infant measures reveals other significant differences between the two interactors. While both age group 1 and age group 3 mothers spent approximately 50% of the session displaying positive expressions, they differed in how they expressed them. Age group 1 mothers displayed positive expressions frequently but did not hold these expressions for long, while age group 3 mothers held their expressions for longer (Figures 4-6) but did not display them at the same high rate. This is in contrast to infant positive expressions, where in age group 3 infants expressed positive expressions at higher rates compared to age groups 1 and 2 (Figure 3), but held these expressions for the shorter durations (Figure 2). Mothers' positive expressions were less frequent and were held for longer as infants got older while infant positive expressions occurred with greater frequency but were held for less time. It is also possible that there is greater mutual co-ordination of positive interaction in age group 3 as mother and infant positive expressions occur with the same frequency.

Both mother and infant negative expressions were scarce compared to other expressions. Not surprisingly, negative maternal expressions were very few overall. Seen as a whole, the trend for negative expressions appears to be that infants spent little time (although more than their mothers) expressing negative expressions, although there was great variety in these expressions at first ¹⁵ (Tables 1-3, see average number of different negative expressions). Negative expressions did not increase as infants got older. ¹⁶

Mothers in age group 2 appear to spend longer periods than their infants still-faced. As during this phase of development babies begin exploring their environment, these figures may indicate a shift in the focus of the interaction. It may be that a large part of the interaction was spent in focus on inanimate objects and thus the facial expressions may be reflecting a mutual focus of attention on external objects. As during the filming mothers were free to interact with or without toys, it is not possible to establish from this data if the profile of age group 2 mothers and infants is due to play with objects.

15. The very low incidence of negative expressions for the mother may be a result of the presence of an observer in the home and cameras.

16. Sternberg et al. (1983) reported that infants' ability to express anger increases at around 6 months as was evidenced by the reactions of infants deprived of their biscuit. However, the decrease in the number of different number of negative expression blends may be due to the fact that these expressions are becoming more clearly defined as babies get older.

Lastly, the different reduction measures for maternal expressions yielded similar profiles. While each reduction measure provides a different perspective on the characteristics of facial expressions, all measures pick up changes in some characteristic of facial expression. The choice of which measure or measures to employ for the main data analysis must rest with assessing how they will correspond with maternal accounts data. This issue will be readdressed in the next chapter after assessing the procedure used for obtaining maternal accounts.

Before discussing the results of the pilot study as regards obtaining maternal interpretations, we will look at the results of analysis of co-occurrences of facial expressions between mothers and infants. While it is recognised that they do not reveal the sequential occurrence of events in time, it was decided to examine what type of information this measurement would yield and how it would fit into an analysis of maternal interpretations of infant behaviour.

5.4.5 Co-occurrence of Facial Expressions

How do the individual measures for mother and infant expressions compare to co-occurrence measures? Table 7 presents the proportion of time in which specific mother-infant expressions occurred as a percentage of total session time. Not surprising, co-occurrence of negative expressions is very low given their rare occurrence overall. Individual mother-infant co-occurrences varied widely. For example, PS1 mother-infant positive expressions co-occurred 14.50% of the session while, for the rest of age group 1 mother-infant pairs, co-occurrences comprised approximately 4% of the total session time. Whilst some co-occurrences were less variable (e.g., all infant expressions accompanying maternal interest expressions), the majority of co-occurrences were not suitable for quantitative comparisons. Part of this variability can be explained by some infants generally being 'fussy' during the filming. However, other factors could have affected the co-occurrences as well. As was mentioned before, object versus face to face play were not controlled and hence some mother-infant pairs interacted in the context of joint object play, whilst others preferred to play joint face to face games such as peek-a-boo. In general, however, despite wide variability, when infants displayed negative expressions, maternal expressions were predominantly positive or neutral.

Table 7: Co-occurrence of expressions for individual mother-infant pairs (expressed as proportion of total time of session)

Co-occurrence of facial expression categories (%T)																
Mother - Baby	POS - POS	NEG - NEG	NEU - NEU	IE - IE	POS - NEG	POS - NEU	POS - IE	NEG - POS	NEG - NEU	NEG - IE	NEU - POS	NEU - NEG	NEU - IE	IE - POS	IE - NEG	IE - NEU
Age group 1																
PS1	14.50	0	0	11.23	2.90	13.30	25.50	0.30	1.30	0.50	0	0	0	4.10	0.60	3.20
PS16	3.89	0	2.20	19.60	0.16	1.20	12.60	1.20	0	1.36	1.83	0.07	14.60	2.14	0.43	2.33
PS9	3.90	0	24.35	1.90	1.13	3.11	4.76	0	0	0	1.80	4.50	27.10	1.44	0.40	0.75
Age group 2																
PS2	3.90	0	24.40	1.89	1.40	6.50	5.90	0	0	0	1.80	4.50	27	1.30	0.4	0.76
PS7	11.40	0	49.80	4.90	0.19	4.55	0.60	0	0	0	8.70	0	9.70	1.70	0	2.60
PS13	20.40	0	24.40	2.00	0.01	3.70	11.80	0	0	0	5.30	1.90	12.60	2.35	0.19	2.00
PS21	19.20	0.25	6.22	1.70	9.26	1.73	10.60	0	0	0	3.50	7.80	16.05	2.90	1.90	1.10
Age group 3																
PS20	25.70	0	2.40	3.75	0	8.64	37.00	0	0	0.54	2.83	0.20	3.26	1.40	0	2.05
PS4	2.50	0	8.30	5.02	7.45	14.60	22.50	0	0.27	0.40	1.10	1.90	7.30	0.20	0.98	6.30
PS10	11.90	0	10.40	3.20	0.10	13.60	12.80	0.13	0.02	0.60	2.70	0.45	8.50	0.60	0	1.74
PS6	10.90	0	1.83	2.80	0.10	2.70	5.40	3.00	3.00	1.90	4.00	0	3.96	7.30	0.75	8.30

POS=Positive; NEG=Negative; NEU=Neutral (O); IE=Interest.

Some co-occurrences also reflected individual measures. For example, neutral expressions for mothers and infants of age group 2 co-occurred for large proportions of time, compared to age groups 1 and 3 (mean= 26.21 compared to 8.85 and 5.73% of total session time for age groups 1 and 3 respectively). This is also reflected in the individual measures for infants and mothers (Figures 1 and 4 respectively). On the whole, however, the variability in co-occurrences between mother-infant pairs suggests that, if this measure is to be employed, it is best suited and more reliable when applied to a qualitative analysis of individual pairs rather than as a descriptive tool for the types of expressions that co-occur in a particular age group as a whole. This is so especially in view of the small sample size.

5.5 Results of Maternal Accounts

The procedure for obtaining maternal interpretations of their infants' behaviour did not yield adequate or specific information. Maternal accounts were sparse and did not reflect the rich interaction that was recorded on tape. Instead, mothers tended to comment on infant behaviour in very broad and general terms (see Appendix 1 for a sample of these accounts). Two factors appear to have been responsible for this result. Firstly, the instructions given to the mothers were too vague and unspecific and thus mothers were not sure what they were supposed to interpret. Secondly, the task of both selecting and commenting on infant behaviours from a running tape may have placed too many task demands on the mothers. An alternative technique was developed to address these problems and is discussed in the next chapter. The maternal accounts for the pilot study, however, could not be coded or analysed.

5.6 Conclusions from Pilot Data Results

The pilot study was useful in clarifying a number of issues regarding data collection and reduction. While the results are incomplete without maternal accounts, some behavioural measures were explored and yielded the following preliminary conclusions:

1. Filming procedure: The preliminary filming session to familiarise mothers and babies with the procedure was disadvantageous. Mothers knew what to expect in the second session and took great pains to dress up their babies and 'put on a show'. Infants still continued to be attracted to the cameras and did not become more familiar with me or the cameras after the first filming session.

2. Length of Filming sessions: The sessions were too long for both mothers and infants. Younger infants especially became tired during the filming. Mothers appeared anxious to terminate the filming sooner.

3. Coding of Facial Expressions: MAX proved to be a reliable method of objectively coding facial expressions of both mothers and infants.

4. The three individual data reduction measures revealed differences between the three age groups. Proportion of time taken up by an expression and rate per minute of expression yielded similar profiles. These measures gave slightly different information regarding different aspects of facial expressions. The choice of the most suitable measurement must however rest with the method in which maternal accounts will be obtained and linked with facial expressions.

5. Measures of co-occurrence of facial expressions revealed highly variable results. While this high variability may be a characteristic of mother-infant interaction, individual measures produced less variability between subjects. Co-occurrence measures would thus be better suited to looking at individual profiles of mother-infant pairs in conjunction with maternal interpretations, if necessary.

6. The feeding situation was not suitable for examining infant expressive behaviour. The youngest infants were breast fed, which meant that their faces were obscured by the mother's breast. The oldest infants faces were obscured by cutlery and food.

7. The play situation confounded object play with face to face play. It was impossible to determine if the differences between expressions in the three age groups were the result of changes in mother-infant interaction styles or were due to mothers and infants using toys.

8. The results of the pilot study for obtaining maternal accounts suggested that clearer instructions needed to be given and an alternative method for obtaining maternal accounts should be used to encourage mothers to be more specific about what they were interpreting.

A potential criticism of the method of examining facial expressions is that the context within which facial expressions occurred was missing from the data analysis. As was argued in Chapters 3 and 4, the aim of the study is to let the mothers define the context and meaning of the behaviour. Thus, the data presented here gives an incomplete picture. Furthermore, the types of measurements used provide a static picture of facial expressions. Although co-occurrences may be partially effective in highlighting the changing roles of mothers and infants within interaction, they are not suited to deal with the data at a more conceptual level. Seen in the light of the nature of maternal interpretations, while it may be possible to define antecedent, co-occurring and consequent facial expressions, it remains a difficult task to ask mothers to identify the specific facial expressions that gave rise to their interpretations and their responses. This is especially so if one takes into account that the meaning mothers attribute to their infants' emotional expressions is likely to be based on many different aspects of the infants' behaviour. A preliminary conclusion is that this study, as a first step in examining maternal interpretations, should adhere to a broad based analysis of facial expressions. This type of analysis would provide a good starting point of examining the relationship between maternal interpretations and infant expressivity than a microanalytic and detailed level of analysis.

In conclusion, the results of the pilot study suggest that a shift in emphasis from facial expressions to maternal accounts is needed. In most aspects of the data collection and coding there was a need to introduce a more functional level of analysis to the expressive behaviours measured. In the following chapter a number of issues pertaining to an increased emphasis on maternal interpretations are discussed. While pilot results have addressed and resolved basic issues pertaining to data coding and reliability, more conceptually related considerations need to be addressed.

CHAPTER 6

RESTATEMENT OF HYPOTHESES

6.0 Chapter Aims

It is proposed that maternal interpretations of infant behaviour provide important indicators of what mothers find salient when negotiating dialogue with their infants and hence what they are likely to respond to. Whilst it is not possible to address all aspects of this complex process at once, an important facet of this mechanism is what factors shape maternal perceptions of their infants. In addressing this particular issue with regards to infant emotional expression, empirical analysis must concern itself with revealing the particular conceptual structures mothers use to create meaning out of infant expressivity and what aspects of both the infant's behaviour and the situational context they depend upon to do so. Retaining this focus, the following chapter re-addresses the design, procedure and data analysis for the main study.

The pilot study results have provided important indicators of what modifications are required. The following chapter presents decisions concerning what situations to film, how to obtain detailed maternal accounts, what aspects of maternal interpretations to code and how to analyse what mothers select. Issues pertaining to reliability of the procedure, and external and internal validity are also addressed. The theoretical and empirical implications of these changes are discussed and the hypotheses of the thesis are reappraised.

6.1 Recording Session

(a) The feeding sessions did not provide a good method of sampling infant expressions and were therefore inadequate for analysis and for promoting maternal interpretations of infant emotional behaviour. Trevarthen and Murray (1989) have pointed out that the interest in the feeding situation, which mainly stems from the psychoanalytic interest in the breast, is unjustified in microanalytic research on facial

expressions, this is born out by the data from the pilot study. The feeding situation will therefore not be used in the main study.

(b) The play sessions as they stand now are unstructured, that is they include face to face play as well as object play. This is confusing and confounding as expressive interaction with objects cannot be assessed independently of expressive interaction with another person. The meaning mothers attach to infant behaviours is likely to differ depending upon whether the infant is interacting with them alone or with a toy. Therefore the play situation will be divided into two parts; interaction with and without toys, each of 3 minutes duration.¹⁷

(c) A prohibitive condition will be included. This will take the form of placing an unfamiliar/attractive object in front of the child and asking the mother to prohibit him or her from touching it without physically restraining the child (Murray, 1989). This condition will serve three purposes: Firstly, it will counterbalance experimenter effects which may influence the mother into attempting to create a 'good' impression by encouraging the *mother* to use negative displays. Secondly, it will provide data on how infants respond to a frustration of intention brought on by verbal and expressive actions of the mother. Thirdly, maternal accounts obtained in this situation would also provide information on whether or not the mother thought the infant understood the prohibition and how she dealt with the infant.

In summary, the observational study will comprise of three different filming situations:

1. A face to face play situation.
2. A prohibitive situation.
3. A toy play situation.

17. Filming infants in joint rather than solitary object play was necessary for a number of reasons. Firstly, situations had to be suited to all three age groups. It would have been unsuitable and unnatural to film infants playing with the novel toy on their own. Secondly, in line with the focus of the study, infant behaviours had to occur in interpersonal contexts given the hypothesised role of maternal interpretations. Thirdly, filming infants in joint object play provided an opportunity of exploring how mothers viewed their role in the interaction when an object was introduced compared to when the interaction centred on them.

6.2 Maternal Accounts

Accounts obtained in the pilot study showed that, when mothers were asked to interpret their infants' behaviour, they were not specific about particular action sequences or what they meant. A method is needed which will encourage the mothers to be less reticent about their infants and to focus their accounts on actual events on video tape. As the stimuli presented to mothers are dynamic, two steps are required to reach an interpretation, the first is to select an act on the basis of specific criteria, the second is to describe what the act means. Thus, in the first instance a method is needed to allow mothers to select acts from the stream of behaviour.

Newtson (1973) devised a technique for segmenting the behaviour stream by asking subjects to bleep when they saw breakpoints in movement. However, the bleeps were recorded on a separate event recorder and did not allow the researcher to see the actions that were selected. Adamson et al. (1987) used a similar technique to examine how parents and non-parents selected infant acts in two different situations when given two different sets of instructions about what to select. However, they did not examine what was selected or what it meant to determine the nature of behavioural cues that might have influenced the impressions of the observers.

McPhail and Collett (1978) devised a more refined method of obtaining accounts of what observers were actually selecting. They showed subjects a tape and instructed them to press a button which places a mark on the sound track of the video tape, whenever subjects saw an act they had been asked to select and to mark the end of it and the beginning of the next. Once the tape had been marked it was played back and subjects were asked to provide a description of the segment which they had identified on the first viewing. This overcomes the problem of asking subjects for their explanations *after* they have viewed the tapes and also overcomes the difficulty of asking subjects to interpret behaviour whilst viewing the tape, a dual task which would place a heavy burden on the processing capacities of observers.

As mentioned in Chapter 3, the variation in instructions in the Adamson et al. study (1987) resulted in differences in selectivity of subjects, depending on whether they were parents or non-parents. Their results indicated that, when asked to select meaningful acts, parents selected far more acts than non-parents, while both parents and non-parents selected similar numbers of intentionally communicative acts. This

divergence in perception between parents and non parents, however, is in line with theories that state that parents "thicken thin data" (Kaye, 1979) and attempt to find meaning in the smallest of infants' acts even when they are not regarded as communicative. The criteria for selection are thus much broader and reports are expected to be more numerous and hence more informative.

Based on a combination of the three procedures described above, maternal accounts will be obtained in the following way. The mothers will be given the "meaningful" set of instructions and requested to view and mark the tape of their infants when they note a meaningful act. Following this, they will view the tape a second time and stop at each bleep to explain what selected infant acts mean. These interpretations will be identified by noting the time on the video tape at which each bleep occurred and audio-recording the accounts for later transcription.

6.2.1 Structure of Tapes to be Shown to Mothers

How the tape will be presented to the mother will affect the types of attributions she makes. There are several alternatives as to how the material could be presented. It is possible to edit the infant tape before it is shown to the mother by predefining and selecting infant acts on the basis of theoretically relevant criteria, e.g., imitative sequences, turn-taking sequences, and feedback sequences. The advantage of this is that a more controlled account of attributions surrounding target behaviours would be obtained. It would also show if mothers make different attributions about events falling within the same category and if this may be related to particular aspects of the interaction or situation. The method, therefore, appears more concise. However, the disadvantage is that there may be behaviours which mothers might find meaningful which will be left out and therefore missed. Since the object of the study is to investigate what selective mechanisms mothers use to identify meaningful infant acts this design is not suitable as it would seriously undermine the goals of the research.

Another possibility is to show mothers the full video of their infants but including their own behaviour as well. Mothers would then be asked to account for why they responded the way they did and what they were thinking when they performed certain actions. Accounts will therefore include attributions of mothers'

and infants' behaviour. The advantage of this would be that mothers would be able to provide direct information concerning their strategies for negotiating dialogues with their infants. However, it would not be possible to compare what mothers say with what they did independently of each other, since it is likely that their accounts will be in line with what they perceive themselves to be doing. Structuring the data in this way would necessitate a different type of analysis based more on maternal impressions of their own behaviour rather than on that of their infants.

A final alternative is to show the mother the entire infant tape, as was done in the pilot study, but only to code facial expressions which fall in maternally selected segments. This would allow the examination of the selective mechanisms of the mothers. Probes may then be used to focus the mother's attention on aspects of the interaction that are important to the investigation or to extract more information on those aspects of the infant's behaviour which she has selected. The latter design will thus be used for the main study.

6.2.2 Facial Expressions and Attribution Categories

By structuring the data in this way several factors can be examined. Firstly, by obtaining maternal accounts of each behavioural episode, it is possible to define event categories based on maternal interpretations. In this way the event will be defined by the mother. There are several advantages to this method; Firstly, it will provide a social context for facial expressions represented by maternal interpretative categories. Secondly, by analysing infant facial expressions that fall within maternally selected segments, it will be possible to see if these expressions are perceived and interpreted by mothers in a similar manner across situations and in different age groups. Thirdly, it is more economical with coding time as there will be no need to code every second of the sessions. Finally, in order to compare between maternally selected behaviours and baseline behaviour, behaviour falling outside maternally selected segments will be sampled for comparison.

One consideration that should be addressed here is what reduction measures to use. In the pilot study, behavioural reduction measures were used to make sense of the various characteristics of facial expressions. While in the pilot study a continuous record of facial expressions existed, in the main study segments may

interfere with the duration and frequency of facial expressions. The measure that is likely to be most affected by the new procedure is the mean duration of expressions. As selected segments may cut into the duration of an expression this would result in artificially short mean durations. The proportion of time taken up by an expression is also dependent on the duration of an expression and thus would also be affected by segment definitions, although it would nevertheless provide information on the proportion of time a particular expression was selected. The last measure, mean rate per minute, is not subject to such biases. Only in cases where two consecutive segments span the length of one expression will it affect the rate, as the same expression would be counted twice. However, given the fact that, in general, infant expressions are not characteristically held for long periods of time, this measure is the most appropriate one to use.

6.3 Design Considerations

Before going on to discuss the hypotheses which will be addressed, it is important to evaluate the strengths and weaknesses of the proposed analysis in terms of internal and external validity and reliability, and to consider the various conceptual trade-offs which result from the constraints such considerations impose.

6.3.1 Internal and External Validity

Internal validity is the degree of confidence with which the manipulation of the independent variables (infant age and situational context) is responsible for observed changes in the dependent variable (maternal interpretations of infant behaviour) (Cook and Campbell, 1979). The A-B-C intervention design used here is an extension of the single subject multiple intervention design. While it is advantageous in allowing several hypotheses to be tested successively, it also provides checks on the internal validity of the assessment. By presenting multiple interventions to different subjects, it is possible to check if these interventions result in systematic changes in the dependent variable (maternal selectivity and interpretations). To the extent that the dependent variable systematically varies with the independent

variables, it is possible to infer that changes in the independent variable (situation or age) are responsible for the observed change in the dependent variable (maternal interpretations of infant behaviour).

Internal validity can be threatened by high variability in the data. This can be reduced by averaging the data or transforming it (as was done in the pilot study). This will reduce fluctuations and will clarify levels and trends so that a reasonable estimate of the intervention effect can be made.

External validity, the extent to, and manner in, which results of an experiment can be generalised to different subjects and settings, is concerned with two central considerations: population-sample considerations and ecological and environmental invalidating factors. Regarding the former point, while the sample size ($N=12$) is small, generalisability can be established on the grounds that the same intervention is applied in sequence across subjects (matched on specific variables) and exposed to nearly identical environmental conditions. If consistent findings are obtained, then it is possible to generalise since the same intervention is replicated over different subjects in the same experiment. That is, to the extent that each of the factors systematically accounts for the pattern of maternal interpretations, the findings can be generalised to similar subjects in the larger population.

Ecological validity, which is concerned with confounding variables such as experimenter effects, has been taken into consideration in the proposed analysis at a number of different levels. Firstly, as regards the conditions of assessment, naturalistic observation in the home was employed. The results of the observations thus potentially reflect what occurs in natural settings in everyday interaction between mother and infant. However, the study was not fully naturalistic for obvious and necessary reasons. Purely naturalistic observations (as were attempted in the pilot study) did not result in a sufficiently frequent sample of facial expressions. Similarly, confining infants to a baby chair was the result of practical considerations related to ensuring standardised measurements of the assessment conditions. Thus, the present design has been constructed to achieve as many as possible of the advantages that both naturalistic and contrived settings could potentially provide.

Another ecological validity consideration that was taken into account was the unobtrusiveness of measurement and how to reduce the problems with reactivity. While video techniques offer reliable methods of assessment, mothers and infants are nevertheless aware that they are being filmed. To minimise reactivity effects I did not

interact with mothers or infants during the pilot study filming (filming mother-infant pairs twice seemed to make matters worse). To minimise experimenter effects on maternal behaviour, a prohibitive condition was introduced, which would encourage mothers to display negative affect.

The pilot study has clarified important conceptual and methodological factors which have resulted in shifts of focus and modifications of hypothetical constructs. The following section will discuss these shifts and provide a framework for the analysis of the data from the study.

6.4 Recapitulation of Hypotheses

The focus of this study on maternal interpretations of dynamic facial expressions distinguishes it from similar work on infant emotional development. Social developmental theories of socialisation maintain that mothers project meaning onto the infant's actions and respond as if the infant intended to communicate a particular message. The organisational principles that guide development are hypothesised to arise out of parental schemata of how the interaction should develop. That is, out of what mothers perceive as the end point of a particular action and how that fits into the general stage of infants' development. The types of questions that empirical analysis will address pertain to identifying maternal perceptions of emotion by examining the content of maternal interpretations in relation to infant behaviours occurring in different situational contexts and for infants of different ages. The research thus comprises of three main aims. These comprise of examining what mothers select as meaningful, the coded facial expressions in these selected meaningful acts, and maternal interpretations regarding these expressive behaviours. Within each of these aims there are a series of questions that need to be addressed. These questions are concerned with developmental changes, contextual influences and comparisons with baselines (see Table 8).

The first aim is to examine mothers perception of meaningful acts. To examine the initial step in the process of interpretation, the selection of meaningful acts, it is necessary to compare mothers' perception of meaningful behaviour in different situations. Research has suggested that the degree to which infant behaviour is perceived as meaningful is subject to contextual influences. Does situational

context influence maternal perceptions of meaningful infant acts? Research has also suggested that infant behaviour becomes more less diffused and more clearly marked by 'points of articulation' as infants get older (Werner and Kaplan, 1963). Do mothers select more infant acts as infants get older? On what basis do mothers perceive meaning in infant behaviour? To find out if there are differences between mothers and external observers, mother and observers' selections will be compared. If differences exist between observers and mothers, this suggests that mothers may use different criteria to define meaningful acts. If so, what are these criteria? Do they change as infants get older?

The second step is thus to examine what facial expressions are contained in selected meaningful acts. If mothers are finding more meaning in behaviour in certain situations, the expressions which accompany them are likely to indicate what facial responses are considered significant in interaction. To this end, selected infant expressions will be compared in three different situations. The evidence from studies on infant facial expressions in Chapter 2 indicates that expressive responses to environmental stimuli become more differentiated with increasing age. It is expected that selected meaningful infant acts will reveal more differentiated expressive responses as infants get older. To examine this proposal, selected expressions will be compared between age groups. To examine if the behavioural repertoire varies between conditions, baseline samples will be obtained from non-selected behaviour and compared to selected behaviour.

The third aim is to analyse maternal interpretations regarding these expressive behaviours. Questions which will be addressed involve identifying the influence of situational context and infant age on maternal interpretations. With reference to maternal inferences surrounding infant emotion states, evidence suggests that mothers infer a variety of emotion states from still-faced photographs depicting emotion expressions (Huebner and Izard, 1988). Is there a relationship between infant facial expressions in selected segments and maternal interpretations of emotion states? Does situational context affect this relationship as was suggested by empirical studies presented in Chapter 1 (e.g., Sherman, 1927a and b)? Secondly, developmental influences on maternal interpretations of meaningful infant acts will be examined. Do mothers become more articulate about the meaning of their infants behaviour as infants get older? Evidence presented in Chapter 2 has shown that, from 9 months onwards, infants increasingly share in the parents' perspective on the world. Will

maternal reports reflect the growing intersubjective skills of the infant? How do mothers conceive of their own role in the interaction vis-à-vis these developments?

It is hypothesised that maternal interpretations are meaning frames which mothers impose upon their infants' activity based on previous experiences with their infants, and are not necessarily shared with us as observers. To highlight this difference in perspective and examine the specific areas in perception which differ, external observers' interpretations will be compared to maternal interpretations of infant behaviours.

Table 8: Aims and objectives

Which acts are meaningful?	<ul style="list-style-type: none"> (a) Does definition of meaningful acts depend on the context of interaction? (b) Does infant behaviour become more clearly defined as meaningful as babies get older? (c) Do observers differ from mothers in their selections of meaningful acts?
What facial expressions occur in those acts?	<ul style="list-style-type: none"> (a) Do selected infant expressions become more differentiated with age? (b) Do mothers select infant acts containing contextually congruent expressions? Does situational context affect what types of facial expressions mothers select? (c) Does the behaviour of infants in selected meaningful acts differ from baseline behaviour?
What developmental changes occur in maternal interpretations of meaningful acts?	<ul style="list-style-type: none"> (a) Do mothers' perceptions of infant emotions change as infants get older? (b) Is there a relationship between emotion state attributions and perceptions of emotion states? (c) Do mothers become more articulate about what infant behaviour means as infants get older? (d) Will maternal reports reflect the growing capacities of infants to engage in interpersonal exchanges? (e) If observers are given the same criteria as mothers for the meaning of infant behaviours, are they as likely to perceive infant acts as mothers do?

Finally, the above analysis will elucidate who is leading the interaction. Research has revealed that the majority of maternal expressions in face to face interaction are initiatory (Malatesta et al., 1982). This suggests that the mothers' role

may be one of guidance whereby they lead infants by initiating expressive exchanges rather than simply accommodating to the infants' expressions. For example, Kaye and Fogel (1980) demonstrated that 6½ month old infants assume a more active role in interaction, as evidenced by their ability to initiate positive exchanges rather than simply respond to them (Chapter 3). Will maternal self-reports reveal this shift in responsibility? Will maternal accounts of the infant's skills reflect the more active role of the infant as babies get older? In the following chapter these questions will be addressed.

CHAPTER 7

MATERNAL SELECTIONS OF INFANT ACTS AND EXPRESSIONS

7.0 A Brief Reorientation

The results of the pilot study highlighted aspects of the design that would have to be changed when conducting the final investigation. These changes were presented in Chapter 6. A greater focus on identifying the dynamics of maternal interpretations has necessitated the creation of a new technique for obtaining maternal accounts of infant acts, and the introduction of three semi-structured situations to allow for a clearer profile of the effect of situational context on maternal interpretations. The use of a cross-sectional design will permit a comparison of age related processes. The study will therefore focus on aspects of maternal interpretations of infant behaviour, and facial expressions, which appear to be characteristic of each age group and situation. Comparisons of maternal interpretations and facial expressions will provide the basis for an understanding of the dynamics of maternal interpretations in the social development of infant emotionality.

The analysis will thus comprise of the three broad components presented in Table 8; Firstly, to identify the circumstances under which infant behaviour is selected as meaningful by mothers. For example, do contextual factors or the age of the babies influence mothers perception of meaningful infant acts. Having determined conditions under which meaningful acts are selected, what is the content of these selected segments? What types of facial expressions do mothers select, and is there any evidence to show that there are developmental or contextual influences on the selection of these expressions? Secondly, to determine what mothers say about these infant acts, and to see if the interpretations are subject to situational and developmental influences. Thirdly, to compare the way mothers select and interpret their infants' behaviour with those of external observers. These three broad components of the analysis will be dealt with in three separate chapters.

The present chapter comprises of two types of analysis: Firstly, a comparison between age groups and situations of the number of meaningful infant acts mothers identify. Secondly, a comparative analysis of the facial expressions contained in these

selected meaningful segments in different age groups and situations. In Chapter 8, maternal interpretations concerning the meaning of these infant acts is analysed and compared between ages and conditions. A quantitative and qualitative analysis exploring how maternal interpretations map onto infant facial expressions is also presented. Chapter 9 presents a series of experiments designed to compare maternal selections and interpretations with observers, to determine if there is a divergence in perspective between mothers and nonparticipant observers.

The first part of the current chapter presents the design of the study. Any problems that occurred are documented and their solutions outlined. The next section of the chapter covers the method, framework for coding, problems encountered in this area and solutions. The hypotheses and results of the analysis of maternal selectivity are then presented and discussed.

7.1 The Structure of the Study

As was outlined in Chapter 6, it was decided that the filming sessions would be structured into three conditions;

- a face to face session lasting approximately three minutes;¹⁸
- a prohibitive session lasting two minutes, or less if the infant got distressed;
- a toy play session in which mother and infant played together, lasting a further 3 minutes.¹⁹

18. The length of these observational periods was determined by the results of the pilot study which revealed that the initial length of filming each situation for 7 minutes was too long for babies, as they became distressed. Using shorter observation periods took this into account, as well as recognising that infants were now required to engage in three, rather than two, situations. Observational periods could not be shorter to ensure that there was sufficient time for mothers to select and comment adequately on infant acts, and to allow enough time to obtain a varied sample of infant behaviour. The shorter length of the prohibitive condition was necessary due to the fact that both mothers and infants found it difficult to maintain interaction in this condition for long. In this condition, observation was terminated sooner in babies became distressed by the prohibition.

19. The three conditions were presented in the same set sequence for each mother-infant pair. The order of the sequences was kept the same to minimise infant distress due to the prohibitive condition.

It was expected that the three situations would enable three types of interactions to be elicited and compared. As was mentioned in Chapter 6, one of the purposes of the prohibitive condition was to encourage the mothers to display negative facial expressions. The pilot study results showed that mothers displayed few negative expressions and suggested that this may be due to reactivity effects. The presence of the cameras and the researcher would also have made it less likely that mothers would engage infants in activities that were likely to create conflict between themselves and their infants. The prohibitive condition also permits an analysis of what happens when there is a divergence in goals between mothers and infants in terms of how mothers view the situation, and their infants behaviour. On the infant's side, it will reveal how infants react to the mother's prohibition.

The face to face play situation, on the other hand, was set up to reflect and capture what is likely to be interactions occurring naturalistically between the dyad when their attention is directed at each other. In this condition, it was expected that mothers would use face to face games to keep their infants engaged, and hence would elicit many instances of positive interactions. It would also allow a comparison of age related changes in infants behaviour in terms of how they respond to purely face to face interaction without the aid of toys, and how mothers would interpret the child's behaviour in this interpersonal context.

The toy play situation, involving, as it does, focus on a third, inanimate object, is designed to compare the types of expressive interactions, and mother's interpretations of these acts in a situation where the baby's attention is divided, as such involves a negotiation of goals to coordinate interaction. It is expected that infants would focus on and explore the toy, although age changes would make other reactions possible. For example, the youngest infants are likely to have short attention spans, and may not be able to play with the toy for long lengths of time. Older infants, on the other hand, are likely to find the toy interesting, and are likely to be more content playing with the toy and their mothers. Last but not least, and as was mentioned above, the toy play condition will also permit a comparison of maternal interpretations in a situation where the interaction involves a negotiation between mother and baby of the infant's attention.

The infants were divided into three age groups as presented in Table 9.

Table 9: Age groups

Age group 1	4-6 month old infants	Range=4;1-6;3
Age group 2	7-9 month old infants	Range=7;0-9;1
Age group 3	10-12 month old infants	Range=10;1-11;3

These age groups have been conventionally used in the developmental literature to highlight critical phases in the infant's development. A discussion of these critical phases and their significance is to be found in Chapter 4 (Section 4.3).

Each age group comprised of a sample of 4 infants, 2 girls and 2 boys, balancing for sex differences. Data collection took place in two stages. In the first stage, mothers and infants were filmed in the three different situations.²⁰ The second stage of the data collection involved obtaining maternal accounts of their infants' behaviour. In the following section the procedure for this will be described.

7.1.1 Procedure for Data Collection

A sample of 12 normal mother-infant pairs was obtained through the National Childbirth Trust (NCT) in Oxfordshire. National Childbirth Trust nurses were asked to contact mothers who were not suffering from any psychological problems. None of the mothers filmed had any involvement with psychiatrists or clinical psychologists either before or during the filming. Mothers were English, white, middle class, primiparous and in their mid-20s to mid-30s. The sample of mothers were selected from the NCT because of the homogeneity of its population of mothers. It was reasoned, on the basis of the theory developed in Chapters 1, 2, and 3, that interpretations are likely to differ on the basis of the social and cultural group to which the interpreters belong to. The conceptual framework caregivers carry with them would be likely to affect the types of interpretations they made of their infants. In order to ensure that interpretations were based on changes in the mother-infant relationship, rather than reflections of different social or cultural backgrounds, it was important to ensure that mothers belonged to the same cultural and socio-economic background.

20. Two cameras were used, one aimed at each of the pair.

They were told that the purpose of the study was to examine the normal development of perception in infants. After obtaining their consent, a familiarisation visit was made, following which filming took place. For the filming session, mothers were asked to place infants in a baby-chair facing them. The following were the instructions given for each situation:

Stage 1: Face to face play (FF)

"I'm going to film you and the baby for about 3 minutes. Could you play with your baby as you often do when you are together. Please do not use any toys or objects. Try to relax and ignore me and the cameras."

Stage 2: Prohibitive condition (PR)

"Now I'm going to bring out a toy (placing the novel toy ²¹ at the edge of the table or on the mother's lap if necessary, just within reach of the baby). Could you try to stop the baby from playing with it without physically restraining him/her?"

Stage 3: Toy play condition (T)

"Could you just carry on playing with the baby and the toy for a few minutes?" (At this point I intervene and place the toy completely within the infant's grasp).

Each stage was treated as a separate filming session. If the baby became distressed between sessions the filming was halted until s/he had been quietened. If the infant could not be calmed the mother-infant pair were replaced (N=1).

Within a two week period, ²² a return visit was made to show the mother the infant video which had been edited with a video time generator. Connected to the

21. The novel toy comprised of a black box with coloured lights and buttons, and a small compartment with a lid. None of the infants had seen this box previous to that point in the filming. The toy was built specifically for the study by K. Holdsworth at the Social Psychology Laboratory.

22. It was decided, on the basis of previous experience, that the gathering of accounts should not be delayed for over two weeks. This was because the infants developed so fast that there was a danger that accounts would be confounded by skills developed after the filming. This had happened in a pre-pilot sample of mothers, where a delay of one month between filming and obtaining accounts resulted in mothers relating the relevance of skills, seen on video, to the development of new skills acquired after the filming.

video machine was a bleeper which was handed to the mother with the following instructions:²³

"As the baby's mother you know your infant far better than I could from a tape. Could you please help me by pressing this button every time the infant does something that you find meaningful? Please mark the tape even if you had previously marked the same type of action before."²⁴

These instructions were elaborated upon by asking the mothers to imagine that they were actually interacting with the infants and to press the bleeper when they would have been able to interpret and respond to the infant, such that they could describe it to me and tell me what s/he meant. Most mothers, however, seemed to grasp intuitively what was asked of them, and had no difficulty in selecting from the stream of their baby's behaviour. After the tape was marked, mothers were asked to see the tape again and to explain what the selected acts meant.²⁵ These accounts

23. The video machine with the bleeper was designed and constructed by Steve Bennett at the Social Psychology Laboratory.

24. With the bleeping technique, one initial problem was that mothers bleeped only once to mark a particular infant act but would not mark it again if it recurred, even though it was meaningful to them. The solution was to state in the instructions that they should mark the segments even though they may have done so before. After mothers bleeped during the first viewing of the video tape, they were asked to hold onto the bleeper during the second viewing. This was because in many instances mothers found that they had missed meaningful episodes in the first viewing and needed to mark them. That also meant that the tapes were viewed thoroughly by the mothers, reducing the likelihood of meaningful infant acts being missed .

25. It was important to present the three conditions in the same order that they were filmed to preserve the temporal context of the infant's actions. A potential criticism may be that this method may give rise to order effects in, for example, the frequency of bleeping across the three conditions. This is not necessarily the case. The mother bases her interpretations not only on the present context of the infant's actions, during interaction, but on how much time has elapsed during which the infant was engaged in a particular activity. Indeed many examples were found where the meaning of an infant action was bound to a previous session or to the length of time which had passed since the beginning of the filming. Thus, it was felt that changing the order of the sequences would have distorted the mothers' interpretations on viewing the tape. Moreover, the object of using this technique was to try to achieve, as closely as possible, a running commentary from the mother while she was engaged in the process of interaction and communication with the infant. As it was not feasible to do so whilst she was interacting with the infant, due to task demands, the alternative was to keep the sequence of events as close as possible to the reality of the filming situation. Therefore, in the light of the above reasoning, although the possibility of serial effects may not be entirely ruled out, it is unlikely that they would have posed a threat to the reliability of the data. This is so especially in view of the number of opportunities the mothers had to view the tape, and

were recorded on an audio machine, along with the corresponding time at which the bleep occurred to synchronise them with the infant behaviour data.²⁶ To ensure that the mothers had been blind to the purpose of the study, mothers were asked what they thought the study had been about. Those who guessed the true nature of the study were replaced.²⁷ Mothers were informed of the true nature of the study at the end of the procedure. In the following section the hypotheses pertaining to this study are presented.

7.2 Hypotheses and Aims of Analysis

To examine the role of maternal interpretation of infant expressions in interaction, the following questions are addressed in the next three chapters. The analysis may be divided into 5 main sections:

A. Does maternal selectivity from the stream of infant behaviour change between situations and age groups? The number of times mothers selected meaningful infant acts was examined to assess:

1. Whether maternal selections of infant acts are affected by infant age or situational context;
2. Whether maternal selections differ from student observers' selections of infant behaviours.

B. Having established the characteristics of maternal selectivity, the next step is to examine what mothers select. What infant facial expressions occur in maternally selected segments? Are there differences in the frequency of selected expressions which can account for the patterns of maternal selections of infant acts?

on the nature of the instructions.

26. From a brief pilot of this method it was found that mothers were sometimes reluctant to go into detail or were not being specific. Therefore a set of standard prompts and probes were used in cases where the mothers' accounts were unclear. Probes used were: "Could you please explain what you meant ...?", " I don't understand, could you explain a bit more?", and " How could you tell your baby wanted/was....?"

27. One mother-infant pair were replaced due to such biases.

1. Do facial expressions, occurring in segments selected by mothers as meaningful, reflect maternal sensitivity to the developing capabilities of infants?

2. Does situational context affect the type and frequency of these facial expressions?

3. Are mothers' selections of facial expressions in various situational contexts also sensitive to the developmental capacities of the infant?

4. Are mothers' selections of infant behaviours haphazard, or do selected behaviours differ from baseline behaviours? As infant age increases, is there less change in facial expressions which can account for maternal selectivity?

C. Having examined what types of expressions mothers select, we go on to examine how mothers interpret these facial expressions. What attributions do mothers use to explain infant behaviours?

1. Do maternal attributions reflect maternal sensitivity to the age-related capacities of their infants?

2. Are maternal attributions influenced by situational context?

3. Does infant age affect maternal attributions in different situational contexts?

4. Do mothers' interpretations differ from observers' interpretations?

D. What relationship exists between facial expressions accompanying specific attributions?

1. Are maternal attributions of emotional states congruent with context free coded facial expressions?

2. Are non-emotion attributions made in the context of particular patterns of facial expressions which are age or situation specific?

E. Finally, what evidence does the above investigation provide about:

1. Who is controlling the interaction?

2. The mothers' role in this interaction?

In the following, the method used to investigate the hypotheses presented in the first two sections on maternal selectivity is presented. The analysis of this data is divided into two parts. After a discussion of measurement and reliability issues, a comparison of maternal selections of meaningful infant acts between age groups and

conditions is presented. The aim of this comparison is to determine whether maternal selections of baby acts are affected by the age of the baby or the situational context. In part two, the content of these selected segments is examined. The aim of the latter analysis is to examine what types of facial expressions occur in maternally selected segments. This will reveal possible patterns of differences in frequencies of expressions between conditions and age groups which may suggest developmental and contextual influences in maternal selectivity.

7.3 Data Reduction and Coding of Facial Expressions

The behaviour segments which were selected for coding and analysis were based on maternal identifications, i.e., on marked segments of the film. These bleeped behaviours permitted a direct comparison of maternal interpretations with the facial expressions of the infant. Segments were defined on the basis of mothers' descriptions of behaviours at each bleep, and backtracking until the beginning of the behaviour defined by the mother. Therefore, the bleep was defined as the end of the segment. Maternal attributions fell around breakpoints in the infant's behaviour. Thus, to define the beginning of the segment was unproblematic as it was generally indicated by a change in the infant's behaviour corresponding to the mother's description of that behaviour. Expressions falling within these segments were coded, providing information on the types of facial expressions upon which mothers based their interpretations. Data for the baseline behaviours comprised of one segment of baseline behaviours which fell outside maternal selections of meaningful behaviours. Baseline segments were 4 seconds long on average, which was the average length of maternally selected segments. Segments falling outside maternally selected segments were shorter than the average length of those segments; therefore, although a number of baseline segments occurred between alternate selected segments, I could only take one four-second baseline segment from each session.

7.3.1 Intercoder Reliability of MAX

The reliability of the facial coding scheme was tested using the same method as in the pilot study. MAX was used to code the facial expressions, and inter-observer reliability of the facial expressions codes was checked throughout the coding. A segment of film was randomly selected from each condition and age group, and was double coded by another trained coder. Intercoder reliability was 85%²⁸ (see Appendix 2).

7.3.2 Facial Expression Categories

MAX coding resulted in over 30 different facial expressions. The large number of expressions was the result of blends of various expressions in different regions of the face. This made any type of comparison of facial expressions between infants in various age groups and conditions problematic, because of the low frequencies of specific facial expressions. To enable comparisons, expressions were collapsed on the basis of their central features, as is explained below. After collapsing the facial expressions, 7 main expression categories were created.

1. **Positive** expressions, defined by the existence of the smile (code 52 in MAX).
2. **Negative** expressions, defined by the predominance of any of the negative muscle movements identified by MAX as involved in negative expressions. Although MAX identifies several negative facial expressions (sadness, anger, disgust, contempt, fear, pain and shame), these did not occur in unblended form and were collapsed to form one negative emotion expression category.
3. **Interest** expressions not blended with any other expression.

28. Izard's instructions in the MAX manual were to compute intercoder reliability as:

Agreements+disagreements.

Disagreements

Agreements and disagreements were calculated by comparing codes of each facial action movement and the onset and offset of the muscle movement in time.

4. **Surprise** expressions not blended with any other expression (not included in the analysis due to low occurrence).

5. **Neutral or rest** expressions in which there was no codable movement, i.e., the face was at rest (denoted by open eyes, smooth forehead, and closed relaxed mouth).

6. **Obscure** face in which the face was hidden from view (not included in the analysis due to low occurrence).

7. **Noncodable**: Expressions for which MAX did not have codes (not included in the analysis due to low occurrence).

7.3.3 Statistical Issues

A number of statistical methods have been used to analyse videotaped data. In a comprehensive review of the uses of video techniques for the study of human action, Bakeman and Ginsburg (1981) list a variety of statistical techniques for the analysis of non-sequential event based data, ranging from chi-square tests, analysis of variance (e.g., Izard et al., 1987; Malatesta and Haviland, 1982), and log-linear analysis (e.g., Brownlee and Bakeman, 1981; Bakeman and Brownlee, 1982).

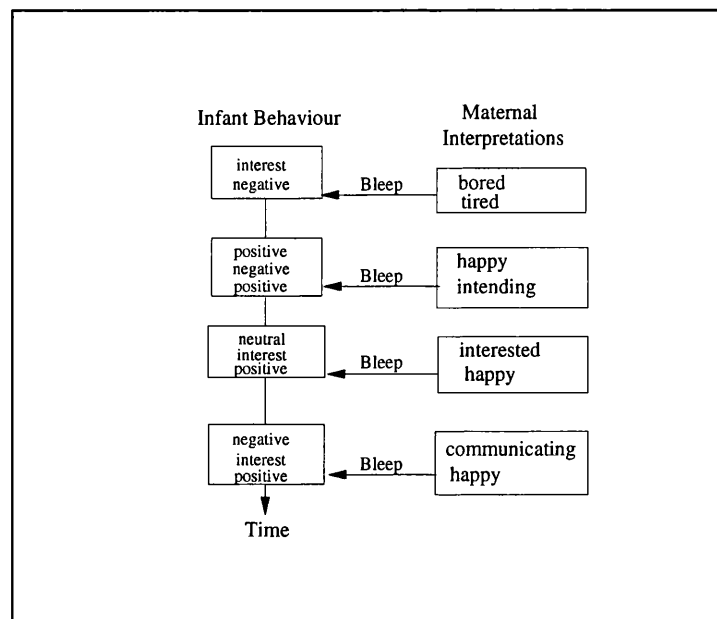
Given the small sample size, a nonparametric test, log-linear modelling, was used, which enabled comparison between the various levels or factors in the design. Because of the low power of the statistical test there was a high risk of Type II errors (i.e., failing to reject the null hypothesis when it is false). Thus, it was expected that several of the comparisons would not be statistically significant although there may have been a substantial effect. Because of this the following analysis will be based on both inferential and descriptive statistics.

7.3.4 A Note on Data Management

Figure 7 presents a simplified example of the data layout to give the reader an idea of how the data was structured. To obtain a measurement of a particular

category of expression or interpretation the data was reduced by calculating the total number of occurrences of that particular category in all selected segments. Observational periods differed in length depending on the state of the infant. It is thus also worth pointing out that because film sessions were of unequal lengths, frequencies could not be used directly. Shorter films would have fewer facial expressions and interpretations, whilst longer films meant that there was a higher probability of more facial expressions and interpretations occurring. Therefore, in all aspects of the data analysis, the total time of each session had to be taken into account. For descriptive purposes, the rates per minute of facial expressions and attributions are used in graphs and tables, as calculated in Chapter 5. Specific facial expressions were summed across the selected segments and divided by the total session time. For purposes of computation, actual frequencies were used, weighted by total time of session (see Appendix 2).

Figure 7: An Example of the structure of data segments



7.4 Analysis and Results of Maternal Selection of Infant Acts

The initial step in the interpretation of behaviour is the selection of what to interpret.²⁹ How do mothers select from the stream of infant behaviour? Are maternal selections of meaningful infant acts subject to contextual and developmental influences? A comparison of the differences in maternal selections of meaningful infant acts in different situations and age groups will go some way towards answering these questions and will highlight the nature of the criteria mothers use to define what they consider meaningful.

Do mothers note meaningful acts in some situations more than others, or in some age groups more than others? Results of log-linear modelling revealed that the number of meaningful acts noted by mothers did not differ significantly between age groups ($\chi^2=5.258;df=2;p=.072$). Table 10 shows that there is a high level of individual variability between mothers.

Table 10: Mean rates per minute of maternal selections

Situations	Age groups		
	4-6 months	7-9 months	10-12 months
Face to face	5.09 (4.60-8.50)*	5.70 (3.50-9.40)	5.05 (2.44-7.70)
Prohibitive	4.50 (2.50-5.40)	4.35 (3.40-6.86)	4.96 (1.70-6.66)
Toy play	4.40 (1.90-6.60)	3.65 (2.59-4.63)	2.88 (1.07-4.99)

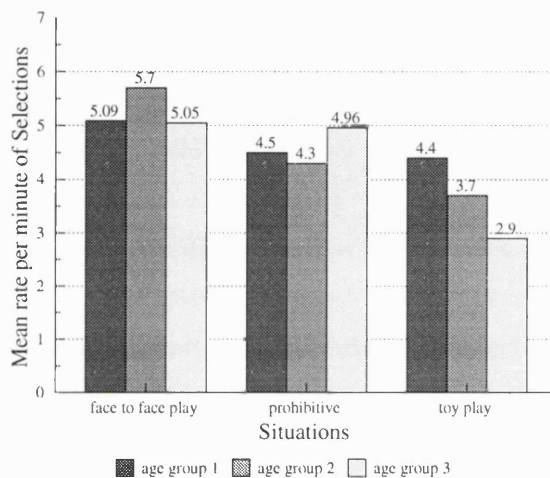
* Figures in brackets represent ranges.

No significant differences were found between each age group and situation ($\chi^2=3.58;df=4;p=.47$), although Figure 8 suggests a trend in the data. Log linear analysis did, however, reveal a situation main effect ($\chi^2=22.65;df=2;p=.000001$). Mothers selected more acts in face to face interaction (FF), and the prohibitive situation (PR), than in the toy play condition (T) (Figure 8). In FF and PR, mothers

29. Maternal selections refer to the number of bleeps mothers used to mark the infant tape.

selected between 4 and 5 episodes per minute, while in T, they selected between 3 and 4 episodes per minute. This would suggest that mothers note more meaningful acts when their infants are engaged with them in interpersonal exchanges, than when infants are playing with inanimate objects. Although PR could arguably have resulted in the infants' attention being focused on the toy, observations from the video tapes revealed that mothers distracted babies by playing face to face games, especially in age groups 1 and 2.

Figure 8: Maternal selections of infant behaviour



Although maternal selections did not differ significantly between age groups, trends in Figure 8 suggest that mothers make progressively fewer selections as infant age increases. While mothers of the youngest age group select approximately the same number of meaningful acts across the three situations, selections of older infant behaviours appear to be fewer, especially in the toy play episode. Older infants may be displaying less interactive behaviour than younger infants in T.

Returning to the original hypotheses, the initial question regarding maternal selectivity was to identify the basis on which mothers perceived and selected infant acts as meaningful. Moreover, whether this is influenced by the age group of the babies or by situational context. The above results showed that mothers find more infant behaviours meaningful in some situations than in others (suggesting that babies may be displaying more meaningful behaviours in these situations). The data suggests that selectivity is also affected by the age of the infant: Mothers of the oldest age group infants' make fewer selections in T than the rest of the sample.

On the whole, however, infant age did not affect the number of meaningful acts noted. It is not clear why mothers did not note more meaningful acts overall in older infants. It has been suggested that, as babies develop, their behaviour becomes more clearly marked by 'points of articulation' (Werner and Kaplan, 1963). In support of this, Adamson et al. (1987) found that adults selected more acts overall as babies got older. The present findings show that mothers selected a similar number of acts overall regardless of infant age (mean=4.66 for age group 1, 4.57 for age group 2 and 4.30 for age group 3). Indeed, the trend, although not significant, appears to be for mothers to select *fewer* acts with increasing age. If this were so, it may be that, although mothers in different age groups do not differ in the *number* of meaningful acts they select, they may differ in *what* they select and how they interpret it. In the following section, the analysis assesses the expressive content of selected segments in the different conditions, and in so doing, examines what mothers are focusing on. This analysis will identify whether differences between age groups reveal a developmental progression in selected facial expressions.

The present results are, however, congruent with Adamson et al.'s results regarding the effect of situational context on selectivity. Their findings show that more meaningful acts are selected in interpersonal situations than in situations where infants are interacting with objects on their own. Although the filming episodes in the present study were not identical, the present investigation partly corroborates these findings; mothers selected more acts in situations where one would expect frequent episodes of interpersonal exchanges and maternal involvement (FF and PR), than in situations where the babies' attention was directed more at the toy (T). If mothers are more inclined to find infant behaviour meaningful in interpersonal contexts, it suggests that they are highlighting potentially communicative expressions for their babies. Moreover, it implies that expressions are selected in behavioural episodes which are characterised by joint dialogue between mothers and infants.

7.4.1 Developmental Changes and Situational Contexts

In the following analysis, the content of maternal selections is examined. What mothers find meaningful is analysed to find out if there are qualitative and quantitative differences in mothers' selections of expressions with increasing age, and

in different contexts. Do developmental variables affect the way infants react to the various situations, and the way mothers select expressive acts? As infants grow older their responsiveness to environmental stimuli develops, as was demonstrated in Chapter 2. This means that babies' facial expressions will become more articulate and less ambiguous. Will this affect the way mothers select and read these expressions? Will mothers find it easier to select and identify changes in infant state from their facial and expressive reactions, as infant expressions become more familiar to mothers?

At the same time, it is hypothesised that situational constraints will affect the expressive behaviour of infants. Evidence presented in Chapter 2 suggests that infants may respond with stereotypical facial expressions when they are confronted with strong stimulation. The situations presented here, on the other hand, do not involve the presentation of strong stimuli, but rather were designed to capture aspects of mother-infant interaction which were likely to commonly occur in everyday settings. Thus, it is expected that facial expressions of infants may be ambiguous and difficult for mothers to define, especially in the younger age groups. This ambiguity is an important aspect of expressive communication in the dyad. As has been shown in Chapters 1 and 2, research designed to uncover the universality of facial expressions has not found universal recognition of facial expressions. Similarly, studies which assessed mothers recognition of stereotypical facial expressions did not find clear-cut evidence of mothers correctly identifying infant emotion states in line with preset definitions. In this connection, as was pointed out by Plutchik (1980b), the stereotypical facial expressions on which so much of the naturalist argument and research rests are fleeting at best and, when they occur, are only held for a short period of time. All these factors indicate that studies which attempt to elicit stereotypical facial expressions in infants by the use of artificially strong environmental stimulation are not representing the process of expression and interpretation adequately.

The choice of situations in this study was set up to answer the question: In naturalistic settings, how are facial expressions selected and interpreted by caregivers? What are the likely influences on these interpretations? This is not to say that the situations chosen here fully represent the range of interactions in everyday settings. However, an attempt was made to use situations and settings with good ecological validity. In this connection, it is recognised that there must be necessary restraints on the activities of the mother-infant pair in naturalistic settings, weakening the

ecological validity of the observational study. However, conducting the study at the mothers' homes helps to reduce the inherent reactivity problems in conducting observational work in artificial settings. The more relaxed and familiar settings of the home environment would have reduced reactivity effects of myself and the filming equipment, although undeniably, they would have had some effect.

The previous analysis revealed that mothers are finding infant behaviour meaningful when it occurs in contexts characterised by interpersonal interactions. In the following analysis, it is expected that the face to face condition would be likely to contain frequent positive exchanges. While, as was stated earlier, the prohibitive condition would be likely to give rise to negative exchanges, although developmental variables may affect how infants respond.

Sugerman-Bell (1978) and Trevarthen and Hubley (1978) found evidence that, whereas infants under 9 months could not yet coordinate between persons and objects, at around 9 months infants began to look up from the toy to their mother during toy play, creating a more interpersonal dialogue during joint toy play. Do selected acts of mothers in the oldest age group contain high frequencies of positive expressions during T to reflect these developments? In the next section these questions are addressed.

7.4.2 Selected Infant Facial Expressions

Infants' expressions fell into four main facial expression categories: positive, negative, interest, and neutral or still-face. Three other expressions were coded, surprise, obscure, and noncodable, but they did not occur with sufficient frequency to allow for statistical analysis. Coded segments did not contain expressions of shame or contempt as identified by MAX; infants do not express the 'social emotion' expressions in maternally selected segments. Table 11 provides a summary of the results of log-linear modelling. It was not possible to compute an expressions x age x situation effect. The number of permutations of such an analysis would require a larger sample size.

Table 11: Chi-square statistics results of log-linear model for main and interaction effects of infant facial expressions

Expressions	Age effect	Situation effect	Age x Situation interaction
Positive	5.83	44.58***	18.69***
Negative	1.80	3.31	26.61**
Interest	0.88	2.51	5.21
Neutral	6.40*	6.40*	11.71*

Significance levels: * = 0.05, ** = 0.01, and *** = 0.001

Degrees of freedom for main effects = 2

Degrees of freedom for age x situation interaction = 4

1. Ages:

As can be seen from Table 11, only neutral expressions differed between age groups. Selected segments contain increasingly higher occurrences of neutral or still-faced expressions in age 2 than ages 1 and 3. Table 12 also suggests possible trends in the remaining facial expressions. For example, compared to mothers of 4-6 and 7-9 month olds, mothers of 10-12 month olds selected segments in which infants smiled less and displayed more negative expression, suggesting that mothers of the oldest infants may have begun to regard negative expressions as having interpersonal meaning. This possibility is examined in the section on maternal interpretations below. Comparing expressions within each age group, a general pattern was found showing positive, interest and negative expressions occurring frequently in age 1 and 3 selected segments. In age group 2, babies were more still-faced and displayed fewer negative expressions than the other 2 age groups in selected segments.

Table 12: Mean rate per minute of infant expressions for age groups

Age groups	Mean rate of infant facial expressions			
	Positive	Interest	Neutral	Negative
4-6 months	2.53 (0.39-4.98)*	2.60 (1.61-3.54)	0.58 (0.25-0.78)	1.07 (0.57-1.53)
7-9 months	2.72 (1.51-3.93)	2.70 (2.21-3.38)	1.47 (0.12-2.89)	0.93 (0.55-1.26)
10-12 months	1.67 (0.00-4.94)	2.40 (0.86-3.39)	0.79 (0.51-1.52)	1.7 (0.26-2.32)

* Figures in brackets represent the range of rates of expressions.

While age differences may have been concealed by high within group variation (see ranges in Table 11), and the small sample size (n=4 for each age group), the results obtained here are similar to those found in the study by Malatesta et al. (1982, 1986) which found no significant differences in facial expressions across age groups. However, as was argued in Chapter 1, the Malatesta and Haviland study ignored the possible effects of situational variations.

2. Situations:

It is expected that both mother and infant would be influenced, not only by each others' behaviour, but also by the overall situational context of the interactive situations. For example, if the mother's task is to engage the infant in face to face interaction, the type of mother-infant dialogue, and maternal interpretations of the infant's behaviour, would be expected to highlight concerns pertinent to face to face play, such as smiling and attending. This is likely to be different if her task was to prohibit the infant from playing with a toy, or if it were to engage in object play. Moreover, the way in which she defines her task is expected to vary from one age group to the next, as both the infant's capacities develop, and her perceptions of her developing infant change. Therefore, age group differences may be embedded in situational context.

Significant situational differences in mothers' selections of infant facial expressions were found (Table 11). Differences in selected positive expressions were highly significant. As can be seen from Table 13, positive expressions predominantly occur in the FF and PR selected segments. Neutral expressions also differed

significantly across situations, appearing most frequently in PR. Mothers' selections of interest and negative expressions did not differ across situations, although interest is the predominant expression occurring in PR and T selected segments.

Table 13: Mean rate per minute of infant expressions across situations

Situations	Mean rate of infant facial expressions			
	Positive	Interest	Neutral	Negative
Face to face	3.55 (0.00-7.06)	2.60 (0.35-3.69)	0.56 (0.00-1.65)	0.90 (0.00-2.09)
Prohibitive	2.00 (0.00-4.50)	2.70 (0.41-4.54)	1.30 (0.00-5.12)	1.50 (0.00-3.99)
Toy play	1.42 (0.00-5.02)	2.40 (0.220-4.62)	0.94 (0.00-2.63)	1.32 (0.00-1.85)

3. Age x situation:

To find out if situational variations are related to the age of the infant, an age by situation interaction was tested for (Table 11).³⁰ Selected positive, negative and neutral facial expressions differed significantly between each situation and age group category. Tests failed to show a significant age by situation interaction for interest expressions. Segments of 4-6 and 7-9 month olds contained frequent episodes of positive expressions in FF while, in 10-12 month old segments, interest was predominant and positive expressions were fewer, compared to the other 2 groups (Table 14). In PR, 4-6 and 7-9 month olds' segments contained predominantly positive, interest and neutral expressions. Segments of 10-12 month olds, on the other hand, contained predominantly negative and interest expressions (Figures 10-13). In T, 4-6 and 7-9 month olds' segments contained predominantly interest episodes. However, whereas these expressions were accompanied by high frequencies of negative expressions in 4-6 month old selected segments, segments of 7-9 month olds contained high frequencies of neutral/still-faced expressions (Figures 10 to 13). Mothers of 10-12 month olds' segments again differed from the rest of the sample, containing predominantly positive and interest expressions (Table 14).

30. Frequencies of expressions were used. Using total duration of time as the unit of measure was not advisable, given that log-linear modelling requires frequencies. The alternative test to use with total duration of time for expressions would have been an ANOVA. However, the small sample size would have made this test unreliable.

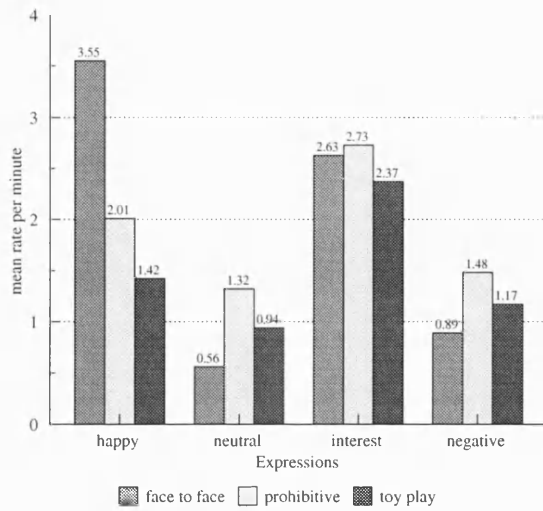
Table 14: Mean rate per minute of infant expressions for situations and age groups

Age Groups	Situations	Mean rate of infant expressions			
		Positive	Negative	Neutral	Interest
4-6 months	Face to face	3.95	0.42	0.50	2.70
	Prohibitive	2.34	0.93	0.18	2.20
	Toy play	1.42	1.85	1.05	2.90
7-9 months	Face to face	4.40	1.08	0.80	2.92
	Prohibitive	2.79	0.80	2.20	2.67
	Toy play	0.95	0.91	1.37	2.61
10-12 months	Face to face	2.31	1.18	0.38	2.32
	Prohibitive	0.80	2.72	1.59	3.30
	Toy play	1.90	1.18	0.39	1.63

The results of maternal selections of facial expressions show :

- Age groups: The frequency of selected expressions did not vary significantly between age groups. Only neutral expressions differed between age groups and occurred predominantly in mothers of m7-9 month olds' selected acts. Possible trends appeared which were not significant; for example, positive expressions appeared to be selected most frequently in ages 1 and 2, followed by interest and neutral. In age 3, on the other hand, facial expressions did not exhibit as much variation as the younger ages, with interest expressions occurring most frequently in selected segments (Table 12).
- Situations: Results showed that FF selections contained predominantly positive expressions, while PR and T contained progressively fewer such episodes (Figure 9). Neutral expressions were least frequent during FF and highest during PR. Although interest expressions did not differ significantly between situations, they were the predominant expressions in PR and T selected segments, followed by positive expressions.

Figure 9: Situational variations in infant facial expressions



- Age by Situation: Selected segments of the 10-12 month old age group, infants smiled less during FF and PR, and more in T, compared to mothers of younger infants. Negative expressions were most frequently selected by mothers of 4-6 month olds in T, and by mothers of 10-12 month olds in PR. Neutral expressions were selected predominantly during T by mothers of the youngest age group, and in PR by mothers of 7-9 and 10-12 month olds (Figures 10-13).

For comparative purposes, test results for mothers' facial expressions in selected segments can be found in Appendix 2. As the main focus of the analysis is to examine maternal perceptions, it was decided to leave them out of the main presentation of results.

Figure 10: Positive infant expressions

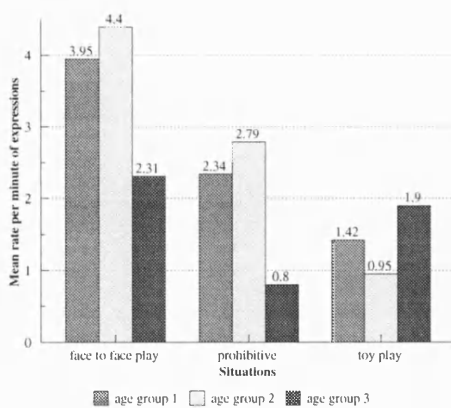


Figure 11: Negative infant expressions

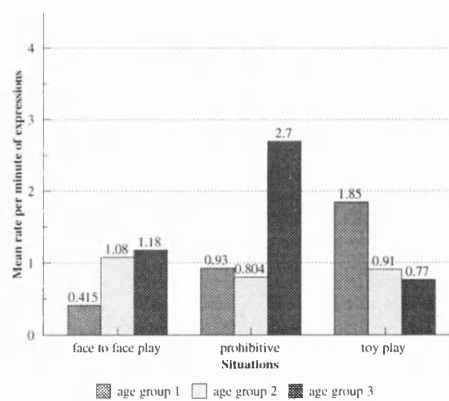


Figure 12: Neutral infant expressions

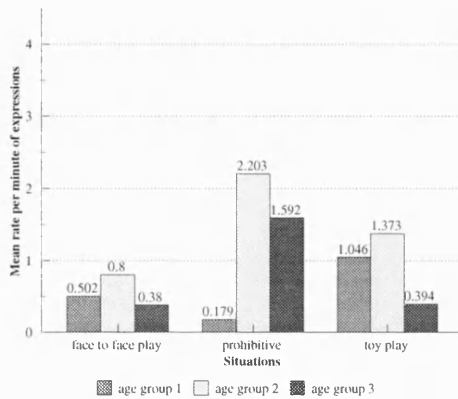
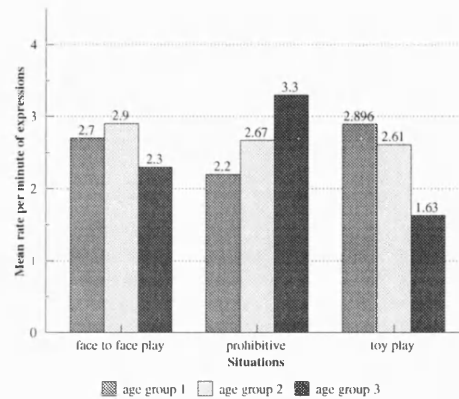


Figure 13: Interest infant expressions



Comparing the above results with the number of meaningful acts noted by mothers shows certain similarities. In FF and PR, where mothers in all age groups selected the most number of acts, these acts contained frequent occurrences of positive and interest expressions. In T, interest was the most predominant expression, positive expressions were fewer, and negative expressions more frequent, compared to the other 2 situations. Mothers appear to select infant acts that are accompanied by a high occurrence of positive expressions in the context of interpersonal situations. However, taking age into account, mothers of 10-12 month olds violate this pattern in PR, where selected episodes contained frequent occurrences of negative and interest expressions. This may indicate that negative expressions have assumed interpersonal significance for mothers of the oldest infants. Segments of 7-9 month olds in PR also contained frequencies of interest and neutral expressions similar to those of positive expressions, suggesting a possible progression in the way infants react to maternal prohibition. While 7-9 month old babies were less positively interactive and more still-faced in PR than 4-6 month old babies, they did not become distressed at the prohibition as the older infants did.

Overall, there appears to be a trend for mothers to select expressions which portray the youngest infants as happiest during FF and PR, and unhappy but interested in T. This pattern changes for 7-9 month olds, where selected expressions portray the infant as less happy but expressing interest in PR, and mostly interested during T. Expressions selected by mothers of 10-12 month olds portray infants as displaying the most situationally appropriate expressions; in FF, infant expressions

show the infant as happy and interested, in PR, distressed, interested and inactive (neutral expressions) while, in T, as happy and interested with bouts of distress.

However, it is possible that selected facial expressions are only a reflection of what is occurring during the rest of the time. That is, that the differences across situations and between age groups are a reflection of developmental changes and the effect of different situations on infant behaviour. It may thus be that mothers are only making haphazard choices and selecting what is predominantly being expressed. If this were the case, the types of behaviour infants exhibit in selected segments would not be expected to differ from behaviour occurring during the rest of the time. On the other hand, one criterion for defining meaningful behaviour may be that selected behaviour is characterised by high frequencies of expression changes.

7.4.3 Comparison of Baseline and Selected Expressions

Upon inspection of the tapes it appeared that mothers used breakpoints when selecting meaningful infant behaviours. Breakpoints are changes in behaviour, both verbal and nonverbal, which signal a change from one action unit to another. Mothers may be defining infant behaviour as meaningful when it involves some change in the level of ongoing activity. To address this possibility the number of changes in baseline facial expressions was compared with facial expression changes in selected segments. Mothers may also be selecting infant acts on the basis of the types of facial expressions they contain. Thus, facial expressions occurring in baseline segments will be inspected.

Table 15: Summary of ANOVA results for baseline sample comparisons

SOURCE	SS	DF	MS	F	Sig. of F
Within cells	17.13	9	1.90		
Age	1.53	2	0.79	0.42	.672
Within cells	6.79	9	0.75		
Condition	5.01	1	5.01	6.64	.030
Age by cond.	13.36	2	6.68	8.85	.007
Within cells	25.25	18	1.40		
Situation	0.58	2	0.29	0.21	.814
Age by sit.	1.83	4	0.46	0.33	.856
Within cells	20.08	18	1.12		
Cond. by sit.	1.69	2	0.85	0.76	.48
Age by cond. by sit.	14.56	4	3.64	3.26	.035

An Analysis of Variance was used to compare selected and baseline segment expression changes (Table 15). Situations and conditions (baseline or mother data) were treated as within subject factors. Baseline segments differ significantly from selected segments. Figures 14 to 16 show that facial expressions change more frequently in selected segments than in baseline segments overall. This pattern varies significantly depending on infant age (Table 15). Selected segments in ages 1 and 3 contained more changes in facial expressions than baseline segments whereas, in age group 2, they contained fewer changes than the baselines. This pattern is further differentiated by situation. Baseline segments of age group 2 infants contained *more* expression changes than selected segments in FF and, especially, in T (Figures 14 and 16). It is not immediately clear why age group 2 mothers should differ from the rest of the sample. A number of possibilities exist. Mothers may be concentrating on one specific expression rather than patterns of facial expressions. Or, mothers may be selecting aspects of infant behaviour which are not characterised by frequent changes in facial expressions. For example, concentrating on the toy would require the infant to remain still whilst characteristically displaying either interest or still-faced expressions. In fact, this appears to be partially substantiated by looking at infants' facial expressions for that age group (Figures 12 and 13), where the most frequently occurring facial expression in T for 7-9 month old infants is interest, and the second most frequent expression is neutral.

Results also show that, in T, mothers selected segments that contained many more expression changes than baseline segments. Both mothers of 4-6 and 10-12 month olds selected acts containing expression changes which differ markedly from

baseline expression changes. It will be remembered that mothers of the youngest infants selected more acts in that condition than mothers in the oldest age group. Thus, while the two groups of mothers selected segments characterised by frequent expression changes, mothers of 10-12 month olds selected fewer such segments. It may be that the difference in the number of *selections* between the two groups of mothers may be partly explained by the fact that the oldest infants emit fewer behaviours containing frequent expression changes and, thus, mothers make fewer selections. (The other possibility is that mothers of 10-12 month olds are defining meaningful behaviours differently from mothers of 4-6 month olds and thus are not relying on expression changes per se. Examining differences in maternal interpretations will allow us to test this.

Also of interest is the fact that baseline and selected segments of mothers of 4-6 month olds in FF contain the same number of expression changes (Figure 14). Are mothers making arbitrary selections of the infants' behaviour in this category, or do they depend on other aspects of infant behaviour? Comparing baseline expression changes for those infants across situations suggests that, whilst infant expressions slow down over situations, mothers consistently select segments which contain frequent changes in expressions, especially in T.

Figure 14: Baseline and selected segments in face to face play episode

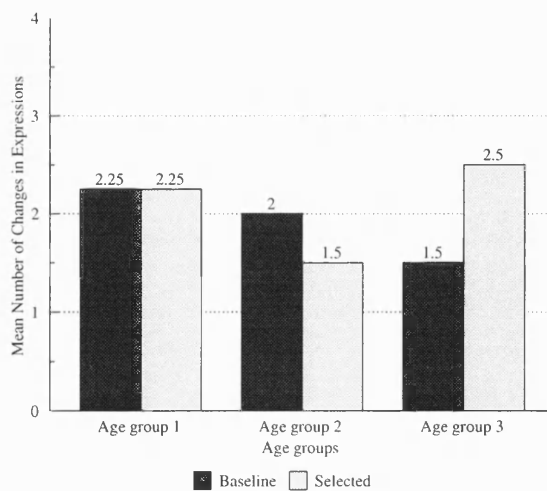


Figure 15: Baseline and selected segments in prohibitive episode

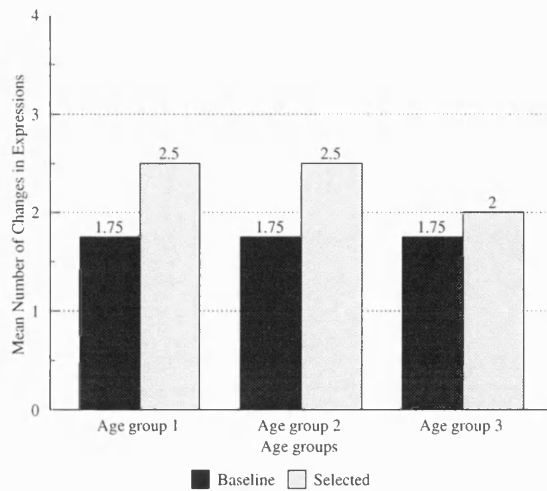
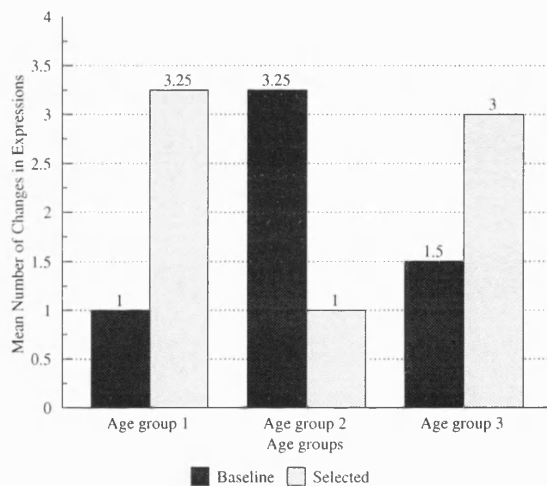


Figure 16: Baseline and selected segments in toy play episode



When infant behaviour is highly variable, as in FF, mothers of the youngest babies may be making arbitrary selections of infant behaviours, i.e., they may be ‘guessing’. This possibility may be addressed by examining what mothers actually say about the infants’ behaviour. The oldest age group, on the other hand, differs from the rest of the sample in FF, in that mothers in this group are the only ones to select segments which contain more expression changes than baseline segments. This may be due to the increasing specificity and articulation of infant behaviour and the increasing selectivity of mothers.

One aspect of baseline segments that could not be statistically analysed was the specific facial expressions contained within them. As was pointed out earlier in this chapter, baseline segments were shorter than the average length of selected segments. To get a baseline segment of similar length to selected segments was there-

fore difficult. Because only one baseline segment could be analysed for each condition x situation, the frequency of facial expressions occurring in these selected segments was very low. This prevented comparing specific facial expressions in baseline and selected segments.

Although, as was mentioned above, tests could not be computed for baseline facial expressions, percentages of specific facial expressions out of the total number of expressions occurring in baseline segments are presented in Table 16. Baseline segments contained all 5 facial expression categories. One apparent trend is that baseline segments increasingly comprise of interest expressions as infants get older. In age group 3, baseline segments in all three conditions show that interest is the main expression in non-meaningful infant behaviour.

Table 16: Facial expressions in baseline segments

	Age group 1				
	Positive	Negative	Interest	Neutral	Surprise
Face to face	57%		28.6%	14%	
Prohibitive	28.6%		57%		14%
Toy play			50%	25%	25%
Age Group 2					
Face to face	80%		20%		
Prohibitive	42.9%		42.9%		14.3%
Toy play	22.2%	11.1%	44.4%	22.2%	
Age group 3					
Face to face	33.3%		66.6%		
Prohibitive		16.7%	66.7%	16.7%	
Toy play	20%	20%	60%		

Positive expressions in the younger age groups, especially in age group 2, make up a large percentage of baseline segments in FF. Older infants' positive expressions are much fewer, both in selected and in baseline segments. This appears to indicate a developmental trend whereby, after 9 months, infants generally display fewer positive expressions and more interest expressions. Finally, negative expressions are present in baseline segments in age group 3 in PR and T. Negative expressions were also very frequent in selected meaningful PR acts. This would suggest that mothers were selecting most of the negative expressions infants produced in PR. It is also possible to speculate that mothers may have been partially ignoring negative expressions in

T, as they occur with low frequency in selected segments but are also found in baseline segments.

It is conceivable, for example, that, had it been possible to analyse baseline expressions, differences would have been found in frequency of expressions between age groups and between selected and baseline expressions. If differences between age groups were found in baseline expressions, this would have shown that infant expressions underwent developmental changes independently of what mothers chose to select. No differences between baseline expressions and maternally selected expressions would have suggested that mothers selected what was prevalent in infant behaviour and that their selections underwent parallel changes to infant expressive developments. If differences between mothers' selections and baseline selections existed, they would have shown that mothers were ignoring certain expressive responses.

A cautionary note is that these figures are based on very few expressions. The baseline segments are not large enough to generalise to the rest of the tape. Nevertheless, the percentages provide a rough picture of the types of facial expressions exhibited by infants outside meaningful acts. They suggest firstly that infant positive expressions become fewer with age, and interest expressions increase. Secondly, when seen in the light of maternally selected facial expressions, they indicate that mothers in general select expressions which are prevalent in infant behaviour. In other words, facial expressions alone do not appear to determine what mothers find meaningful in infant behaviour. The overall behavioural context (i.e., situation) and the more local behavioural context (i.e., level of activity as measured by the number of facial changes) appear to affect what is selected as meaningful. To complete this picture, it is necessary to examine what mothers actually say about these infant acts.

The above results highlight a number of important points. Firstly, they show that, on the whole, mothers select segments in which facial expression changes are frequent compared to the rest of the interaction. However, when situation and age are taken into account, changes in facial expressions are not always used as a criterion for selecting infant acts. Thus, while changes in level of activity, or breakpoints, do play a role in maternal selectivity, they do not, by themselves, determine what is selected. The profiles of different expressions for each condition suggest that selectivity depends on other aspects of the interaction, such as the meaning of particu-

lar expressions for mothers in particular contexts. This is partly substantiated by the difference in selectivity between mothers and observers. Secondly, while it was expected that older babies' expressions would be less variable than younger babies', as was found in Malatesta et al.'s study (1982), the data did not reveal age differences in the number of expression changes between different age groups. Some trends in the data do, however, suggest that this may be happening. For example, baseline segments in FF suggest that expression changes become fewer as infant age increases and, furthermore, that positive expressions in both baseline and selected segments decrease after 9 months of age and negative expressions increase. It is likely that, as babies develop, their responses to situational stimuli became more articulate, and mothers selections and interpretations were sensitive to these changes.

7.6 Interpersonal Contexts and Developmental Transitions

The aim of the above analysis was to answer two specific questions. Firstly, to assess if maternal selectivity is influenced by situational context or infant age. Secondly, to examine the content of these selections to determine if differences in the frequency of selected expressions can account for the patterns of maternal selections of infant acts. The above results, taken as a whole, provide evidence that maternal selectivity is affected by situational context. Mothers note more meaningful acts in FF and PR than T, indicating that one criterion for selection of meaningful acts may be the interpersonal context of the behaviour. This is substantiated by the findings on maternal selections of infant expressions. Although mothers in all age groups and situations make selections involving all 5 facial expressions, segments in specific age groups and situations reveal differences in the frequency of particular expressions. These differences appear to indicate a preference for positive expressions in situations characterised by joint interpersonal exchanges. However, mothers of 10-12 month olds appear to differ from the rest of the sample. Whereas mothers of 4-6 and 7-9 month olds select segments highlighting positive interaction during FF, mothers of 10-12 month olds select segments which contain frequent episodes of distress in PR and similar frequencies of positive expressions during FF and T, suggesting a transition has taken place by 10-12 months. These results support the hypothesis that mothers' selections of facial expressions in various situational contexts is also sensitive to the

developmental capabilities of babies. To find out if mothers interpret infants' behaviour in ways that are congruent with their selection of facial expressions, we will turn now to an analysis of the attributions mothers make concerning these expressions in the next chapter.

A cautionary note here is that while these findings suggest important mechanisms they must be seen in the light of certain limitations. Two main limitations prompt caution in generalising these findings to the wider population. Firstly, the small sample size used for the study places limits on extrapolating the results of the above analysis to a wider population of similar mothers. Moreover, although significant effects existed, despite the high probability of a Type II error due to the small sample size, the analysis was restricted in terms of the types of comparisons that could be made.

Secondly, the sample of mothers who participated were homogenous in terms of socio-economic status and age. At one level, this ensured that changes in maternal selections were a reflection of the influences of context and developmental changes. At the same time, however, it restricts the results to a similar, and narrow, sample of mothers in the general population. Further research is needed to determine to what extent these findings are characteristic of mothers of different ages and from different backgrounds.

Certain methodological limitations in the present study have highlighted areas of improvement for future studies. For example, it was not possible to determine if mothers attributed meaning to infant expressive behaviour on the basis of a single expression or a pattern of facial expressions. Despite the high variability and changeability of babies' facial expressions, caregivers sustain relatively stable interaction patterns with their babies (e.g., Fogal, 1980). In this connection, little research has been undertaken to examine what influences caregivers in their selection of a particular expression, or pattern of expressions, for interpretation. Possible ways of shedding light on this issue may be to look at behavioural interactions in more detail. For example, to examine the types of body movements accompany infant facial expressions in segments mothers identify as meaningful. In this connection, it would be possible to investigate if combinations of expressions and body movements retain the same meaning in different social and interactional contexts, or indeed when they are held for different durations. In other words, while the above analysis looked at the context of expressions in broad terms, as overarching situational context, a

more detailed analysis of context, at a more behavioural level may shed light on more specific characteristics of parental interpretations.

The present analysis was useful, however, in shedding light on some important processes. By looking at how mothers select the meaningful behaviours of their own infants it was possible to show that mothers select fewer acts as infants grow older, rather than selecting more acts, as Adamson et al.'s (1986) results showed. This would suggest that the increasing articulation of infant expressive behaviour does not necessarily lead to more acts being selected as meaningful. Rather, it would appear that, with the increasing co-ordination in infant acts, mothers become more specific and more selective concerning what they label as meaningful. In order to examine this issue in more detail, the analysis must be taken a step further by examining mothers' interpretations regarding these selected segments. This will allow us to assess whether maternal interpretations undergo parallel changes with infant acts in different age groups and situations. In the next chapter, this analysis is presented.

CHAPTER 8

MATERNAL INTERPRETATIONS OF INFANT BEHAVIOUR

8.0 Hypotheses and Aims of Chapter

The results of the analysis presented in Chapter 7 suggested that mothers perceive more meaningful acts in babies when they are engaged in predominantly interpersonal contexts. The analysis also highlighted the possibility that mothers find fewer infant acts meaningful as babies get older. The expressive content of these selected segments show that mothers select infant acts which reflected both situational and age related developments; selected segments contained fewer positive expressions in FF, more negative expressions in PR, and more positive expressions in T. These differences in the expressive content of selected segments suggest that infants have become more articulate in response to certain kinds of stimulation. As important is that these expressions may have assumed a new communicative functions for mothers. By looking at the way mothers actually interpret these segments of infant behaviour, the types of linguistic meanings they ascribe to them, we can examine this possibility further.

Using a qualitative technique to explore maternal selectivity of meaningful acts is an important new step in the area of expressive development. In recent years there has been a growing emphasis on using a mix of methodologies, both quantitative and qualitative, in approaching research questions (Robson, 1993). This flexibility has mostly characterised research in social psychology; developmental psychology has been slower to mix techniques. In the following sections, I will examine the underlying themes or meanings that characterise the way caregivers perceive and make sense out of their infants' behaviours. In doing so, the analysis will uncover possible relationships and associations between the developing expressive capacities of infants and the changing meanings they assume within the mother-infant system. This enhances our understanding of what parents are focusing on when they ascribe meaning to their babies' behaviour. It also underlies a concern, discussed in Chapter

1, with understanding the child's development from the point of view of the caregiver.

Developmental psychology has been instrumental in constructing what the child is able to do, and the caregiver's role in the development of capacities. However, as Woollett and Phoenix (1991) point out,

"Although psychologists generally argue that mothers are central figures in their children's lives, as carers, as 'socialisers' and providers of stimulating and sensitive environments, they are rarely considered as having an existence of their own or a perspective on what they do as mothers." (Woollett and Phoenix, 1991, p.29)

There has been little question that the construction of infancy by researchers may be lacking vital components of interpretation. Indeed, there is an increasing concern that despite the plethora of research conducted on identifying what aspects of parental behaviour influences the child's development, no clear cut findings have emerged:

"That parents do have an effect on children may seem obvious, yet in practice it has often proved extraordinarily difficult to demonstrate such an effect. It is ironic that in spite of the enormous amount of research in this area we still face the challenge of specifying as to what really goes on between parent and child that has such an impact on the child's development." (Schaffer, 1986, p.769, quoted in Woollett et al., 1991)

Linked to this is the 'invisibility of mothers' in psychological theories (Woollett and Phoenix, 1991). Mothers are not asked to describe their feelings or perceptions regarding their children. This may well be due to the lack of a conceptual framework for analysing these aspects of the mother-child relationship. However, evidence presented in earlier chapters suggests that the perspective of caregivers may provide an important source of information regarding how emotionality develops in infancy. Chapters 1, 2, and 3 have developed a conceptual framework within which maternal perceptions of their infants have a place within expressive development. The assessment of these interpretations, from the perspective of mothers, will suggest underlying relationships between the developing capacities of infants, the inferential process of caregivers, and the influence of context on that.

The following analysis thus hopes to compliment the latter quantitative analysis of infant facial expressions. It addresses the following questions; what do the different themes in mothers accounts tell us about the developing relationship

between mother and infant? How do the developing expressive capacities of babies become incorporated into the mothers' perceptions of their babies? There appeared to be specific age related developments in infant expressive behaviour. Expressions selected by mothers also showed situational variations. What are the meanings ascribed to expressive acts in these different developmental and situational contexts? What can they tell us about developmental mechanisms?

By providing a comparative aspect to the data, analysing maternal accounts further explicates and expands our understanding of quantitatively based findings. The use of multiple methods in this study distinguishes it from others done in the area of expressive development. Employing both techniques allows for comparisons, examining matches and mismatches, between the objective coding of facial expressions, and caregivers' ascriptions of meaning to these expressions.

Thus, having examined what types of expressions mothers select, we now go on to examine what types of attributions mothers make concerning these meaningful acts. More specifically, the analysis addresses the following questions:

- Firstly, whether the meanings mothers ascribe to their infants' expressive behaviour is influenced by the social context of the interaction
- Secondly, whether maternal interpretations are in line with changing infant capacities. That is, to explore how mothers begin to ascribe different meanings to infant actions as babies become more skilled communicators.

The first part of this chapter deals with how the data from the mothers accounts was transcribed and coded. The particular methodology used for constructing the coding frame is described, and the grounds for its construction explicated. The results of the investigation are then presented and discussed.

8.1 Verbal Accounts

Verbal accounts were transcribed and coded using Textbase Alpha (Tesch, 1989),³⁰ a computer package which supports the qualitative analysis of verbal data. The program allows the coder to perform unstructured coding of text and incorporates the codes into SPSS. Codes were constructed using Grounded Theory principles

30. Courtesy of Dr. Julie Dockrell.

(Strauss, 1987). Grounded Theory analysis explicitly allows for the generating and testing of theory. Strauss (1987) explains,

"The methodological thrust of the grounded theory approach to qualitative data is towards the development of theory, without any particular commitment to specific kinds of data, lines of research or theoretical interests." (Strauss, 1987, p.5)

The basic categories for coding the accounts were derived from prevalent themes in the mothers' own accounts. Coding was conducted with the aim of isolating those aspects of the mother's accounts which were relevant to the facial and behavioural changes in the infant's actions. While no coding frame is totally free of the theoretical orientation of the researcher, the construction of the codes was explicitly conducted to reflect the types of concerns that characterised the maternal accounts. It was decided that, rather than impose a rigid structure on the mothers' accounts, it was more advantageous to look for commonalities and underlying themes in maternal interpretations. In this way, the codes would be a reflection of salient maternal concerns in interaction. Furthermore, the technique provided a systematic way of reducing the high degree of variability in maternal accounts. This was achieved by first coding the data to reflect the complexity of the accounts and subsequently grouping these categories along theoretically meaningful lines. Strauss describes this process thus:

"Many indicators (behavioural actions/events) are examined comparatively by the analyst who then 'codes' them, naming them as indicators of a class of events/behavioural actions. He or she may give this class a name, thinking of it then as a coded category. By making comparisons of indicator to indicator the analysis is forced into confronting similarities, differences and degrees of consistency of meaning among indicators. This generates an underlying uniformity, which in turn results in a coded *category*." (Strauss, 1987,p.25)

These dimensions or 'linkages' then become the most important or salient core categories of the resulting coding frame. The present coding rested on 'sociological' or socio-psychological constructs which are "essentially the terms used by actors in that field themselves" (Strauss, 1987, p.33), and, thus, were derived directly from the language of the mothers, and were concerned with descriptions of infant emotion states. For example, if mothers made the statement that the baby 'is happy', it was coded as an attribution of happiness. These codes also go beyond local meanings to

broader socio-psychological concerns (Strauss, 1987). For example, if a mother stated that the baby 'wanted to play with the toy' it was coded as an attribution of intention.

The resulting core categories were concerned with statements of infant activity and state, attributions of infant mental or cognitive skills and mothers' self reports. The latter category included statements mothers made about their own activities when explaining the meaning of infant acts. Intercoder reliability of the final coding framework was tested against another coder. A different condition from each age group was randomly selected and double coded. Overall intercoder agreement was 83%. The coding framework may be found in Appendix 2.

8.1.2 Maternal Attribution Categories

Coding frames in large part reflect theoretical concerns. The types of categories that were constructed reveal the predominant underlying themes in maternal reports. Consensual categories of meaning in mothers perceptions of their infants were formed which were salient to grasping the way they understood their infants at a number of different levels. Previously, evidence was presented which showed that the prescription of emotion states was subject to contextual and interpersonal influences. Intentionality and intersubjectivity were shown to be essential scaffolding frames through which caregivers can share and organise infants' input. Caregivers interpret their infants' emotional expressions in highly variable ways. Hence, maternal statements made regarding current, ongoing activities viewed on video provide a rich source of pertinent concerns during interaction. They were also analysed to thematically reflect interpersonal and intersubjective mechanisms which are hypothesised to be crucial to the development of the mother-infant system.

Qualitative data can be coded at many different levels, ranging from categories concerned with the characteristics of language to those concerned with abstract ideas or 'reflection' (Tesch (1990). Interpretative segments were coded to reflect the different themes mothers used to describe their infants. For example, a typical example would be a mother describing her infant's state (e.g., bored), then describing something she was trying to do to attract the babies attention (e.g., clapping hands), then describing the child's response (e.g., clapping hands back). That segment would

be coded attribution of boredom, maternal behaviour, and maternal effect respectively. Statements made about infants referring to general characteristics that were not related to the ongoing interaction were not coded. For example, mothers referring to infants performing a specific activity in another context, as an analogy.

Aside from the focus on emotion states and facial expressions, a number of important aspects of development were included, as mentioned above. For example, the ascription of intentionality to infant acts is a vital mechanism by which parents are able to manage and organise the child's environment. It was important to bring this theme into focus in order to compare how mothers ascribed intentions to their babies behaviour in different situational and developmental contexts. Similarly, as was discussed in Chapter 2, intersubjectivity is hypothesised to be a vital component in the child's cognitive, emotional and social development. Hence, statements made by mothers reflecting a shared understanding between herself and her baby were highlighted and coded thus. Codes describing mothers' accounts of their own behaviour were useful as a measure of how involved mothers felt they were in the interaction, and as a verbal reflection of the process of 'scaffolding'. In the following analysis, the different complexities in meaning used by mothers is explored.

In order for maternal interviews to yield useful results, because they are explicitly concerned with interpreting infant behaviour viewed on video tape, the coding was geared to the an understanding of the activities, emotion states, and meanings mothers regularly referred to when interpreting babies' behaviour.

The codes reflect themes of differing complexity; the bottom categories reflect more complex activities than categories at the top of the coding frame, which describe basic infant acts. The thematic levels are advantageous, not only because they generally characterise the way mothers interpret their babies' behaviour, but also because they allow us to compare the contexts in which mothers use more versus less complex meanings when interpreting interactions. Maternal attributions were divided into 5 main categories. In the following, each category is defined and described by providing examples from maternal attributions to reflect the predominant themes in each category.

Category 1: Simple Descriptions of Facial and Body Movements refer to descriptions of **simple body movements**, e.g., "*He's looking down*", "*She's reaching out for an object, she's looking at the object*", and **descriptions of facial movements**, e.g., "*She's wrinkled*

her nose", and "She stuck her chin out". Mothers did not elaborate on these descriptions.

Category 2: Emotion State Attributions refer to descriptions of infant emotion states. These are further divided into the following categories: **Positive attributions**, for example, "So she's saying 'yes this is fun and I'm joining in this game'", and "This is her enjoying herself, she's having a good time". Or more simply, "She's happy". **Negative attributions** formed another category, as when mothers made the following types of interpretations: "She wasn't enjoying it as much", "She was getting distressed", "Exasperated and 'its not fair' type of thing". Sometimes these attributions did not contain a specific negative emotion label but were descriptions of vague feelings of discontent. For example, "...it was a bit like she wasn't happy, it wasn't that the box wasn't interesting her, I think in a way maybe it was too much for her". **Attributions of infant attentiveness**³¹ were concerned with the infants focusing either on objects in their environment or on their mothers. For example, "Inquisitive, watching observing what I'm doing with my hands. Just interested. I could tell he was interested because of the way he was actually concentrating on what I was doing", and "He actually seems to be concentrating on my hand, he's not looking back at my face". **Attributions of boredom**, as when mothers described their infants as disinterested or distracted, contained phrases such as "That turning her head, stopped looking at me, looked away, and going 'meueueu' means, I'm bored with this...", "That 'umf', arms away again is again, 'I'm bored and fed up...". There were other attributions made by the mothers which were coded but which occurred so rarely (3-4 times for the total of all 12 mothers and infants in the three different situations) that they could not be used (e.g., describing the child as hesitant or confused).

Category 3: Attributions of Mental Skills refer to descriptions of the mental processes of the infant. These contained two categories created from collapsing other categories;

31. Some attribution categories were collapsed due to their low numbers. Collapsing was done on the basis of the general categories mentioned above. For example, the category of attributions of attentiveness was used to encompass maternal attributions of **interest** and **concentration**. Similarly, the category of **negative attributions** was used to encompass attributions of **frustration**, **tiredness**, **distress** and **unhappiness**.

attributions of intersubjectivity³² and attributions of exploratory behaviours.³³

Attributions of intersubjectivity contained frequent references to social referencing by the infant. For example, *"She's very much looking at me to see how I was reacting to what was there cause she's not sure"*. Or, *"There he's watched you bring something down and obviously wants to do something with it but he just glances at me to kind of make sure its alright"*. Mothers also attributed intersubjectivity to their infants in the context of explaining how their babies were reacting to their prohibition to not play with the toy. These descriptions highlighted a mutually understood system of rudimentary gestures which had a shared meaning between the mother infant pair. For example, *"She's got her mouth stuck like that because she's sort of making a point to me that she was upset and just letting me know that she , well not upset, but that she didn't like it, the way I've spoken to her or that she couldn't do it"*, and *"That's when he fully understands what you mean by no"*. Mothers also described their infants as sharing knowledge and expectations with them with reference to objects in their environment. For example, *"There she wasn't quite sure what I was doing cause she was looking... but she was looking 'round for the dog but then when I said no she smiled sort of as if to say 'well what did you say it for then or what are we doing?'"*, and *"She just communicated to me about the lights, ooh look they're flashing, I've never seen anything like it before."*

Attributions of exploratory behaviour were rare. However, when they occurred they were generally used to describe instances when babies were searching for objects in their environment or when they were being curious. For example, *"He's being quite inquisitive"*, and *"...he looked around to see if there was something more interesting going on, he's an incredibly nosey child"*. Or, as when one mother described her daughter looking for the father, *"She stopped rubbing her eyes and became interested again and was looking around, her head moved and her eyes moved to look for him"*. Similarly, mothers described their babies as 'finding out about things'. For example, *"...he tried to close the lid to find out about it"*, or *"...and the sort of patting the box to feel*

32. Attributions of intersubjectivity encompassed attributions of infant **understanding**, **social referencing**, **intentional communication** by the infant and infant **responding** explicitly rather than reacting to the mother.

33. Attributions of exploratory behaviours encompassed two attributions: Attributions of **exploring or being nosey**, and attributions of **searching**, either for a specific object or for something to grasp their interest. Tests were tried on some of these categories in uncollapsed form; however, due to their very sparse occurrence, no test statistic could be computed.

it, I suppose to find out about it...to find out about [its] texture and what sort of thing it is really. He does that to fabric, and to me and to toys and things. He strokes them".

Category 4: Attributions of Intentionality refer to descriptions of intentionality in infant behaviour. These descriptions were usually wide ranging in their usage. They frequently described something that the child either wanted or did not want. For example, *"Something there and she wants it", "Just didn't want any more to do with it", "Wanted me to carry on", "In that section he actually wants to reach out and get my hand, he's making his own decision to touch my hand, reach out and take it"*. In addition, mothers imputed intention to activities in the course of describing them. For example, *"She's just seeing what I'm doing with it before she tries it herself", and "She was trying to pull the box nearer her"*. These attributions also highlighted the dynamic and activity bound nature of mothers' perceptions of their babies. For example, *"She wanted a hug then, she wanted to be picked up from the chair, or me to come closer or something"*. They underlie a course of action on the mother's part, as may be seen from some of the previous quotes and from the following one, *"He doesn't want my hands on it he just wants to be able to pick the box up and examine it because his hands go straight round the box"*.

Category 5: Maternal Self-Attributions refer to mothers' accounts of their own behaviour when describing the meaning of an infant's behaviour, as in *"She did look up but only momentarily, I attracted her attention"*. These attributions either described how some aspect of mothers' behaviour was designed to elicit a response/reaction from the infant, or how some aspect of their behaviour had an effect on the baby. These two descriptions were coded **maternal behaviour** and **maternal effect** respectively.³⁴ Examples of the former category are, *"I tried to make him interested by making those noises and pressing the buttons and talking to him a bit more", "I tickled her there", and "I did a certain thing that I knew would catch his attention, which is to say, where is Bertie the dog"*. Examples of the latter category include statements such as, *"I started singing the song and then spoke, and when I spoke she went back to looking at the*

34. Other attributions were coded but could not be used because of their low numbers. Only attributions which occurred with a frequency of 10 or above for the whole data set were included. Attributions which were not included were those of surprise, identifiers of emotion or mental states used by mothers, maternal prediction of next infant act and attributions of infant anticipation.

toy instead of looking at me". Or, "She stopped when she heard my voice", and "She was ceasing to pay any attention to me because I called her name and she'd responded and nothing had happened, and I'd flapped my fingers and she'd responded and nothing had happened so she was ceasing to pay any attention to me calling her name or flapping my fingers". These attributions also refer to instances where mothers behaviour resulted in negative consequences, "That's her having reached out and me saying no...Her eyes are looking down and her eyebrows are down and her mouth is definitely down like I've never seen it before cause she's being told not to do it."

8.2 Results of Maternal Interpretations of Infant Behaviour

Examining maternal interpretations will reveal whether mothers' criteria for meaningful acts are (a) subject to situational influences, and (b) qualitatively different as babies get older. The results of the analysis are presented in Table 17.

Table 17: Chi-Square statistics results of log-linear modelling of maternal attributions

Attributions	Age effect	Situation effect	Age x Situation interaction
Movements	29.40 ^{***}	2.32	3.37
Happiness	3.55	15.28 ^{***}	17.61 ^{**}
Negative States	0.43	8.29 [*]	9.96 [*]
Boredom	12.28 ^{**}	1.61	10.46 [*]
Attentiveness	1.26	4.58	36.66 ^{**}
Maternal behaviour	5.99 [*]	13.71 ^{**}	2.75
Maternal effects	6.87 [*]	11.96 ^{**}	4.02
Intentions	3.86	13.91 ^{***}	2.86
Intersubjectivity	6.15 [*]	14.33 ^{***}	10.92 [*]

Significance levels: * = 0.05, ** = 0.01, and *** = 0.001.

1. Age:

Significant differences between age groups were found for descriptions of body movements, boredom, maternal behaviour and effect, and intersubjectivity. Descriptions of body movements are predominantly made by mothers of 4-6 month olds (age group 1) (Table 18). As babies get older, mothers make fewer such attributions. Boredom is attributed predominantly by mothers of 7-9 month olds, and least frequently by mothers of 10-12 month olds. Maternal behaviour and effect

attributions were made most frequently by mothers of 4-6 and 10-12 month olds. However, unlike mothers of the youngest infants, mothers of the oldest babies also made frequent references to infant intersubjective skills (Table 18).

Table 18: Mean rates of attributions for age groups

Attributions	Age groups		
	4-6 months	7-9 months	10-12 months
Movements	1.31* (0.00-4.229)	0.72 (0.31-1.61)	0.18 (0.08-0.24)
Happy	1.04 (0.56-1.54)	0.76 (0.16-1.51)	0.73 (0.22-1.56)
Bored	0.65 (0.20-1.15)	0.96 (0.45-1.69)	0.32 (0.00-0.67)
Negative state	0.81 (0.10-1.19)	0.73 (0.49-0.92)	0.85 (0.33-1.56)
Attentive	0.96 (0.00-1.38)	0.76 (0.40-1.27)	0.87 (0.43-1.31)
Maternal behaviour	0.81 (0.00-1.97)	0.45 (0.34-0.71)	0.92 (0.00-1.47)
Maternal effect	0.55 (0.00-1.25)	0.27 (0.10-0.47)	0.67 (0.34-1.14)
Exploring	0.18 (0.00-0.56)	0.40 (0.00-0.77)	0.32 (0.07-0.61)
Intention	1.00 (0.90-1.63)	0.74 (0.61-1.18)	1.30 (0.78-1.75)
Intersubjectivity	0.31 (0.00-0.91)	0.21 (0.00-0.61)	1.21 (0.16-3.33)

* Figures in bold are significantly different across age groups.

2. Situations:

Interpretations differed significantly between situations, except for boredom, attentiveness, and simple descriptions of body movements (Table 17). Mothers attributed happiness predominantly in FF, and negative states predominantly in PR and T (Table 19). Maternal self attributions and attributions of intention were most frequent in FF, but were attributed with decreasing frequency in PR and T. Mothers

attributed communicative and intersubjective skills to their infants in PR predominantly.

Table 19: Mean rates of attributions for situations

Attributions	Situations		
	FF	PR	T
Movements	0.75 (0.00-3.35)	0.85 (0.00-5.71)	0.61 (0.00-3.62)
Happy	1.32* (0.50-4.63)	0.55 (0.00-2.00)	0.67 (0.00-1.95)
Bored	0.77 (0.00-2.19)	0.46 (0.00-1.48)	0.69 (0.00-1.94)
Negative state	0.46 (0.00-1.88)	0.99 (0.00-2.47)	0.92 (0.00-2.16)
Attentive	0.62 (0.00-1.38)	1.25 (0.00-2.14)	0.93 (0.00-2.07)
Maternal behaviour	0.94 (0.00-2.96)	0.83 (0.00-2.00)	0.42 (0.00-1.23)
Maternal effect	0.60 (0.00-1.98)	0.67 (0.00-2.00)	0.23 (0.00-0.92)
Exploring	0.51 (0.00-1.68)	0.16 (0.00-0.50)	0.23 (0.00-1.84)
Intention	1.40 (0.35-3.38)	0.94 (0.00-2.00)	0.66 (0.00-1.29)
Intersubjectivity	0.31 (0.00-1.98)	1.33 (0.00-9.99)	0.095 (0.00-0.28)

* Figures in bold are significantly different between situations.

3. Age by Situation:

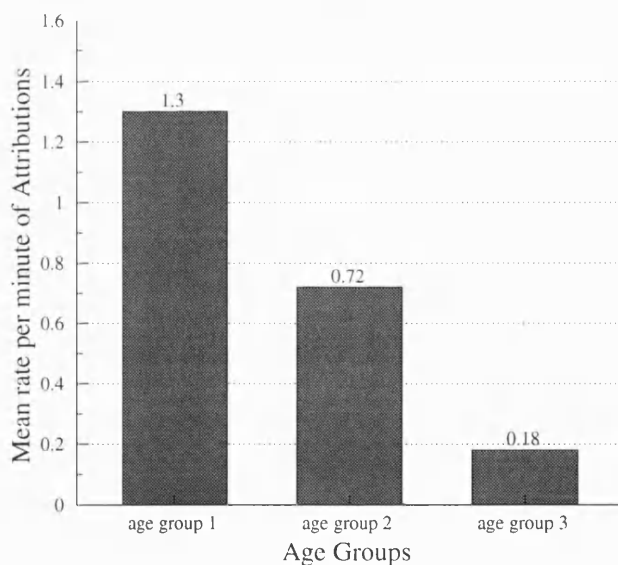
All attributions of emotion were affected by the specific age and situation in which they occurred (Table 17). Mothers of 4-6 and 7-9 month olds interpreted infants as becoming increasingly attentive, bored, and unhappy across situation. Mothers of the oldest infants interpreted their behaviour as most attentive, and most unhappy during PR, and most bored during FF. They perceived their infants as happiest when playing with the toy, although infant positive expressions in T were less frequent than in FF. Attributions of simple body movements, intention, maternal behaviour and maternal effect did not differ significantly between specific age group and situation categories.

The above results thus indicate the following:

- **Age:** Mothers become more specific about the meaning of their infants' behaviour as infants get older. Figure 17 presents the rate per minute of attributions of maternal descriptions of simple movements. This category refers to infant acts at a rudimentary level, devoid of explicit interpersonal, emotional, or social meaning. The frequent occurrence of this descriptive theme in mothers of 4-6 month old shows that their interpretation of infants is based on a wide range of behavioural cues. Thus, while they are able to label facial expressions as indicating a variety of emotion states, they require a whole range of behavioural cues to support such interpretations.

As infants get older, mothers become more specific about inferring emotion states and thus such descriptions decrease. The decline of these attributions with increasing age indicates, not surprisingly, that mothers become more specific about the meaning of infant behaviours as infants get older. Thus, the criteria of meaningful behaviour become more strictly defined with increasing age.

Figure 17: Descriptions of Simple Movements



Moreover, the profile of maternal interpretations between the different age groups suggest that they undergo qualitative changes, especially in the oldest age group (Figures 18 to 20). While all mothers attribute emotion states to their infants consistently, mothers of older infants attribute intersubjective skills as well. This, apparently developmental, progression is in line with social constructionist views of emotion development. In order for the child to understand the meaning-rules of a given culture, there must be some means of transmission of these rules. It also lends

credence to the theoretical proposal in Chapter 2, that intersubjectivity is not an inborn, inherent, capacity, but rather something that develops between mother and child. What is novel about the following evidence, is that it is the babies' mothers who are ascribing shared meanings to their infants, and not researchers. It is notable that younger mothers do not describe their infants in those terms.

For example, from age group 1:

"There she's happy 'cause she's smiling, and its combined with then turning to the other person in the room and smiling at them..."

In contrast with an attribution from age group 3:

"It's a fairly obvious reaction to me saying no. I mean it was a bit more frustration, feeling she couldn't do what she wanted to do than that she was actually frightened of me...She was very cross 'cause she felt she couldn't do what she wanted to do."

Maternal perceptions, both of their own role, and of the meaning of infant behaviour, change as infants get older. Specifically, boredom is attributed less frequently by mothers in age group 3 than those in age groups 1 and 2, and intersubjectivity is attributed more frequently as babies get older; mothers of 10-12 month olds are now perceiving these emotion displays as having intersubjective meaning, that is, as intentionally communicative. Mothers of 7-9 month olds made the least number of attributions of maternal behaviour and effect compared with mothers of the youngest and oldest age group babies. Mothers of the middle age groups' perception of the less personally interactive nature of infant behaviour, may well be a reflection of babies' preoccupation with the external world of objects at this phase of development.

For example,

"She made a little noise and put her arms out to the side which is another gesture...she wasn't wanting me to do what I was doing 'cause she was wanting to investigate what was going on round about." (Mother in 7-9 month age group)

The perception of younger and older mothers of the infant being responsive to them may be seen as indicative of the younger infant's preference for face to face interaction, and the older infant's growing social and cognitive skills in interaction (game playing, eg. the naming game in older infants, and in younger give an example of smiling reciprocally with mother).

The development of mother and infant into a social system was previously discussed as a necessary building block for the acquisition of skills. Social systems are characterised by the ability of *both* partners to anticipate each others' actions towards each other. The following examples show that what appears to be happening is that mothers initially project an expectation onto the infant. Later on, as babies got older, expectations reflected previous experiences, and appeared to be based on the growth of socio-cognitive capacities in the child.

One mother, from the 4-6 month age group, explained her baby's behaviour as follows:

"Looking directly at me and he's laughing, telling me to carry on with what I'm doing really, so he's enjoying himself."

In comparison, mothers of older infants described their effectiveness as resting on previous experiences with their infants, and the child's ability to recognise and anticipate these experiences:

"I could tell she was bored because she's not looking at me and not anticipating what I 'm going to do, which she would do if she was following it. She had anticipated before. I know because she was watching me and she was still, and her body was still, and she wasn't making any noise. These indicate that she's following me and anticipating me going 'Boo!'"

As the following figures show, while emotion states are a consistent theme in maternal accounts, by 10-12 months, the descriptive content of maternal reports contains increasing emphasis on intentionality and intersubjectivity.

Figure 18: Maternal attributions for age group 1

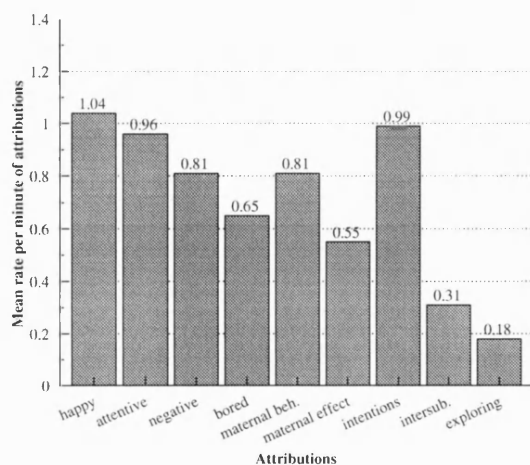


Figure 19: Maternal attributions for age group 2

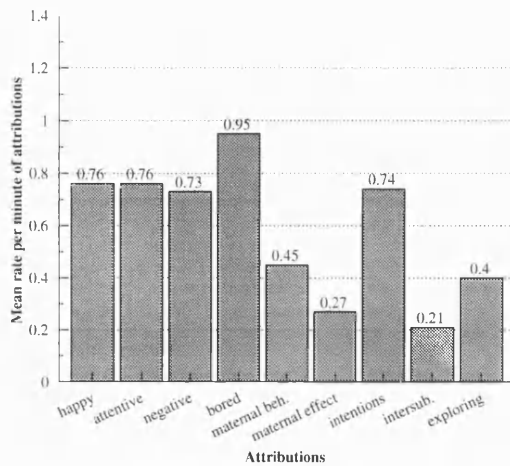
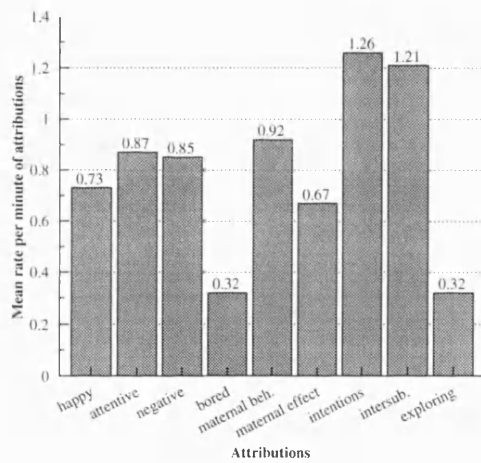


Figure 20: Maternal attributions for age group 3



- Situations:** Emotion state attributions are predominantly of happiness in FF, and attentive and negative states during PR and T (tests failed to show a significant difference for attributions of attentiveness) (Figure 21). The attribution category ‘maternal behaviours’ refers to instances where mothers made explicit reference to their own activities vis-à-vis the infant, despite the fact that mothers could not see their own activities on tape (although they could hear their own vocalisations on the film soundtrack). These attributions may be regarded as indicators of how important mothers felt their activities to be in explaining the infants’ behaviours. They indicate mothers’ perception of the interactive and interpersonal nature of selected infant acts. Mothers find it important to refer to their own behaviour when interpreting infant behaviours during FF and PR but less so during T. Lastly, attributions of intention are only significantly different between situations.

Figure 21: Situational differences in maternal attributions

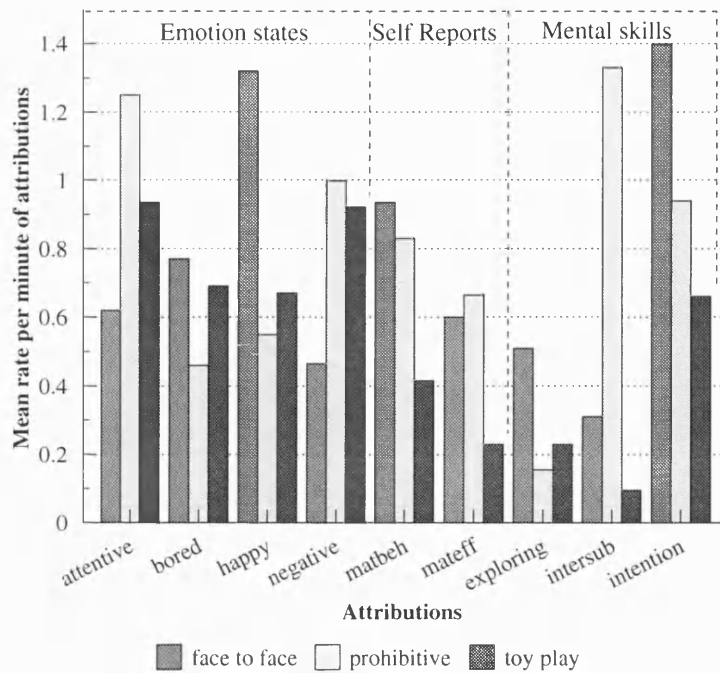


Figure 21 shows that intention is the predominant attribution category in FF, but decreases over situations. Intentionality in meaningful behaviour is attributed most frequently in the context of purely interpersonal interaction (FF), and decreases as the context of the situations becomes less interpersonal.

For example, intentions were frequently described in the context of face to face interactions, as can be seen from the interpretation of this mother from the 10-12 month old age group:

"She just looked up to me as if to say, this game is alright, you can carry on with it"

However, while frequent references to infant intentions characterise FF segments and, to a lesser extent, PR segments, references to intersubjectivity mainly characterise PR episodes. For example:

"That's when I said no again and she's trying to touch the lights and pursed her mouth a little bit and looked down. It means she's not very happy with the situation. She wants me to stop saying no and let her touch the lights." (Mother from 10-12 month age group)

Mothers' interpretations of infant acts in PR reveal that they perceive intention in the context of *communicative* behaviour (attributions of intersubjectivity contain references to infants responding explicitly, communicating intentionally, and understanding the mother's own communications, which all contain references to intentional behaviour by the infant). While mothers continue to attribute intentions to infants, they use interpretative categories which reveal intentions with an interpersonal significance in PR.

- **Age x situation:** Figures 22-24 show that attributions of happiness are different from all the other attributions. Happiness is attributed most frequently in FF, and declines over subsequent conditions. This pattern is characteristic of the two youngest age groups. In age group 3, mothers attribute happiness most often in toy play. They also perceive infants to be most distressed in PR, and attribute fewer negative states in T relative to the younger age group mothers.

Figure 22: Attributions of emotion states for 4-6 month olds

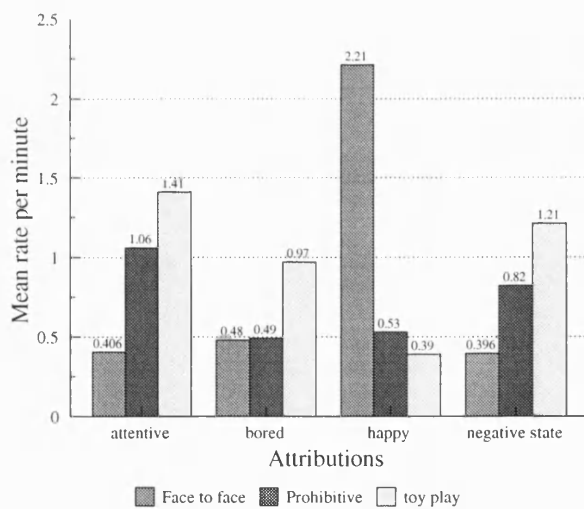


Figure 23: Attributions of emotion states for 7-9 month olds

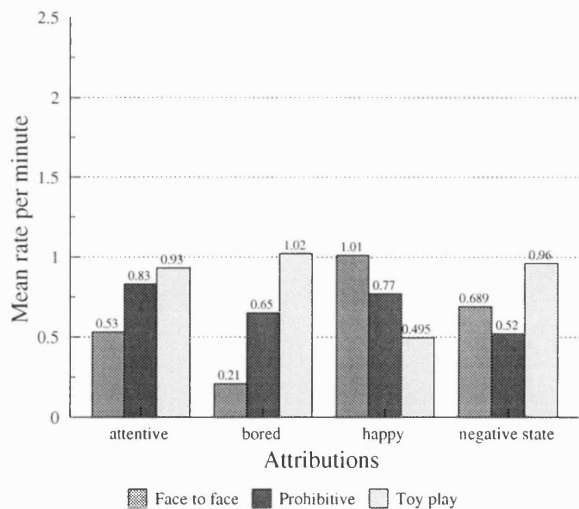
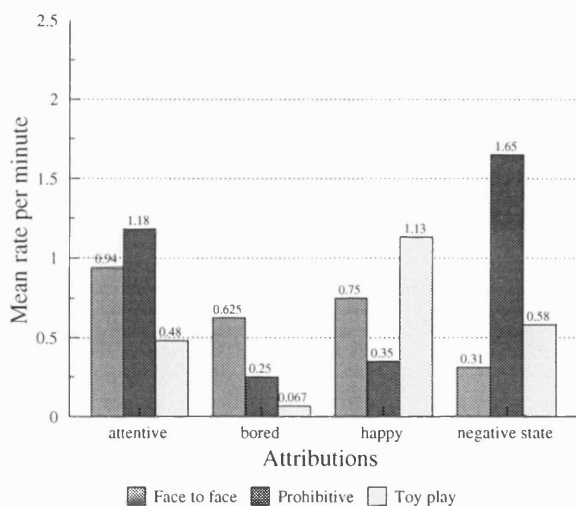


Figure 24: Attributions of emotion states for 10-12 month olds



This result is interesting in the light of the number of selections mothers made overall during T. While mothers noted few acts in T, they attributed happiness most frequently in this condition, relative to FF or PR, suggesting that the majority of selected segments in T contained attributions of happiness. Mothers were concerned with describing the infant’s positive state while playing with them and the toy. No evidence was found for self-attributions or attributions of intention differing with age of infants across situations (Table 17). However, mothers of 10-12 month olds make significantly more attributions of intersubjective skills during PR than all the other mothers, and compared to all the other situations (Figure 25).

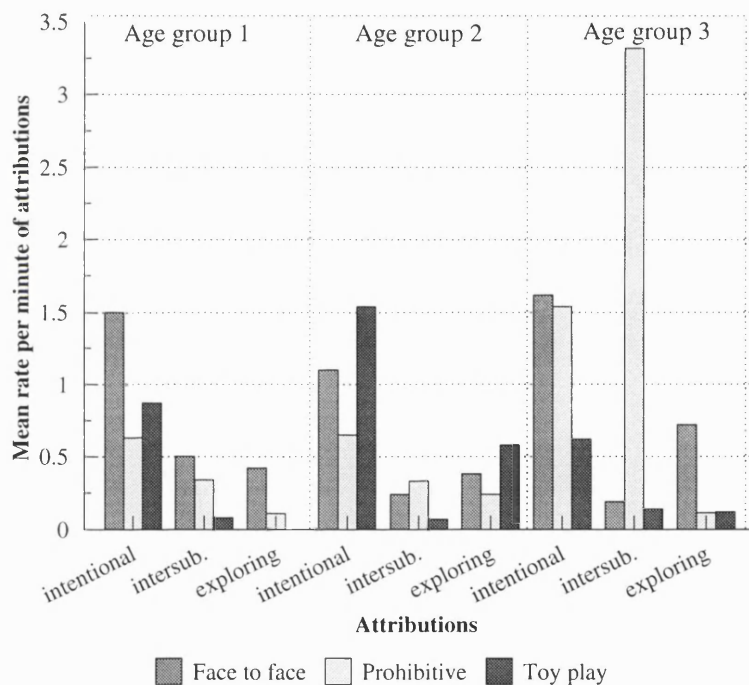
Differences in attributions of boredom were only significant when infant age was taken into account (Table 17). Thus, although situational context significantly affects this interpretation, it does so only in the context of infant age. While mothers

in age groups 1 and 2 perceived their infants as becoming increasingly bored over consecutive situations, mothers in age group 3 perceived their infants as bored most frequently during FF, but becoming less so when the toy was introduced. Compare the following quotes from FF and T respectively of a mother of a 10-12 month old girl:

"I thought she was getting a bit fed up with it [game] there because she is fidgeting and she's looking up at me and she wasn't smiling or anything..."

"She'd seen the box and she's smiling because something interesting is going to happen."

Figure 25: Situational and age differences in maternal attributions of mental skills



All mothers interpret infants as more exploratory in FF; this is most likely to be due to initial interest in the cameras and the author (Figure 25).³⁵ Mothers of 7-9 month olds attribute more exploratory behaviours to infants in general, and in T in particular, implying that they are sensitive to the infant's increasing interest in the environment at this age, as the following quote shows:

35. Log-linear modelling was not used on this category because of the infrequent number of attributions. It is presented here for descriptive purposes only.

"For the last few seconds he'd been exploring the toy with his mouth, which he couldn't do before 'cause it was too far away from him. He was interested, curious, holding it with his hands."

The previous analysis examined objectively coded facial expressions, while the present analysis up until now has examined mothers' subjective interpretations. Combining the two types of data is likely to yield important insights into the degree to which mothers' subjective inferences map onto objective categories of infant behaviours. It is also interesting to examine if maternal sensitivity to infant emotion states in general rests on certain characteristics of infant behaviour which are readily codable and accessible to observation. Thus, it is useful to examine whether mothers infer infant emotion state on the basis of the predominance of corresponding facial expressions, or whether there are other influencing factors. Similarly, to explore the contexts, both expressive and situational, in which mothers make non-emotion attributions of their babies. As was pointed out above, this analysis is important as it directly compares mothers' subjective impressions of their babies with the objective facial coding frame. In the following section, the results of this analysis are presented.

8.3 Emotion State Attributions and Facial Expressions

Emotion attributions may be made on the basis of the predominance of corresponding expressions. This is suggested by the fact that there are fluctuations to show that infants are interacting differently in each situation and that maternal attributions of emotion states appear to parallel these fluctuations. To find out whether there is an association between maternal attributions of emotion and corresponding infant expressions, a Spearman's Rho was computed. While it was not possible to test for associations in each age group and condition separately ($n=4$), or across situations for one age group, as these would have contained the same subjects, hence inflating the probability of a significant correlation, it was possible to compare across subjects regardless of age. To find out whether there was an association between attributions and expressions overall, the three situations were collapsed for each of the mother infant pairs. To determine whether situational context affected the association, each situation was computed separately for all 12 mother-infant pairs. The categories examined were: Positive expressions with happy attributions, negative

expressions with negative state attributions and interest expressions with attentiveness attributions.³⁶ The results are presented in Table 20.

Table 20: Results of spearman’s rho on attributions and facial expressions

Comparisons	Correlation coefficients		
	Positive-Positive	Negative-Negative	Interest-Attentive
Overall association	0.357	0.466	-0.362
Face to face	0.508*	-0.266	0.394
Prohibitive	0.497	0.645**	-0.074
Toy play	0.833**	0.461	0.593**

* p<.05 one tailed

** p<.025 one tailed, .05 two tailed

No overall association between rates of expressions and attributions was found. However, when scores were computed for each situation separately, important relationships were found.

- There is a significant relationship between the amount of positive infant expressions and mothers’ attributions of happiness in FF and T.
- Mothers’ attributions of negative states are significantly related to infant negative expressions during PR.
- Mothers’ attributions of attentiveness are positively related to infant interest expressions in T.

These findings suggest that there are significant associations between objective coding of some expressions and maternal perceptions of emotion. It appears that situational context, and not only the predominance of an expression *in isolation*, affects how mothers perceive infant emotion states. That is, it is probable that mothers were also influenced by the differences in rates and durations of expressions in the different situations. The evidence presented in Chapter 7 on the different frequencies

36. Rates per minute of attributions and expressions were used. While it is not possible to assume that only the occurrence of an expression, regardless of its duration and behavioural consequences, can be directly associated with an attribution, because the rates were ranked, the scores only reflect general quantities rather than precise scores. This overcomes any implicit assumption of a one to one relationship between the occurrence of a particular expression and the attribution of a corresponding emotion state.

of infant facial expressions point to babies responding differentially to different situations. In a similar manner, and as was discussed in Chapter 7, certain situations may have affected the quality and articulation of the infants' expressive responses, making it easier for mothers to identify and label them. Thus, both the context of the interaction and the infants' expressive behaviour allowed mothers to make the link between the child's expressions and broad emotion states in particular situations. In others, mothers were ignoring expressions. The result is that, by identifying and recognising emotional reactions as they occur in specific situations, mothers appear to be consolidating and articulating links between the child's facial expressions, their physiological responses, and experiences in specific situations.

In this way, while mothers perceive their infants' positive expressions as indicating happiness in FF and T, in PR, where infants are being prohibited from playing with an object (an inherently negative situation), there is no relationship between positive expressions and perceived positive states. In the same way, negative expressions are associated with negative attributions only during PR, although they occur in the other two situations. Interest expressions are significantly associated with attentiveness in T, suggesting that mothers are more likely to link interest expressions with attentiveness, in the appropriate context of toy play, than in FF or PR.

Alternatively, mothers may be using other attribution categories to describe the significance of the facial expressions. Although comparison between age groups was not possible, making it difficult to compare these results with those on observers' interpretations, the findings indicate that the existence of facial expressions does not necessarily lead mothers to attribute a corresponding emotion state. For example, although the frequency of selected positive expressions in T was similar to that in FF, mothers of 10-12 month olds perceived their infants as happier in T. It would therefore appear that mothers were highly sensitive to positive infant activity during T.

8.4 Mental Skill Attributions and Facial Expressions

Mothers interpret the same segments of infant behaviours using more than one attribution category.³⁷ While they interpret infant acts by referring to infant states, they also use non-emotion categories to describe the meaning of the infants' behaviour. However, the above analysis only examined emotion attributions and facial expressions. Further examination of non-emotion attributions is needed to find out what facial expressions these segments contain. Such analysis is particularly important in demonstrating how mothers' perceptions of cognitive and communicative skills of infants maps onto infants' expressive displays. It also demonstrates what types of facial expressions *mothers* use when they think their infants can understand them and, hence, provides a link between maternal perceptions and maternal expressive responses. Thus, a qualitative analysis of facial expressions falling in segments, interpreted using non-emotion attributions, will be presented.

Facial expressions co-occurring with attributions of intention, intersubjectivity and maternal effects were examined. These categories were chosen to illustrate how mothers label facial expressions within the context of perceived goal directed behaviour on the part of the infant (intention and intersubjectivity), and in the context of perceived goal directed behaviour on the part of the mother (maternal effect).

8.4.1 Attributions of Intention and Facial Expressions

Figures 26-28 show facial expressions occurring in segments in which mothers attributed intentionality.

- In FF, mothers of 4-6 and 7-9 month olds selected intentional behaviours containing predominantly positive and interest expressions. MO, on the other hand, selected

37. An analysis of co-occurrences was made to see which attribution categories co-occurred with each other. The results only confirmed general patterns already found in maternal accounts. That is, in cases where two attributions occurred with high frequency, they co-occurred with a high frequency.

intentional acts containing predominantly interest expressions, with positive expressions occurring less frequently.

- In PR, all mothers selected intentional behaviour which contained predominantly interest expressions, although mothers of 7-9 month olds' segments also contained frequent neutral expressions, and segments of mothers of 10-12 month olds contained predominantly negative expressions.
- In T, intentions attributed by mothers of 4-6 month olds were made in the context of predominantly interest expressions, although the segments also contained positive and negative expressions. Mothers of 7-9 month olds perceived intentional acts which contained predominantly negative expressions, while mothers of 10-12 month olds perceived their infants to be acting intentionally in behaviour sequences that contained frequent episodes of interest expressions.

The results show that infants of all age groups display positive and interest expressions in FF in the context of perceived intentional behaviour. Maternal accounts contained references to infants being interested and enjoying their mothers attempts to engage them. For example,

" He's quite enjoying that 'cause he laughed and he wants to hold onto my hand, and he's accepting that its quite amusing, quite entertaining. He probably wanted more contact, wanted me to hold him, or hold my hand or suck my finger."
(Mother from 4-6 month age group)

When mothers perceive intentional behaviour in PR, however, it appears to refer to acts which show the infant as predominantly interested, in many cases because of mothers' distracting strategies. For example,

"He obviously wanted to look at the box...and the way he could be distracted by the movement of the hands, they were moving in circles, you could see his head moving around and he obviously found them quite interesting." (Mother from 4-6 month age group)

Mothers of 10-12 month olds again differ from the rest of the sample; predominantly negative states accompany perceived intentionality:

"She's trying to touch the lights and pursed her mouth a little bit and looked down. It seems she's not very happy with the situation. She wants me to stop saying no and let her touch the lights."

This points to a developmental shift in the way infants respond to prohibitions, and the way mothers interpret infant negative expressions; by 10 months, negative states gain communicative significance for mothers. In T, intentionality is attributed to acts which contain interest and positive expressions in age 1 infants, mostly negative expressions in age 2 infants, and mostly interest and negative expressions in age group 3 infants. Mothers frequently commented that infants were getting tired during toy play. Hence, they may have interpreted infant negative states as indicating a desire to be removed from the chair and to terminate play, as in the following example:

"...he'd moved his arm up [to the toy] but then decided 'no', he didn't want to play this game any more. He wanted to come out. I mean he slowly turned round to me again and shouted as if he wanted to come out. The look on his face, looked like he wasn't happy." (Mother from 7-9 month age group)

The results above suggest that a developmental shift has occurred by 10 months, which is characterised by a greater understanding between mother and infant, and a more effective maternal role in interaction. In the following section, this proposal will be examined by looking at facial expressions accompanying intersubjectivity attributions.

Figure 26: Intention attributions and expressions in age group 1

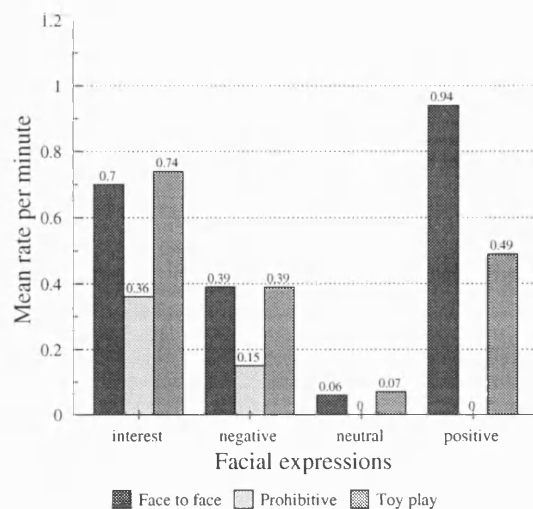


Figure 27: Intention attributions and expressions in age group 2

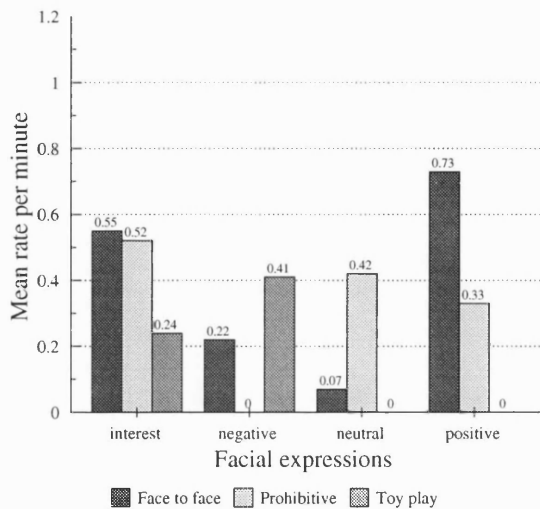
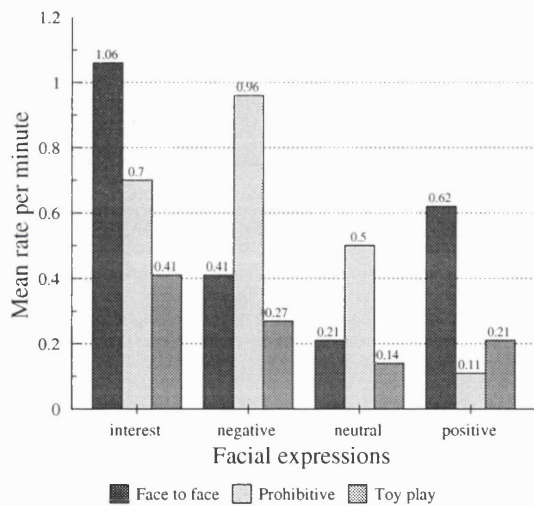


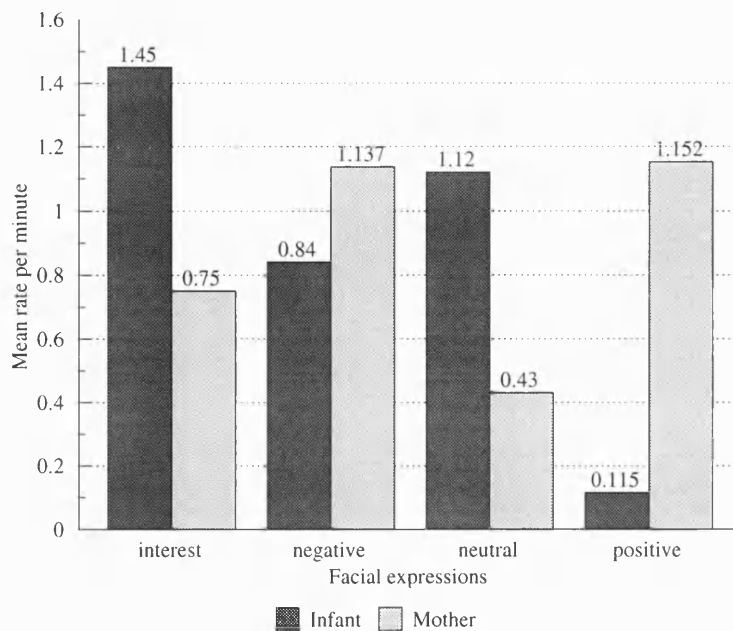
Figure 28: Intention attributions and expressions in age group 3



8.4.2 Attributions of Intersubjectivity and Facial Expressions

To find out if mothers use their facial expressions in the belief that babies understand their prohibitions, mother-infant expressions accompanying intersubjectivity attributions in PR for age group 3 were examined.

Figure 29: Co-occurrence of intersubjectivity attributions and facial expressions for 10-12 month old infants during prohibitive episode



Mothers displayed high rates of negative facial expressions in segments where they attributed intersubjectivity (Figure 29). This pattern of maternal response was unique to that age group and situation (see Appendix 2 for comparison with other age groups and situations)³⁸. This cannot be taken as evidence that there is a causal connection between mothers' perceptions and their expressive behaviour. However, it suggests that there is some association between maternal responsivity and their perceptions of their infants capabilities. Infant interest in the toy and distress at the prohibition was evident in the high rate of interest and negative expressions, and the very low rates of positive expressions. Mothers, in contrast, responded with many times more positive expressions, appearing to create a balance between their positive and negative displays, calming yet prohibiting the infant. Mothers were able to exert a greater control over their infants' behaviour with the use of their facial expressions, and perceived infants as being capable of understanding their expressions.

38. This condition was unique in that it was the only instance where a) mothers negative expressions were more frequent than infants' negative expressions, and b) there was such a large discrepancy between mothers and babies in the rates of positive expressions.

8.4.3 Maternal Behaviour Attributions and Facial Expressions

This is further substantiated by looking at expressions accompanying attributions of maternal behaviour (Figure 30). In the prohibitive situation, mothers' self-reports of their behaviour occurs largely within the context of infant negative expressions. They perceive their behaviour as creating negative states in the infant. Compared to situations 1 and 3, both mothers' and infants' facial expressions were markedly different in both type and frequency.

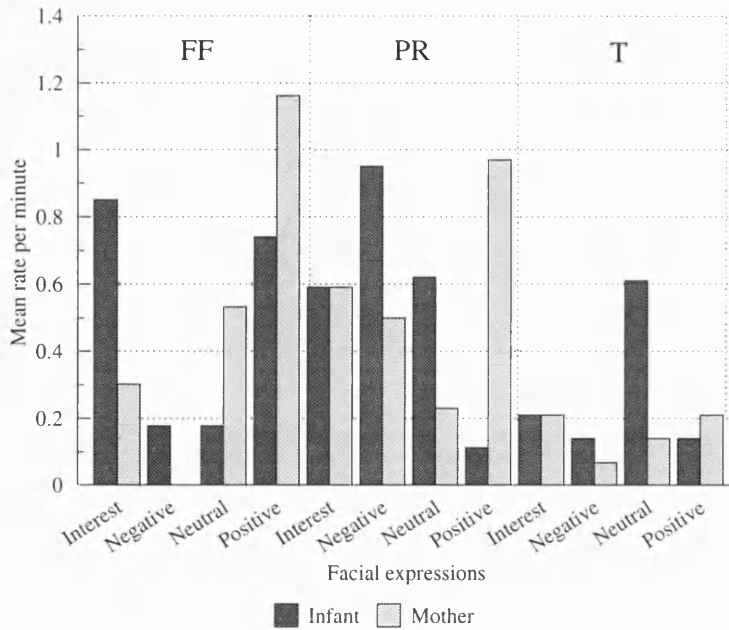
Maternal behaviour attributions are made in segments containing mostly interest and positive expressions in FF, highlighting the types of expressions mothers are explicitly interested in eliciting and responding to for that situation. This is echoed in their attributions:

"...she liked what I was doing [playing peekaboo]. I knew because she smiled with her mouth and her eyes and her eyebrows and her whole face and showed her teeth."

In T, where the infant is engaged in the toy, maternal behaviours are rarely attributed at all (Figure 30). When they are, infants are generally still faced. This suggests that, when maternal self-reports occur in T, babies attention would be directed away from mothers, at the toy, and their facial expressions would therefore likely to be fewer. The following quote supports this:

"She just heard the noise I was making with the button and was interested...in the button. She's looking...see, concentrated." (Mother of baby girl, 7-9 month old age group).

Figure 30: Co-occurrence of maternal behaviour attributions and facial expressions in age group 3



To sum up this section, the profile of maternal expressions suggests that maternal perceptions reflect characteristic patterns of maternal responsivity at the interactional level. When mothers attributed intersubjectivity in age group 3, there was an associated high rate of maternal negative facial expressions, possibly used to deter infants. Infants responded to their mothers' prohibitions by becoming distressed. Mothers tempered their prohibition with frequent episodes of positive expressions. Similarly, these reactions were also described by mothers to indicate the effect of their own behaviour on their infants. Overall, mothers use their facial expressions instrumentally, communicating information about the environment, and about the infant's own actions vis-à-vis the environment, within socially meaningful contexts.

8.5 Specificity and the Growth of Shared Meaning in Interpretations

The initial hypotheses regarding maternal interpretations questioned whether maternal attributions reflected the influence of developmental variables, and of situational context. Questions asked were whether maternal attributions would reflect

maternal sensitivity to the age related developments of their babies. Moreover, whether the different conditions in which mothers interpreted their infants' behaviour affected the way they perceived their babies. Assessing maternal attributions revealed important characteristics of mothers' perceptions of their babies that would otherwise have been missed using a purely quantitative analysis.

The analysis showed that mothers become more specific about the meaning of their infants' behaviour as babies get older. Mothers of 4-6 month old infants describe selected infant acts in terms which contain predominantly simple descriptions of body movements, devoid of explicit social or interpersonal meaning. With increasing infant age, mothers make fewer such interpretations, becoming more precise about the meaning of behaviours they have selected. Thus, while infant behaviour may become increasingly defined by 'points of articulation' (Werner and Kaplan, 1963; Adamson et al., 1987), mothers become more precise about what this behaviour means rather than selecting more acts.

Selection of meaningful acts appears to be related to the interpersonal context of infant behaviour, and to mothers' perception of the appropriateness of the infants' affective and mental states. Thus, for example, mothers select infant acts which contain predominantly positive expressions in FF, and interest and negative expressions in PR and T. However, as infants get older, these acts contain fewer positive expressions and higher frequencies of interest displays in FF, and more episodes of positive expressions in T. While these facial expressions are consistently interpreted as indicating infant emotion states, they appear to be reported on the basis of whether they were situationally appropriate, rather than *only* on how often they occurred. This suggests that the criteria of selectivity and interpretation rest on the mother's knowledge of the infant, her representation of the demands of the situation, and also on the physical characteristics of the behaviour.

Analysis of meanings mothers ascribed to infant acts they had selected revealed that contextual significance does not only refer to the physical situation in which mother and infant interact, but also includes the interpersonal meaning of these expressions for the mother. Perception and attribution of emotion states is accompanied by attribution of intentions consistently in all age groups. Moreover, mothers perceive intentionality differently depending on the situation, and integrate emotion states with this intentional behaviour. Thus, for example, in FF, where mothers attribute the greatest number of intentional acts, they also interpret their

infants as predominantly happy. In PR, on the other hand, where intention attributions are less frequent, mothers predominantly perceive their infants as attentive and unhappy. Interestingly, in the case of mothers of 10-12 month old infants, negative states are interpreted as signalling an interpersonal understanding of the prohibitive situation.

The same pattern is found for maternal behaviour and maternal effect categories. When mothers perceive an intention, they describe some aspect of their own actions vis-à-vis this perceived intention. Mothers' attributions of intention, in Figure 21, appeared to follow the same pattern as their descriptions of their own behaviour. Thus, when mothers perceive intentions, they also describe what they do to fulfil their infants' desires. Hence, the perception of emotion states is embedded in dynamic action sequences, and is perceived as goal directed. Mothers' perceptions of intentionality is an important indicator of what is responded to (as evident in maternal behaviour and effect attributions) in interpersonal exchanges. Moreover, mothers' perception of the interpersonal and intentional significance of emotion states is not restricted to a particular emotion. For example, in some cases, positive states are linked to intentional behaviour (e.g., in FF) while, in others (e.g., PR), negative states are linked to intentionality. In T, although positive and negative expressions occur frequently, attributions of intention and maternal self attributions are low. Mothers do not perceive infant behaviour as interactive during T, and they perceive the least number of meaningful acts.

Mothers are also influenced by infant age; mothers of 4-6 month olds perceive their infants as happy in FF, and becoming increasingly attentive, unhappy and bored over consecutive situations. Mothers of 7-9 month olds perceive their infants as happy and distressed in FF, attentive and happy, but getting bored, in PR and attentive, bored and unhappy in T. Mothers of 10-12 month olds perceive infants as mostly attentive during FF, as understanding their prohibition and highly distressed and attentive in PR, and happy in T. In some instances, frequencies of selected facial expressions do not correspond to frequencies of emotion attributions. In those cases, mothers appeared to either over-interpret or under-interpret a particular emotion state. For example, although mothers of the oldest babies selected segments which contain more frequent displays of infant positive expressions in FF than in T, they interpret the infant as happier in T. Similarly, although mothers of 7-9 month olds select segments which contain more episodes of positive expressions during FF than

mothers of the youngest infants, they make far fewer attributions of infant happy states than those mothers.

The general pattern that can be deduced from the above findings shows that, as babies get older and their expressive abilities become more articulate, mothers a) select fewer acts, b) become more specific regarding what these acts mean, and c) attribute intersubjective meanings to these acts. Thus, as infant expressive responses become more attuned to environmental stimulation, these expressions become 'framed' by mothers in explicitly interpersonal language. Mothers of 4-6 month olds appear to project haphazard meanings to infant expressions. Babies' expressions, in turn, appear to be highly variable in response to the different types of environmental stimulation. Nevertheless, mothers perceive this behaviour as highly meaningful. They appear to project meanings onto their infants' activities, although they describe it in simple themes. As babies get older, their responses to environmental stimulation become more situationally appropriate. Mothers become more selective as there is less 'variability' or ambiguity in infant expressions. Hence the trend to select fewer acts, and for selected segments in the older age groups to reflect developmental capacities (e.g., positive expressions in the toy condition, and negative expressions in the prohibitive condition).

The text of mothers' reports also shows that they are more specific regarding what this behaviour means. Emotion states are consistently attributed across all age groups. This indicates that, in infancy, there is a pre-occupation with the emotional states babies. It further shows that facial expressions are the main medium of messages in the mother-infant system. However, as infants get older, this message system evolves from being one in which babies' expressions are used as simple indices of internal states, to one in which these affective expressions signify underlying shared meanings. Signals become interpersonally communicative, and mothers reflect this by describing their babies as able to communicate intentionally.

The progression of maternal interpretations towards more abstract meanings highlights how symbolic rules are introduced into the management of affective states. It also appears that the introduction of interpersonal meanings into mothers perceptions of their infants results in a greater degree of self-perceived maternal control. Thus, two, seemingly contradictory, perceptions develop; on the one hand, there is a greater perception by mothers of infants being autonomous, while at the same time, mothers' descriptions reflect how much more effective they are when they

interpret the meaning of their infants' actions. In Chapter 10, a discussion of how these age-related developments map onto the theoretical framework developed earlier is provided.

Some ambiguity in the findings on maternal interpretations did exist, however. Mothers appear to label the same expressions, e.g., negative expressions, in a variety of ways depending on the context and age of the infant. It will be remembered that negative expression codes were collapsed as a result of the multiplicity of blends that resulted from the coding. Because of these blends, few pure MAX emotion expressions could be identified. This may be because infants do not display pure anger, distress, or pain expressions and, so, mothers project meaning onto ambiguous negative expressions. It is also possible that few unambiguous negative expressions were elicited in the situations filmed because they did not involve high levels of intense stimulation.

Such methodological limitations are possible to overcome by using more controlled methods of eliciting maternal accounts. For example, in some cases mothers were asked to identify facets of infant behaviour that they based their interpretations on. The probes used did not, however, elicit this information adequately. Consequently, 'identifiers' were not numerous enough to be included in an analysis. An improvement on the technique used here would thus be to ensure that mothers give adequate justifications for their ascription of emotion states to babies. This may be done by specifically asking mothers to account for their interpretations in the instructions given to mothers at the beginning of the interview.

A second alternative would be in the choice of interaction situations mothers were interpreting. It is a testable hypothesis whether mothers would be less ambiguous about the meaning of infant negative displays with increasing age, if the stimulation used to elicit these expressions was stronger than that used in the present situations. Using stronger stimulation to produce infant affective reactions may sharpen the focus on the criteria mothers are using to ascribe emotions. One possibility may be to ask mothers to identify situations in which they think their infants are likely to react strongly, and film infants in those situations. A third possible method for bringing maternal criteria into sharper relief is to compare their interpretations with those of observers.

While the above results imply that mothers both interpret infant acts on the basis of what is prevalent in infant behaviour, and also infer mental skills which may

not be directly observable, it is not clear whether observers would attribute the same meaning to infant behaviour. It may be that, without any definition of meaningful acts, observers perceive meaningful behaviour differently to mothers, as was suggested by Adamson et al.'s (1987) study. It may also be that, once they are given the same criteria as mothers, they may interpret infant acts in the same way that mothers do.

The results suggest that mothers are making specific selections of infant behaviours. Analysis of baseline samples in Chapter 7 revealed that on the whole baseline segments contained fewer expression changes than selected segments. However, it is not clear if mothers' perceptions rest on observable physical characteristics accessible to any observer, or if they are the product of specific experiences between mothers and infants. If maternal perceptions are congruent with external observers perceptions of infants, then eliciting maternal accounts is unnecessary. Without a comparative study it is not possible to demonstrate the particular value of the attributions and selections of parents or caregivers. Taking the findings one step further, to confirm that the perspective of interactional others is indeed a reflection of a different conceptual framework, and a different orientation, to that of observers, and hence to highlight the importance of this insiders perspective, two experiments were conducted. In the next chapter, these experiments are reported.

CHAPTER 9

COMPARISONS OF MOTHERS' SELECTIONS AND INTERPRETATIONS WITH THOSE OF OBSERVERS

9.0 Aims and Objectives

Up until now, the behavioural and verbal analysis in Chapters 7 and 8 has been used to address some of the initial theoretical concerns presented in Chapter 1. Attribution theory advocates that actor-observer differences exist, and that they affect how people's actions are interpreted and understood. Ichheiser points out that there is an important tension between impressions and expressions. Our perception of other people is subject to contextual and interactional dynamics, and does not depend solely on the physical characteristics of their behaviour or their appearance. Hence, our interpretation of others will vary according to who is doing the interpreting. Attribution theory therefore has important lessons for our understanding of what emotions are, and how they develop.

In Chapter 1, Kaye (1984) identifies three types of relationships between expressions and impressions. He highlights the need to integrate perspectives other than those of researchers into the appraisal of emotions, especially in studying infants. Obtaining multiple perspectives allows us to examine commonalities and discrepancies between individuals who have different relationships with babies. If interpretations differ, it may be possible to attribute discrepancies to characteristics of the relationships they hold vis a vis babies. For example, in Adamson et al.'s (1987) study of adults' perceptions of meaningful acts, they compared parents versus nonparents' selections of meaningful and intentionally communicative acts. Their findings suggest that caregivers attach greater meaning to infant behaviour than non-parents (Adamson et al., 1987). The more consensually defined intentionally communicative acts were as likely to be selected by one group as the other. This has been taken to indicate that parents' criteria for defining meaningful acts are far broader than those of nonparents. If this were indeed true, it may be taken as important evidence that part of the parental mechanism of scaffolding and social referencing is to over-attribute meaning to infant behaviour so as to be better able to manage the baby in

a coherent and consistent fashion. In addition, this overattribution would enable parents to be one step ahead of their babies, enabling them to drive infants' capacities to greater levels of complexity. Hence, capturing more than one perspective can highlight aspects of infant behaviour which are particularly salient to parents in their understanding and management of their babies.

The analysis has so far has dealt with two points of view on infant emotionality. In the first instance we have looked at infant expressions using an objective, context-free coding frame. In the second, we have obtained the perspective of caregivers regarding the meaning of their infants expressions. Comparison of the two points of view yielded some important results. It showed that, regarding the selection process, mothers find babies' behaviour more meaningful in some situations than in others. Mothers also appear to become more selective as infants get older. There was also evidence that expressions in segments selected by mothers reveal developmental and situational changes. When maternal attributions of emotion and corresponding facial expressions were compared, the analysis revealed strong associations between the two. This was especially true when the situational context was conducive to a particular affective state. Importantly, as babies got older, mothers started to ascribe mental states and intersubjective meanings to their babies.

The results raise a number of issues. It may be possible to deduce from them that facial expressions are the main criteria used to attribute emotion states in infants. There was evidence of strong associations between facial expressions and emotion attributions. However, the analysis has not shown whether mental skill categories would be perceived in the same way from multiple perspectives. Shared meanings between mother and infant may not be physically present in the behaviour that is being interpreted. In this case, the data would be especially valuable in providing a framework for understanding how the mother-infant expressive signalling system evolves. At present, the analysis does not show whether caregivers' interpretations are any different to those of other groups. Thus, while these findings are important in highlighting the predominant concerns and criteria with which caregivers assess their babies, they need to be extended to answer a number of questions.

One such question is whether parental criteria regarding what is meaningful behaviour in their infants is consensually defined, and present in the physical characteristics of that behaviour alone. Data from the baseline comparisons suggests that there are no clear physical demarcation points regarding what is defined as a

meaningful act. Indeed, mothers of the youngest age groups may have been 'guessing' or projecting meanings onto infant acts. This raises the question: In the absence of any set definition of a meaningful act, how much meaning do *observers* ascribe to infant behaviour compared to mothers? The Adamson et al. (1987) study suggests that parents select more meaningful acts than non-parents because non-parents have to construct criteria for what constitutes a meaningful act. The study also suggests that selectivity is influenced by interactional context. This raises the question of whether observers too are influenced by the situational context in which they view the baby.

A second related question is; if non-parents are given the same criteria for interpreting infant acts as parents, will they interpret infant acts in the same way? The results of comparing mothers' attributions with objectively coded facial expressions showed that the criteria for attributing emotion states may, at least partially, lie in the physical characteristics of behaviour. However, does the same apply to non-emotion categories? I have argued elsewhere (Chapters 2 and 3) that intentionality, intersubjectivity and the development of a social signalling system between mother and baby rests on a history of shared experiences. Transitional gestures evolve through the negotiation of dialogue between caregivers and their babies. Comparing observers with parents would bring this divergence of perspective into sharper focus.

Hence, the following chapter addresses the following: The mother's role in interpreting her baby's acts on tape is one of both participant observer and of a caregiver who knows the baby. To highlight how this dual role contains important dynamics which differ from those of external observers, two types of comparisons were made: The number of maternal *selections* of meaningful acts was compared to those of student observers, and the type of *interpretations* mothers made was compared to those of observers. The first experiment examines if the criteria observers use to define meaningful acts are the same as those of mothers. Secondly, if the absence of criteria for defining meaningful acts is partially responsible for disparities between observers and mothers, how do observers compare to mothers when they are given the same interpretative criteria? The second experiment is set up to address this issue. In the following section the two experiments are described, and the results are discussed. The overall results of the are then summarised and discussed. What they inform us about the organisation of mother-infant interaction is considered. Finally, the strengths and limitations of the overall study are addressed.

9.1 Comparisons between Mothers and Observers in Selection of Meaningful Infant Acts

As it can be argued that mothers are only selecting what is simply prevalent and therefore directly observable in infant behaviour, we must examine whether the mothers' selections of infant acts are based on the same criteria as those of external observers. To do this, differences in selectivity of infant acts between mothers and external observers were tested for.

Student observers (N = 24) were asked to view the tapes of two of the infants filmed, one boy and one girl from age group 1, and to note infant meaningful acts. The sample of students consisted of a large number of mature students. Many had had experience handling babies. At this stage, it was felt that an important first step was to identify disparities between mothers and non-mothers to highlight the role of participant observers. However, it is recognised that future studies will need to assess if different groups perceive infants differently, depending on their familiarity with the particular baby versus their familiarity with babies in general. For example, by asking mothers to interpret each others babies and comparing that with how they interpret their own babies behaviour.

As an initial step, however, it was necessary to establish if there was any discrepancy between mothers and observers. During the experiment, observers were shown the mother-infant tape (with the mother's film edited onto a split screen) in its entirety, as had been shown to mothers. They were asked to note down instances where they felt the infant had done something meaningful. Their selections were compared to those of the mothers. From Table 21 it can be seen that for 4 of the 6 conditions, mothers' scores are outside the range of observers' scores. The remaining two scores, for the baby girl, in FF and PR, although not falling outside the range of student observations are, nevertheless, within the range by a very small margin.

Table 21: Observers' selections of meaningful infant acts

Situations	Frequency of selections			
	Girl		Boy	
	Observers	Mother	Observers	Mother
Face to face		11		31
Mean (\bar{x})	6.76		4.17	
Range (min., max.)	(4,12)		(1,13)	
($\bar{x} \pm 2s.d$) [*]	(4.76,8.76)		(2.17,6.17)	
Prohibitive		7		16
Mean (\bar{x})	3.35		2.90	
Range (min., max.)	(1,8)		(1,7)	
($\bar{x} \pm 2s.d$)	(1.35,5.35)		(0.9,4.9)	
Toy play		8		13
Mean (\bar{x})	2.81		3.09	
Range (min., max.)	(1,6)		(0,9)	
($\bar{x} \pm 2s.d$)	(0.81,4.81)		(1.09,5.09)	

*s.d= Standard Deviation

It is significant to note that both observers and mothers select the greatest number of meaningful episodes in FF (Table 21). This suggests that the behaviour of 4-6 month old infants interacting with their mothers is more easily defined as meaningful by observers, whether they are participant or external observers. However, while external observers appear to note more meaningful acts in FF relative to the other situations, they, nevertheless, select far fewer behaviours compared to mothers. During the task, there was a striking difference between the ease and confidence with which mothers selected from the stream of behaviour and the difficulty observers faced when deciding what was meaningful. It appeared that mothers were more flexible when selecting acts as meaningful, or were more ready to project meanings to infant acts than observers.

The difference between mothers and observers highlights the point made by Adamson et al. (1987) that mothers' criteria for 'meaningful acts' are far broader than the criteria of observers. As regards the selection of infant behaviour, it would appear that the perception of what is regarded as meaningful does not *only* depend on prevalent infant behaviour, but also on the criteria one uses to define these acts. In the absence of any definition of meaningful acts, observers make fewer selections than mothers. However, it may be that, once they are given the same criteria as mothers,

they may interpret infant acts in the same way that mothers do. In the next section, this hypothesis is tested.

9.2 Comparisons of Maternal and Observers' Attributions

Do mothers' interpretations of their infants' behaviours differ from the interpretations of observers? An experiment was run to compare mothers' and observers' interpretations using a group of thirty psychology students. Postgraduate students were divided into groups of 4-8 people. Two tapes (with mother and infant on split screen) were shown to each group (total number of tapes shown = 12). Students were asked to view the tapes in their entirety and interpret infant behaviour using the same categories *derived from the maternal accounts coding frame*. This restricted the number of possible interpretations observers could make, and defined the types of behaviours to be coded in advance.

In this way, the criteria for interpretation corresponded to Adamson et al.'s (1987) definition of consensually defined acts. In their study, they suggested that intentionally communicative acts are easier to select than perceived communicative acts (i.e., acts which were meaningful to the observer), because the former are consensually defined, often conveyed by conventional gestures and words. In contrast, perceived communicative acts are less consensually defined, and so the recipient must *construct criteria* for what constitutes a 'meaningful act'. The previous experiment which compared mother and student selections of infant behaviours did not provide the observers with predefined categories to select from. They experienced great difficulty in deciding what was meaningful. It was predicted that if, as Adamson et al. argue, providing criteria for a given act facilitates its selection, observers would be as likely as mothers to perceive the same types of acts.

To test for differences between mothers and observers, a binomial logit model was used (those who had used a particular attribution were scored as 1 and those who had not were given a score of 0). Three attributions of infant emotion state were examined: Happiness, negative state, and attentiveness. Three categories of infant mental skills were also compared: Intention, exploration of the environment, and intersubjectivity. Lastly, maternal attributions of the effect of their own behaviour

were compared to student perceptions of the effect of maternal behaviours on the infant.

9.2.1 Emotion Categories

The emotion-related categories tested were happiness, negative states, and attentiveness. Results of testing for differences between mothers and observers in attributing happiness revealed that, although there was no significant difference overall between the two groups, the numbers of mothers and observers attributing happiness differed depending on infant age ($\chi^2=5.99;df=2;p=.05$). This difference was found in age group 3. Out of the total number of subjects who attributed happiness, 62% were mothers and 37% were observers (in age group 1, 46% were mothers and 54% were observers and, in age 2, there was a 50% division of mothers and observers).

Attributions of attentiveness and negative state were used frequently by both mothers and observers in all age groups and situations, and tests failed to reveal significant differences between the two groups.

9.2.2 Attributions of Mental Skills

There was a highly significant difference in the number of mothers (71%), compared to the number of observers (29%), who attributed intention to the infant's behaviour overall ($\chi^2=22.70;df=1;p=.000001$). Mothers and observers did not differ significantly between specific situations or age groups; the difference represented an overall trend. This is important in highlighting how maternal interpretations of infants are framed in explicitly intentional, and hence dynamic, terms. Observers, on the other hand, provide a more static picture of infants. This points to an important characteristic of the divergence in perspective between mothers and observers.

Results on attributions of intersubjectivity showed a significant age related difference between the number of mothers and observers attributing intersubjectivity ($\chi^2=7.25;df=2;p=.02$). While mothers generally do not attribute intersubjective skills

to infants until 10-12 months of age, the majority of observers interpret the behaviours of 4-9 month old infants as indicating that the infant understands the mother's communication or intends to communicate (Table 22). Surprisingly, fewer observers interpret 10-12 month old infant behaviours as communicative, compared to observers in the younger age groups. This result is especially interesting as this category specifically refers to Adamson et al's definition of 'intentionally communicative' acts and should have yielded the same result for both students and mothers. As Adamson et al. did not use the infants' own parents in their study, this may explain the difference in results, and points to the dynamic nature of maternal perceptions of infants compared to external observers. It is possible that mothers and observers use different criteria to decide when the infant understands or is communicating intentionally.

Table 22: Percentage of mothers and observers attributing intersubjectivity

Percentage of subjects attributing intersubjectivity		
Age categories	Mothers %	Observers %
Age group 1	33	67
Age group 2	40	60
Age group 3	58	42

An overall significant age effect was found for the number of subjects who attributed exploratory behaviour ($\chi^2=6.22;df=2;p=.05$). Of the total number of subjects who attributed exploratory behaviour to infants, 18.75% made these attributions in age group 1, 40.6% in age group 2, and 40.6% in age group 3. Infant behaviour from 7 months onwards begins to be perceived, by both mothers and observers, as exploratory, suggesting that it is more readily interpreted without specific knowledge of the infant.

Finally, comparing students' perceptions of the effect of mothers on the infants' behaviour with maternal attributions of their own behaviour did not reveal significant differences overall. However, there was a significant difference between age groups for mothers and observers ($\chi^2=7.76;df=2;p=.02$). Whereas more observers attributed maternal effect to mothers of 4-6 month olds than the mothers themselves (60% observers and 40% mothers), more mothers of 10-12 month olds attributed the

infants' behaviour to their own actions than observers (60% and 40% respectively). There was an even division in the attribution of maternal effect in age group 2.

Taken as a whole, these findings show that mothers use different cues to attribute happiness, intersubjectivity, intention, and maternal effect from those of observers. In the case of maternal effect, the difference between mothers and observers is important in revealing the divergence in perspective between actors and observers. Student observers viewed the mothers' behaviour on a split screen, while mothers inferred their own behaviour from observing the infant. More observers noted maternal effect than mothers in age 1, but less noted maternal effect than mothers in age 3. This suggests that observers may be interpreting maternal effectiveness on the basis of stimulus response contingencies, while mothers' perceptions of their own effectiveness rests on knowledge based on previous experience with their infants.

Interpretations of intersubjectivity are attributed by more observers than mothers in age 1, and by more mothers than observers in age 3. As one of the definitions of this category is deliberate responding on the part of the infant, observers may again be relying on stimulus-response contingencies between mother and infant. Mothers may be interpreting behaviour on the basis of their knowledge of 'transitional gestures', by which they negotiate and maintain dialogue with their infants. Such gestures would not have been accessible to observers. In the case of intentionality, where the definition of this activity does not necessarily rest on stimulus response contingencies, but on the perception and understanding of an infant's gesture, observers made few interpretations compared to mothers.

A cautionary note is that this analysis does not tell us if the discrepancy in interpretations is due to differences in level of experience with babies between mothers and observers. In other words, if the differences are a reflection of experience with babies, rather than with a particular baby. However, the lack of significant differences between observers and mothers in attributions of most emotion states suggests that emotion may be inferred on the basis of the predominance of emotion related facial expressions. It may be, for example, that some facial expressions may be easier to 'read' and interpret than others in some situations.

The exception to this proposition are mothers of 10-12 month olds, who appear to perceive happiness in their infants on the basis of other criteria than those used by observers. Mothers of the oldest babies may be inferring positive states on the basis

of the type of activity in which the infant is engaged, rather than the predominance of positive facial expressions. An alternative possibility is that observers do not find positive expressions to be salient indicators of older infants' behaviour, while mothers continue to find such expressions important in interpreting infant behaviour. In the following summary of results, the above results are integrated with those in the previous two chapters.

9.3 Lead or Follow: Synopsis of Results

Infant facial expressions in selected segments indicated that infants display predominantly positive expressions in FF, increasingly come to display negative expressions in PR, and display more positive expressions in T as infant age increases. While it is possible to speculate that mothers simply respond to this input by selecting what is prevalent in infant behaviour, other indicators pointed to mothers using specific criteria to select what was meaningful. For example, compared to students' definition of meaningful behaviour, mothers' criteria for selectivity were more differentiated, leading to more acts being selected by mothers than students. What are these criteria?

It was found that mothers perceive and select more meaningful infant acts when infants are engaged in interactive situations. They select more acts in FF than in PR, and more acts in PR than in T. There also appears to be a trend for mothers to select fewer acts, i.e., to become more selective, as infants get older, although the trend failed to reach significance. The evidence from results on selectivity suggests that maternal perception of what is regarded as meaningful does not only depend on what is prevalent in the physical characteristics of the infants' behaviour. Indeed, when maternal interpretations were analysed, mothers differed between age groups revealing that, as infants got older, mothers, firstly, became more specific about the meaning of their infants' behaviour and, secondly, began to describe infants as able to communicate or share interpersonal knowledge with them. Similarly, when compared with observers' interpretations, agreements between mothers and observers concerning emotion state attributions were high, but the two groups differed in attributing intentionality, intersubjectivity and maternal effectiveness. Thus, two criteria appeared to be central to the dynamics of maternal interpretation of infant

behaviour; firstly, mothers select overt behaviours which are interpersonally directed and, secondly, they select acts on the basis of knowledge of the infant not present in the physical characteristics of infant behaviour.

Comparing baseline segments showed that mothers did not depend on changes in facial expressions alone to make selections. For example, mothers of 7-9 month olds differed from the other two age groups; they selected infant acts that were characterised by fewer expression changes, compared to the baseline in FF and T; mothers focus on infant acts concerned with exploring the environment, as was supported by the rise in both mothers and observers attributing exploratory behaviours to infants after 7 months. Both mothers of 4-6 and 10-12 month olds' segments were characterised by frequent changes in facial expressions compared to baseline segments. However, analysis of maternal interpretations showed that, as infants got older, mothers interpreted infant activity differently.

Simple descriptions of infant behaviour decreased with increasing infant age. Mothers of 4-6 month olds interpreted infant acts using predominantly attributions of positive emotion states and descriptions of behaviour that were devoid of social or cognitive terms. In the light of results for baseline segments, such findings show that mothers of 4-6 month olds appear to make haphazard selections during FF. Mothers of all age groups attributed emotion states, intentionality, and maternal self-attributions to their infants. All three attributions decreased across situations. This appeared to mirror the pattern of maternal selections of infant acts. The three categories taken together show that, when mothers attribute an emotion state, they also describe it in the context of an intention on the part of their infant. They refer to their own behaviour vis-à-vis their infants as well (using maternal behaviour and effect attributions). For example, " I bleeped that 'cause I put my hand in front of her eyes and so affected her vision, took my hand away and so she smiled a lot. She smiled because it was an unexpected thing for me to do, and maybe to make me do it again" (attributed to mother of baby girl, 10-12 month group). Thus, the findings support the earlier proposal that one criterion for defining meaningful acts is maternal perceptions of the interpersonal nature of their infants' behaviour.

Mothers of 10-12 month olds interpreted their infants as happiest in T, supporting research by Trevarthen and Hubely (1978) and Sugarman-Bell (1978) showing that, after 10 months, infants are able to coordinate object interaction with person interaction. It also implies that mothers of the oldest infants were selecting

infant acts in T that were directed at them, rather than the toy, instead of focusing on simple changes in the level of infant activity, as mothers of the youngest babies did. Partial evidence for is to be found in the descriptive content of maternal accounts. Mothers of 4-6 month olds interpreted infant acts in T as expressing predominantly attentiveness, boredom and negative emotion states, appearing to reflect the discomfort of infants in this situation.

Mothers' interpretations also contained differences between age groups in the three situations. In particular, mothers of the oldest babies made a dramatically high number of attributions of intersubjectivity in PR. Their infants displayed high levels of negative expressions, suggesting that negative expressions become intentionally communicative to mothers by 10-12 months. Younger mothers did not generally perceive their infants' expressions as indicating a deliberate intention to communicate, or an explicit mutually shared understanding.

Moreover, while mothers attribute emotion states to their infants, this attribution is situation dependent. A relationship was found between attributions of emotion states and corresponding facial expressions. Positive expressions were positively correlated to attributions of positive emotion states in FF, but not in PR or T. Similarly, negative expressions were significantly associated with attributions of negative emotion states in PR, but not in FF or T. In the same way, attributions of attentiveness were positively correlated with interest expressions in T, but not in FF or PR. Mothers were thus ignoring facial expressions which were atypical of the general trend of the infants' behaviour, and which were less frequent and less ambiguous than other expressions, thus creating a consistency and stability in the way expressive behaviour is managed in social context.

The results highlighted an important transition in mothers of 10-12 month olds compared to the rest of the sample. This transition was discussed in Chapter 8. By 10 months, mothers gain more control over their infants (i.e., become more effective) in driving and directing the interaction, while at the same time, perceive their infants as able to assume a more active and communicative role in interaction. Qualitative analysis revealed that, when mothers of 10-12 month olds perceived their infants as exhibiting intersubjective skills, negative maternal expressions in PR were frequent. Mothers also made frequent references to the effect of their own behaviour in segments which contained predominantly negative expressions. This demonstrates a point that will be discussed in detail in the following chapter; that mothers of older

infants were influential in directing their infants' activities and perceived themselves as so. At the same time, they perceived their infants as able to initiate communication with them and to understand their own expressions and desires. Hence, unlike mothers of younger children, they perceived their infants as playing a more active role in the interaction. Without proposing any causal mechanisms, this also suggests that maternal perceptions are associated with the way mothers interact with their infants, although further research is needed to examine this possibility in more detail.

Mothers of 4-6 month olds perceived their infants as displaying emotion states and intentionality, but while maternal behaviour and effect attributions were frequent in FF, mothers did not perceive infants as able to assume an autonomous role in interaction. Similarly, although they place expressions in the context of infant desires, embedding them in activity bound contexts, they do not perceive their infants as able to comprehend these responses, but rather only emphasise the resulting effect of their own actions to control or maintain the infants' positive state.

Taken as a whole, the results highlight how maternal interpretations provide important indicators of the types of affective processes that are salient to mothers in the social development of infant emotionality. They have demonstrated that what mothers find meaningful does not necessarily depend on the presence or absence of a particular facial expression alone. Mothers project meanings which are context and age related. They provide the infants with continuity in the course of development by consistently perceiving, interpreting and responding to affective displays. They provide increasing complexity by interpreting these affective states in the context of more complex socio-cognitive processes, leading infants towards more complex relationships between their own expressive behaviours and the wider environment.

Socialising influences are also present. Mothers discipline their infants to obey them by using negative displays when they think that infants can comprehend them; however, they attempt to discourage negative displays by involving infants in positive exchanges. The process is reciprocal, with mothers relinquishing ever greater control to their infants. By 12 months, mothers' face to face exchanges with their infants are characterised by the more active participation of the infants. Simple positive facial interaction is no longer the main medium of exchange. Infants are seen as being capable of being happy outside the context of face to face play, in T, highlighting the growing independence and capabilities of the infant vis-à-vis the wider environment. These findings suggest that infant emotion cannot be studied outside social context.

Furthermore, that maternal interpretations provide essential information on how emotions in infancy emerge as complex socio-cognitive processes. However, aspects of the design of the study give cause for caution in interpreting these results as general mechanisms.

As was mentioned earlier, the small sample size and the nature of the sample are limiting factors. In this connection, the homogenous nature of the sample (NCT mothers), while being a strength in terms of limiting variability in interpretation due to differences in SES backgrounds, nevertheless limits generalisability to a wider, heterogenous population. Similarly, the small number of subjects used calls for caution in extrapolating the results of the present study to a wider population of similar mothers.

At the same time, because the of the cross-sectional nature of the design, developmental processes could not be studied more directly. This issue is dealt with in detail in Chapter 10. For the present, it is important to draw attention to the problem of extrapolating developmental processes from the cross-sectional results obtained here. While there is continuing controversy surrounding the empirical assessment of longitudinal processes, it is nevertheless recognised that further research needs to longitudinally assess how mothers' perceptions of their babies. In the next chapter issues dealing with the directions this research might take are examined.

A final potential limitation is the lack of analysis of gender issues in maternal selections and interpretations. In this connection, two points need to be made. Firstly, the findings on sex differences in the expression of emotions and their interpretation have generally been ambiguous and variable. This is partly due to the lack of studies which set out to study gender differences in expressivity as a topic worthy of study in its own right.

Most of the literature that was reviewed in Chapters 1, 2, and 3, treated gender as one of a set of independent variables, if it was included at all. Gender differences are rarely interpreted adequately, are mostly treated as peripheral to the investigation. Hence, in the present case, it was felt that to do justice to the issue, it should be investigated in its' own right, in future research extending the scope of the investigation. That is, as a separate investigation of gender issues in emotionality. By first identifying general characteristics of maternal interpretations, more specific hypotheses can be generated to investigate how gender may affect it. The present

study was primarily geared to understanding maternal perceptions of babies. A secondary step would then be to examine how other variables may affect this process, one such being the gender of the child.

This is related to the second point. In the present study equal numbers of male and female babies were chosen. It may have been advantageous to select one gender only, hence reducing any variation that may have arisen from sex differences. However, in doing so it would have been necessary to decide on a single gender, and to have specific reasons for doing so. This would have then shifted the focus of the study to an examination of how maternal perceptions are associated with the development of socio-emotional gender identities. As was mentioned above, this was felt to be more appropriate as secondary analysis, as the issue of sex differences is an important and complex issue in its own right. Nevertheless, as was mentioned earlier, some preliminary tests for sex differences were made, and did not show significant effects.

While limitations did exist, the study was important in that it combined the use of objective coding of facial expressions with caregivers' interpretations. This mixture of qualitative and quantitative techniques was innovative in the area of emotion development. It revealed important dynamics in the way mothers perceive and manage their babies emotionality. The use of both techniques was vital in unraveling how maternal perceptions adapt to the child's developing expressive capacities. They also revealed the way mothers' perceptions are tied to the different contexts in which they interact, and suggested how mothers may be selecting specific expressions and filtering out others in the process of interaction. In addition, maternal accounts revealed that mothers were highly skilled and sensitive observers of their children's skills and were in tune with developing capacities. With the above points in mind, in the next and final chapter, the implications of these results for our understanding of the social development of emotions are discussed.

CHAPTER 10

FACIAL EXPRESSIONS, THE CAREGIVER'S PERSPECTIVE, AND EMOTIONAL DEVELOPMENT

10.0 Diversity and Integration

Emotions regulate all aspects of our lives. They permeate other psychological processes and regulate relationships with people and events. In infancy, the debate surrounding emotional development has important repercussions for the way emotions are understood as motivational and social processes in later life. Researchers have come a long way from viewing emotions as epiphenomena. However, they have faced difficulties in integrating emotions with the wider development of the child. In this thesis I have proposed that emotions are socio-culturally mediated responses to events and people. In infancy, caretakers are responsible for instilling these socio-cultural attitudes by their propensity to act as a scaffolding mechanism. One critical aspect of this process is caretakers' projection of meaning onto infant facial expressions. Through treating facial expressions as indices of emotion states, caretakers incorporate infants' instinctive expressive responses into social discourse out of which emotions develop in conjunction with other capacities.

The present chapter assesses the extent to which the current findings support these developmental proposals. The empirical evidence in Chapters 7, 8 and 9 is brought to bear on the models of emotional and social development presented in Chapters 1, 2 and 3, and key findings are synthesised with the original basis of the thesis. The particular problems of the approach used are highlighted and the prospects for further research are discussed.

10.1 The Caregiver's Perspective in Emotional Development

Eliciting maternal interpretations of infant facial expressions has uncovered important indicators of how emotionality is perceived and contextualised in interaction. By objectively coding facial expressions and comparing these codes to maternal

interpretations, it was possible to assess how mothers integrated the perceived affective states of infants' with their expressive behaviour in the context of the infants' wider development. Such integration has largely been lacking in theories of emotional development. These theories have either tended to under-emphasise emotionality, or to have over-emphasised it, at the expense of understanding how it relates to the wider socio-cognitive development of infants. It was argued that emotions cannot be said to exist in infancy without the development of a socio-cognitive understanding of the social significance of events and that this understanding takes place through social interaction shaped by maternal interpretations of expressive behaviour. In the present study, mothers emphasised positive face to face exchanges in the youngest infants. In the 7-9 month old age groups they emphasised the infants' preoccupation with, and exploration of, the environment. Frequent attributions of happiness during toy play pointed to the propensity of 10-12 month old infants for joint activity. These findings highlighted how maternal accounts linked the perceived affective states of infants with different modes of infant activity. Eliciting maternal accounts has provided a new opportunity for understanding how infant capabilities from different domains become integrated in day to day settings. The developmental changes that occur in the interpretation of infant expressive behaviour have highlighted how infant expressions are incorporated into ever more complex processes by adults, suggesting how infant instinctive processes become transformed into higher mental processes.

It has been proposed that investigating how mothers transmit social rules of what to feel starts during infancy with their perception of the infants' affective state. In Chapter 1, research paradigms which do not recognise the nature of facial expressions as inter-individual processes were criticised. Acknowledging that facial expressions should be assessed in more naturalistic settings led to the proposal that parental mechanisms governing responsivity to infants may be based, not on the expressive function of facial expressions, but on the ability of parents to form impressions of their infants' affective signals. Research paradigms that sought evidence for the presence of emotions in infancy by assessing discrete affective signals under various environmental conditions were criticised for not including the inferential processes of caretakers. It was proposed that such research needed to be complemented by studies which considered the psychological significance of these

affective reactions for the interactors. For example, infant behaviour was perceived differently by observers and parents (Adamson et al., 1987).

It was proposed in Chapter 3 that the infant's development is guided by adults' provision of both structure and meaning. Meaning is not inherent in interaction, but something we impose upon behaviour; the infant's signals in interaction are only given the status of communicative signals to the extent that mothers impute that status to them. The divergence in perspective between observers and parents in the Adamson et al. (1987) study suggested that, if parents were finding infant behaviour more meaningful than observers, it was important to examine what they select as meaningful and the conditions under which they do so. What is selected by caregivers, and the influence of context on selectivity, would provide insight into the different conditions under which the infant's signals are highlighted as salient.

In the present study, the situational context of behaviour and who was interpreting it affected what infant acts were perceived as meaningful. Mothers perceived more meaningful acts in situations characterised by interpersonal exchanges such as face to face play and the prohibitive episode. They also perceived more meaningful acts than external observers. The fact that mothers' criteria for meaningful acts are more differentiated than observers' suggests that the former are particularly sensitive to certain aspects of infant behaviour which are ignored by external observers. Without examining these criteria an important factor in understanding the dynamics of expressive interaction and development is overlooked.

Chapter 1 highlighted how the interpretation of emotional expressions can be approached from different perspectives. It was suggested that there were important advantages in adopting the criteria of sense 2 (Kaye, 1982) but from the perspective of the primary caregiver. In Kaye's sense 2, expressions lead others to infer feeling states or emotions in the expresser. That is, facial expressions are *interpreted* as indices of emotion states. This sense is distinct from the other two senses. In sense 1, for example, expressions are regarded as accurate indices of emotions. Most research carried out on emotionality in infancy implicitly or explicitly assumes that facial expressions are synonymous with the presence of emotion states.

The finding that observers perceive fewer meaningful acts than mothers demonstrates that employing the criteria of sense 2 on its own, from a perspective that is external to the interaction, ignores important inferential dynamics. Caregivers'

propensity for perceiving meaning in infant expressive behaviour is far more differentiated than that of observers. Evidence from the present study suggests that maternal selectivity is based on the mother's perception of the interpersonal nature of infant expressive behaviour. Studies which assess infant expressivity from an external perspective, or those which ignore situational and behavioural context, lack the necessary ingredients to gain a full understanding of how different components affect emotional development. In order to understand the dynamics of expressive development, the salience, for caregivers, of facial expressions needs to be examined.

What mothers perceive as meaningful, and the circumstances under which they do so, should be considered in models of emotional development. Research has shown that adults structure interaction and endow situations with meaning for the infant. From the adult's point of view, there must be some representation of how to organise interaction and what sense to make of it. The results obtained here suggest that adults find behaviour meaningful when it occurs in interpersonal contexts, that is, when expressions are directed at them, rather than at other objects in the environment. This suggests, at least initially, that emotional expressions are contextualised through interpersonal exchanges. When expressive behaviour is directed at inanimate objects, such as in toy play, caretakers attach less meaning to it. Infant emotionality is meaningful primarily when it is directed at others. As a first step, the results suggest that the common pathway which links expressive behaviour to the wider environment is the caretaker. Through her, emotional responses become associated with events and gain meaning for the infant. For caregivers, the meaning of facial expressions is embedded in a wider social reality. In the next section differences found in facial expressions occurring in selected meaningful acts demonstrate how situational context influences the salience of expressions for mothers.

10.2 Contextual Influences and Developmental Changes: Facial Expressions and their Interpretation

There appeared to be a growing differentiation in the way infants responded to different situations within perceived meaningful acts. Facial expressions occurring in selected meaningful acts contained fewer positive expressions in FF, more negative

expressions in PR, and more positive expressions in T, as infant age increased. Baseline facial expressions appeared to be similar in content. It would appear that, as infant expressions became more differentiated, maternal interpretations underwent parallel changes, that is, mothers were sensitive to changes in expressive behaviours.

These results appear to contradict those in the Malatesta et al. (1982; 1986) studies which found that mothers acknowledged fewer expressions generally, and ignored negative expressions in particular with increasing age. Instead, mothers in this study appeared to be sensitive to the increasing differentiation in infant expressive behaviour and considered expressions to be meaningful/salient depending on their representation of the situation and the infants' abilities.

Infants' expressions did become more differentiated with increasing age, as was suggested by research evidence presented in Chapter 2. For example, studies on the expressive repertoire of infants indicated that negative expressions contained more differentiated anger signals to external stimulation as infants got older, especially after 7 months of age (Sternberg et al., 1983; Izard et al., 1981). One important difference between the method used in these experiments and in the present investigation was in the type of elicitor used. Intense levels of stimulation were employed to produce these reactions (repeated arm restraint and painful inoculations). In more naturalistic settings, such as in the present study, it was found that infant emotional expressions rarely occurred in 'pure', undifferentiated form, which in fact led to the collapse of facial expressions.

Furthermore, in such settings it was possible to see how infant negative states became dissociated from physical stimuli and were elicited by the behaviour of others, as for example in the prohibitive situation. By 10-12 months infants displayed a large number of negative expressions in selected acts (and in baseline segments) without any physical contact with their mothers. Thus, while negative expressions were produced in other situations, selected PR segments contained the most number of negative expressions. Mothers' interpretations indicated that they attached specific communicative significance to these negative expressions, perceiving them as being caused by their own behaviour and as being intentionally communicative.

Developmental changes in positive facial expressions and their interpretation were also found. Infants expressed more positive expressions in T, indicating a transfer of expressivity to object related contexts. Mothers of younger infants did not

generally perceive infants to be happy during toy play, while mothers of older infants perceived their infants as happiest when playing jointly with the toy. For example,

" There she's looking at me to say, 'Look what I've done, I've opened it [the lid on the toy].' She wants me to recognise that she's pushed it all the way back. She's pleased with herself because she's smiling and looking at me as if to say, 'Good girl!'. (Mother of baby girl, 10-12 month age group)

That affect becomes gradually transferred from the immediate nucleus of the mother infant system and linked to objects, is also supported by Trevarthen and Hubley (1978) and Sugerman-Bell (1979) in their studies on intermodal perception and interaction. Cognitive theories of emotional development would argue that smiling is a result of mastery. However, while this may be the case, these positive expressions are also signals to interactional others which result in an integration of mother and infant into a common perspective. They allow the mother to acknowledge the child's mastery while, at the same time, creating a communicative act. Thus, affect works at many different levels, and analysis at different levels explicates multiple functions and how they are interrelated.

In infancy, the link between facial expressions and emotion states rests on the evaluative capabilities of the adult. Naturalistic theories of emotional development portray the relationship between facial expressions and emotions in overly simplistic terms. Such an approach fails to integrate the inferential process into a wider social dynamic which shapes the course of development. Important cross-cultural differences in the recognition of facial expressions suggested that cultural factors play an important role in what expressive displays signify. Studies of infants found that precipitating conditions determined what emotion was inferred from infants' expressive displays. Context appeared to affect what meaning observers inferred from facial expressions. Even studies which removed contextual information revealed that facial expressions were interpreted as indicating to mothers a variety of emotion states (Huebner and Izard, 1988).

In the present study, two things were evident. Firstly, as I will elaborate upon presently, discrete negative facial expressions were not found, nor did mothers use clear emotion labels. Secondly, when situational context was taken into account, positive expressions were associated with happy states in FF, negative expressions with negative states in PR, and positive and interest expressions with happy and attentive states in T. Mothers acknowledged general categories of facial expressions as indices

of general emotion states only when it was contextually appropriate to do so. Although further research needs to document how these relationships are affected by infant age, the present findings demonstrate that the relationship between perception of emotion states and facial expressions rests on the interpreter's representation of the situation, and the appropriateness of behaviour occurring within it.

If these results are integrated with findings on maternal selections of facial expressions, it would appear that mothers select what is predominantly occurring in infant behaviour. They attribute emotion states in line with the predominant expressions. Hence, it is not surprising that associations between attributions of emotion states and corresponding facial expressions were found for different situations. But the results suggest that mothers are constraining the infants' expressive reactions by selecting what is prevalent and ignoring whatever else is being expressed. They are organising infant affective reactions by creating a particular representation of the infants' affective state and filtering out expressive 'noise'. This creates a stability for the infants, in that mothers are reducing the possible combinations of affect-event relationships for the infant and are consolidating certain others which have social significance for mothers. The ambiguity and variability of expressive behaviour is gradually reduced as mothers impose a particular schema or representation of the infants' state and organise interaction around the regulation and management of this state. Moreover, this representation will also contain social significance, whereby the perceived affective state is given further meaning by the overarching contextual reality. The following results also imply that this may be occurring.

As was mentioned above, discrete facial expressions of negative affect were not found and were not validated as differentiated social signals, as Huebner and Izard (1988) maintain. They found that, when given checklists of emotion labels, mothers interpreted emotion slides of negative facial expressions using a number of emotion labels, although they attributed the highest intensity emotion to the corresponding slide of emotional expression. It was pointed out in Chapter 1 that the method used by Huebner et al. used static, still-faced emotion slides and checklists of emotion labels, seriously affecting the ecological validity of the results.

In the present study, where infant expressions were in dynamic social contexts and maternal reports were unrestricted, maternal accounts of their infants' negative

expressions were often ambiguous. A particularly salient example is the following transcript during the prohibitive episode:

"There he's furrowed his brow. Frustrated or cross, or something like that...he's cross, frustrated, doesn't know. He's either bored or cross, looks more like he's frustrated. Difficult to tell." (Mother of a baby boy, 4-6 months age group)

Moreover, when mothers interpret infant states in more naturalistic settings, they infer subtle differences in emotion states based on behavioural cues that would have been concealed using Huebner and Izard's method. The following quotation during T demonstrates this:

"The flailing around with her arms, I think that would have meant that she was less happy, and although she's still looking at me, she's...I'm not doing exactly what she wants." (Mother of baby girl, 4-6 months age group)

Drawing on the above discussion, emotion expressions are not clear-cut, unambiguous affective signals. Nevertheless, mothers perceived subtle differences in infant behaviour and interpreted them as indicative of general affective states. Such subtle cues were likely to have been missed by external observers. Mothers were highly sensitive to these cues, despite the fact that they seemed unsure exactly what they meant, especially in the younger age groups. As is implied by the quote above, these meaningful acts were almost always linked to a course of action on the mother's part. This aspect of maternal accounts has important implications for the way emotionality becomes differentiated, as was pointed out above.

Viewed in the light of the rapid development of perceptual and inferential abilities, it is possible to see how later emotions become qualitatively different through the contextualisation of expressive reactions by mothers. For example, the ability of 5 to 6 month old babies to discriminate happiness, sadness and surprise, and that of 4 to 6 month olds to be particularly sensitive to joy expressions but not to neutral expressions (see Chapter 2) would make social referencing using still face or negative expressions ineffective. Mothers appeared to have a mental representation of infants' skills at each age of development, and organised their own actions around these skills. In the present study they used two different strategies when interacting with their infants in PR. Up until 9 months mothers distracted their infants from

playing with the toy by drawing their attention away from the toy or playing social games with them. For example:

"She had been mainly looking at the toy and looking excitedly at it, and then, as soon as I started to sing, she looked up and raised her eyebrows and was interested in what I was doing." (Mother of baby girl, 4-6 months age group)

Similarly:

"I was just trying to distract him with my hand cause you didn't want him playing with the box." (Mother of baby boy, 7-9 months age group)

After 9 months, mothers used more direct strategies:

"So I lifted my hand up to say 'No, no, don't, it's hot!' He immediately starts crying with his hands up in the air, cause he thinks I'm completely denying him something, or telling him off." (Mother of baby boy, 10-12 months age group)

The ability of infants to integrate information across time and space means that they are able to perceive links between events and stimuli in their environment. For example, 5 month olds possess some form of object permanence, and can perceive continuities in motion (Section 2.2). Such capacities are the tools with which infants increasingly come to appreciate that the mothers' signals vis-à-vis the infants' own behaviour are differentially organised around events occurring around infants; furthermore, that these routines are repetitive and have certain outcomes. Thus, when mothers vary their responses to infants on the basis of their representation of the situation and the infants' goals, important new associations are formed between the infants' own behaviour and its consequences. For infants, their developing expressive capacities assumed novel functions as mothers incorporated them into interaction as intentional gestures. The development of infant skills, being characterised by their increasing co-ordination, allowed mothers to attribute meaning to them, and meaning to the child's experience of them.

For example, in FF, MY segments contained similar levels of facial expression changes to baseline segments, suggesting that mothers were 'guessing' what infant behaviour was meaningful. Differences between selected and baseline expression changes in the rest of the sample indicated that it was not the level of activity per se

which influenced what mothers acknowledged, but the mothers' representation of the infants' skills and the context in which they were interacting. This was supported by the fact that the younger age group mothers needed to refer to general body movements to support their interpretations of meaningful episodes. Mothers of the youngest infants were selecting from the stream of expressions and justifying their inferences by referring to general movement patterns; perceived affect was linked to behavioural manifestations. As infants got older, mothers became more concerned with the underlying mental processes implied by these expressive behaviours and used fewer attributions of body movements; perceived affective states became linked to socio-cognitive processes.

Maternal representations of what the infant is doing, and what the infant is able to do, seem critical to the way they respond. A mother marks out an expression as if the infant's intention was present in the act of expressing it. The perception of intentionality seems to lie at the very root of the integration of the infant into the adult's world. In the following excerpts from maternal accounts, two things are evident: Firstly, intentions accompanying the perception of the emotion state are linked to a general course of action on the part of the mother and, secondly, that mothers explicate infant intentional behaviour in line with the overall situational context in which they are interacting. A quote from the mother of a baby boy from age group 1 during FF illustrates the first of these two points:

"...sort of enjoyment, carry on, sort of. It was in the middle of when I stopped bouncing him, and he wanted to carry on...I've stopped bouncing him, but he wants to carry on, so this is at the end of the laugh saying, 'Carry on, I'm enjoying myself.'"

The following quotes, from an age group 1 mother in T, demonstrates the second point:

"There he doesn't really like [the toy], and he's looking at me to say, 'Take it away'. He had a little cry and looked at the object then at me, as though expecting me to do something about it."

Bruner (1981) has described how the ascription of intention by others affects the way behaviour is responded to. Such behaviour is subject to correction of a kind not usually given to action perceived as caused. Thus, perceived intentions are

responded to (as implied by maternal self-reports) on the basis of the goals they imply vis-à-vis the interaction. Attributions of intentions in the present study differed significantly between situations. Situations in which mothers perceived the greatest number of meaningful acts were also those in which they made the most number of attributions of intentionality. Perhaps not surprisingly, mothers linked the significance of meaningful acts to intentionality in their infants and to their own activities, i.e., the mothers'. This further suggests that an important criterion for maternal selectivity is the interpersonal significance of infant behaviour.

Moreover, while attributions of intentions were not affected by infant age, other important changes occurred suggesting that intentionality was being perceived at a more abstract level. Socio-cognitive skills became salient for mothers by 10 months, whereas in earlier accounts mothers did not attribute intersubjectivity (i.e., social referencing and *intentional* communication). The results were in line with studies on infant social referencing which have shown that infants begin to use the emotional signals of others systematically by 10 to 12 months of age (Hornick and Gunnar, 1988; Nelson, 1985). For example, mothers described this process in the prohibitive episode as follows:

"There he's watching you bring something down and obviously wants to do something with it, but *he just glances at me to kind of make sure it's alright.*" (Mother of baby boy, 10-12 months)

Mothers felt that their infants were able to negotiate interaction and comprehend the mother's prohibition. For example:

"She was looking down, because she's got her finger on the black button, and she kept it there all the time, and she kept looking at me, almost defiantly, *because she knew I was saying no* but she just kept it there and she would look up at me when I would say no and she would just look down on her finger again. I think *she's trying to tell me* 'Well, you might be able to stop me touching those little lights, but I'm going to touch those little buttons.'" (Mother of baby girl, 10-12 months, PR)

As was pointed out in Chapter 3, there are two types of intention. One type is intentional acts of which animals are capable. These are signs whose occurrence causes others with whom we are interacting to infer an intention from them. The other type is intentional signals which are performed with the explicit purpose that

the other should infer an intention from them, that is, they are gestures. Most importantly, they are conventional gestures because they have a shared meaning with the particular social system in which they take place. Before 9 months, infants' intentions were inferred on the basis of behavioural signals. After 9 months, mothers began to use attributions of intersubjectivity. That is, they began to describe their infants as intending to affect them, i.e., the mothers. Maternal interpretations depicted episodes where their infants were using intentional signals or conventional gestures. Even though they continued to attribute intention to infants' behaviour, intentions became linked to intersubjective skills after 9 months. Infants are depicted by their mothers as sharing knowledge and expectations with others. For example:

"That's her having reached out and me saying no, her eyes are looking down, and her eyebrows are down, and her mouth is definitely down like I've never seen it before, cause she's being told not to do it...She's got her mouth stuck like that because she's sort of, *making the point to me* that she was upset and *just letting me know* that she....didn't like it, the way I've spoken to her, or that she couldn't play with the toy." (Mother of baby girl, 10-12 months)

Similarly,

"That's when he fully understands what you mean by no. He wants you to know he still wants to do it anyway. That noise, that kind of 'You're not being fair' noise, and the fact that he kept his finger on the thing. He understood what I was saying to him. If he hadn't understood, he would have carried on anyway, but making that noise is his kind of, 'I don't think you're being fair noise'. (Mother of baby boy, 10-12 months, PR)

It is significant to note that intentional communication occurred in one context predominantly, when mothers were using social referencing. Coming back to the discussion in Chapter 2, infant inferential, perceptual and expressive skills gain significance, i.e., are made use of and become instrumental in development, through processes which allow the parent and the child to share a common perspective on the world, that is, through intersubjectivity. Moreover, that mothers did not attribute intersubjectivity until 10 months also suggests that this is an emergent process built on a history of mother-infant interaction and not an innate infant capacity, as Trevarthen (1979) maintains.

Returning to theories of emotion development, important issues are brought to light. Campos et al.'s (1983) proposal concerning the development of emotions

stipulates that emotions are subject to psychophysiological programmes. Certain events are associated with particular emotional reactions. They propose that whether or not the events do elicit the emotional reaction depends on the goals of the organism at the time. However, the present study showed that, in early infancy, the goal significance of emotional reactions is the mothers' and not the infants'. Facial expressions are elicited within interpersonal contexts, and are salient to caretakers within interpersonal contexts. The infant's expressions never occur in isolation, they are contextualised in the reality that produces them, and this contextualisation takes place through parental interpretations. Mothers perceive intentions which imply a course of action on their part to respond to their infants. The notion of basic physiological programmes in early infancy is incomplete without including the mother's perspective while, in later development, it is too restrictive to accommodate the cultural constituting of emotions. Moreover, the development of cognitive skills, and mothers' perceptions of them, redirects the interaction as well as being influenced by it. As Campos et al. point out, this allows more environment-affective relationships to become possible. However, the evidence presented here suggests that this occurs through the interpretative and prescriptive nature of mothers' responsivity. The responsibility of affective, social and cognitive development does not fall on the infant alone.

Novel functions emerge via this dialectic process. For example, as facial expressions became more differentiated, they were interpreted by mothers as communicatively significant. When mothers acquired a representation of infants' ability to comprehend and share mutual understanding with them, they, the mothers, displayed the most frequent number of negative facial expressions. These expressions implied that mothers had a representation of what was expected of the infant, and constrained the situation in line with this representation using specific signals. Such developments in signalling functions between mothers and infants underlines the increasing integration of mother and infant into a coherent social system. Such integration does not rest on behavioural or cognitive skills per se, but requires the development of a mutual understanding between members of the dyad. The internalisation of display rules is not based on behavioural contingencies, but on what mothers perceive infant expressions to mean when expressed in wider behavioural contexts, and in the context of the situation in which these behaviours occur.

It was proposed in Chapter 3 that, for the mother and baby to constitute a social system, there must be a mutual exchange of specific signs that have developed through a history of experience with each other. Support for such a proposal came from differences in interpretation between mothers and observers. Although both mothers and observers perceived emotion states in infants, mothers differed from observers in interpretations of intersubjectivity, intentionality and maternal effect. The divergence in perspective concerning these attribution categories illustrates that mothers were inferring them on the basis of different types of criteria from observers. As was suggested in Chapter 9, it appeared that observers may have inferred these categories on the basis of behavioural contingencies, while mothers appeared to be relying on knowledge of the infant not accessible to direct observation. The longer history of mother infant interaction in the oldest age group suggests that mothers had developed a specific signalling system with their infants. These categories point to a divergence in perspective between mothers and observers in the perceived dynamic nature of facial expressions (intentions), in their communicative value (intersubjectivity), and in the mothers' responsivity to their infants (maternal effect).

These results only suggest increasing organisation in the mother-infant system. The demonstration of how the mother and infant constitute a social system requires more detailed investigation. However, they do point to how the cognitive components of development may become integrated with affective development by demonstrating the increasing understanding and negotiation of goals and meanings between mothers and their babies.

In this respect, the concepts of Sroufe (1979) and Campos et al. (1983) are not contradictory to the hypothesis developed here. Developments in the cognitive domain (Sroufe et al., 1979) do allow the infant to develop more organisation vis-à-vis the environment. However, this organisation is not arrived at by the infant on her own. Emotions become integrated and linked to cognitive processes and to dispositions towards certain forms of actions through the necessary interaction between the mother and the infant. Maternal interpretations highlighted the fact that increasingly complex and sophisticated infant capacities became salient in interaction. These capabilities and the increasing organisation of affective responses suggested that a qualitatively different emotion is formed by virtue of how the affective state of the infant is perceived, and, as was mentioned earlier, responded to, by mothers in PR.

The sharp differences in attributions and facial expressions between the earlier age groups and the 10-12 month old age group have pointed to a developmental shift in infant behaviour and the way it is perceived. The changes suggest rapid reorganisation. By 10 months, mothers gain more control over their infants in driving and directing the interaction. At the same time, they perceive their infants as able to assume a more autonomous and active role in interaction. Mothers in all age groups perceived their infants' expressions in the context of infant intentions, embedding them in activity bound contexts. Situational context influenced the degree to which infant acts were perceived as intentional. In this way mothers direct, constrain and contextualise the interaction in line with the infants' abilities, while providing a consistent thread of continuity by perceiving affective states throughout. Although mother-infant interaction is bidirectional, one can see by the variability in maternal facial responses in particular instances, and by the fact that mothers refer to their own behaviour, that they are active in shaping and organising infant activities. The projection of meanings which are age and context dependent provide the infant with both continuity and change in the course of development. The increasing complexity in the perception of the underlying processes of emotional expression ensure that emotionality is responded to in ways that increasingly come to reflect the values of the wider culture.

10.3 Limitations of Approach

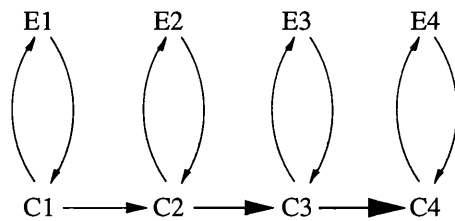
Throughout this thesis I have pointed out the methodological and conceptual problems in research on emotional development in infancy. In trying to overcome some of these problems the present study encountered others which were peculiar to the approach that was employed. In attempting to redress the poverty of meaning in research, the approach was faced with the problem of dealing with the ambiguity of meaning. This was especially problematic given the variable nature of infant facial expressions and maternal interpretation, and the difficulty in identifying developmental variables. The research presented here has shown what it is that develops, but has not provided direct evidence of how it develops. Thus, it was not possible to draw any direct causal links between the inferential process of caregivers and the development of emotions. This limitation was based on a number of conceptual and

methodological problems which could not be resolved within the framework of this thesis.

Conceptually, it is difficult to address the link between inferential processes and direct behavioural consequences because of the bidirectionality of mother-infant interaction. While bidirectionality (and multiple causality) has been demonstrated as a necessary condition when assessing how development proceeds, it nevertheless makes the modelling of specific developmental processes difficult. This problem is not new to developmental psychology or to the social approach adopted here. There is an inherent circularity in proposing that infants develop through the internalisation of the rules of social exchange. Does the development of capacities affect mothers' interpretations and behaviour, or do mothers' interpretations affect their behaviour and hence affect the development of infant capacities? To be consistent with the principle of multiple causality, both are likely to be true. However, the next question is the extent to which each component is responsible for the developmental outcome and the relationship between the two components. Such questions are extremely difficult to answer. Moreover, there has been a shift away from causal associations and a growing call for looking at the functions and relationships between various components in development.

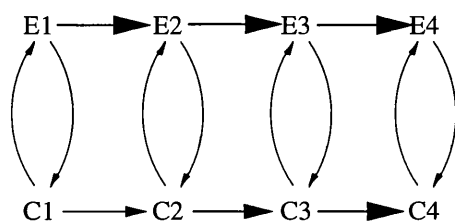
Recent conceptualisations of the developmental model, such as the transactional model of Sameroff and Chandler (1975), have attempted to explicate the dynamics between the various components in development. For example, interactional models have provided important insights by incorporating the effects of the child on the environment. They have added to the independent contributions of the child and environment characteristics of the environment that are conditioned by the nature of the child. Different characteristics of the child will trigger different responses from the environment. Sameroff (1991) demonstrates the continuity implied in the organisation of the infant's development in Figure 31 by the series of arrows from C1 to C2 to C3. Yet there is still a missing sense of continuity in the organisation of the environment from E1 to E2 to E3.

Figure 31: Reciprocal Interaction Model of Development



The transactional model extends the dialectic nature of development by emphasising the effect of the child on the environment, so that experiences provided by the environment are not independent of the child. In this way, the previous behaviour of the infant may have been a determinant of current experiences. In Figure 32 transactional processes between infant and environment are combined with continuities in each. The continuity of competency in the infant is represented at C1, C2 and C3. With increasing age, the competencies increase, represented by the thickening arrows. The other set of arrows leading from E1 to E2 to E3 represent the environment's state at successive points in time. Those environmental factors would be the parents' understanding of the rules of emotional exchange and their competency at regulating their infants' development in the present study.

Figure 32: Social Regulatory Model of Development



Just as in biological models there are two levels, the developing organism and a superordinate regulatory system, so too for behavioural outcomes there is also a system that regulates the way human beings fit into their society. Sameroff (1991) calls this the cultural code. It is directed at regulating cognitive and social-emotional processes so that the individual will fill some social role defined by the society, including the reproduction of that society. Although the cultural code can be conceptualised independently of the child, changes in the ability of the child are major

triggers for regulatory changes and may in fact have been major contributors to the evolution of the code.

In the approach adopted here, I have argued that research has not integrated the social aspects, or cultural code, with developmental outcomes, and I have documented how this has led to a neglect of a necessary component in development. Lock et al. (1989) have called on researchers to adopt a more social/transactional perspective in developmental psychology. They state:

"Depending on the perspective...the locus of responsibility for what happens can be attributed to something inherent in the individual [e.g., skills]...or something inherent in the [environment]. We can apply this to the conception of infancy inherent in the dominant paradigms. Developmental psychologists tend to act as objective observers who attribute what they see to something inherent *in* the infant, seeing the infant as responsible for what happens in the situation. Instead, we want to consider the other attribution, that the responsibility for much of what infants do should be attributed, not to them, but to the situational context and the participating adult." (Lock et al. 1989, p.244)

By examining the changing interpretations of mothers regarding their infants, the present study was able to reveal the changing characteristics of the infant's environment. Mothers were not just sensitive to the developmental changes in their infants' expressive capacities. They interpreted facial expressions within selected meaningful acts using increasingly interpersonal and interactive terms. At least as a first step, such changes revealed the transactional dynamics between the development of the infant and the changes in mothers' representations and responsivity towards their infants. In Figure 32 the process of interpretation is represented by the upward arrow from the infant (C1) to the mother (E1). This component has generally been overlooked in models of emotional development. Yet this aspect of development has important potential for understanding the way in which the dynamics between mother and infant evolve and the consequences of this for the further development of the infant at a social-emotional level.

Returning to the analysis in this study, causality cannot be ascribed to either the infant or the mother alone. Interaction and development are dialectical. What is cause at one stage or level is an effect at another. What is possible to isolate and inspect in this dynamic process is a snapshot of changes at any one time (Hinde, 1990). It is still clear from the analysis that mothers' perceptions of what infants expressed changed as infants got older. However, to then proceed to differentiate

which came first, the change in behaviour or the maternal interpretation, is to reduce development to linear causal sequences.

Attempting to integrate developmental outcomes with social processes requires the conceptual link between the psychological processes of others and the behaviour of the infant. This link must depend on the philosophical perspective or paradigmatic position one adopts. In Chapter 1, it was pointed out that, by and large, research on emotions is conducted within the Cartesian paradigm. This view ignores the individual's social environment and conflates the expression of emotion with the communication of emotion. Likewise, by regarding behaviour as essentially irreconcilable with thought processes, an artificial rift is created between the two.

In this thesis a link was made between the thought process of the adult and the behaviour of the child. The path between the inner world of instinct and reflex, and the outer world of symbols is the communicative act. The act committed by the infant does not start off as inherently communicative as some have suggested (e.g., Trevarthen, 1979), but acquires communicative status *for the child* gradually, by becoming a communicative act for the parent through interpersonal dialogue.

At the behavioural level, dialogue is shaped by, and shapes, maternal representations of the infant which influence her responsiveness to the baby. The link between mothers' perceptions and behaviour was suggested by the finding that, when they thought infants possessed intersubjective skills, they displayed frequent negative expressions. How mothers may actively influence development was hinted at by demonstrating how they used their facial expressions to prohibit infants from playing with the toy. The relationship is reciprocal; infant facial expressions in different situations became more differentiated with age.

Methodologically, certain limitations prevented the exploration of the developmental process in more dynamic terms. For example, one issue that was not addressed in the present study was the accompanying behavioural interaction of mother and infant. Future research will need to assess how maternal interpretations are associated with their behaviour and that of their infants. In Chapter 4, models of behavioural interaction were criticised for presenting either a linear framework or a structural one in which no justification was given for the imposition of predefined structural units onto behaviour. Nevertheless, it would still have been informative to compare predefined structural units with facial expressions and maternal interpretations in the present study. There were a number of reasons why this was not

carried out. Apart from time constraints on the research, the small sample size meant that it was not possible to include more permutations in the analysis (e.g., Age x interaction category x situation x maternal interpretations, or, age x interaction category x situation x expressions).³⁹ Nevertheless, the present study did include a preliminary analysis of behavioural context at one level by looking at interaction in three different situations. The three different conditions employed constrained the interaction and predefined the types of behavioural patterns that were likely to be emitted by the interactors. Objective coding of facial expressions provided a more detailed measure of the types of behaviours which occurred within these interactional contexts. The next step for further research is to analyse interactional or dyadic variables more directly. A related issue was the inability to take into account patterns of expressions within segments. Due to the variable length of segments, and to the fact that they did not comprise a continuous record in time, there was not enough data generated using this technique to allow for statistical analysis of patterns of facial expressions in selected segments.

Another limitation that arose from segmenting behaviour was that durations of facial expressions could not be included in the analysis. Segments truncated duration of expressions. Similarly, because segments were generally quite short (4 seconds), calculating total time of a particular segment yielded results similar to using frequency counts. This was because facial expressions in selected segments were reduced to very short durations as was just mentioned. For example, if 2 facial expressions occurred in one segment, each of one second duration, calculating the total number of seconds of duration of a particular expression was equivalent to counting the number of times it occurred. In most segments, facial expressions occurred with a mean duration of one second. Frequency counts and total durations were therefore very similar. In the next section some suggestions are made regarding how analysis of expression durations can be improved.

Co-occurrences between infant and maternal expressions were not analysed in the main study. As was shown in Chapter 5, co-occurrences of facial expressions in the pilot study were highly variable. As I pointed out there, using this measure in the main study would therefore only have been possible as a qualitat-

39. In some cases, however, this was implicitly carried out by creating event categories out of maternal interpretations, as for example in attributions of intersubjectivity and attributions of exploratory behaviour.

ive/descriptive analysis of mother-infant pairs. In effect, such an analysis was carried out, in the last section of Chapter 8, by looking at mother and infant facial expressions in segments where mothers attributed intersubjectivity and maternal behaviour. The striking results on attributions of intersubjectivity, which revealed that mothers of older infants made the largest number of such attributions in the prohibition condition, endorsed focusing on mother and infant expressions in associated segments and in segments where other attributions related to intersubjectivity were made.

One particular shortcoming was that it was not possible to compare the number of particular interpretations observers made with the number of attributions mothers used. It may have been the case that, although a similar number of mothers and observers perceived emotion states in infants, the actual number of such attributions differed in the two groups. This analysis was not possible due to limitations of sample size, making it necessary to use a binomial logit model to analyse the data. Similarly, it was not possible to examine the relationship between emotion attributions and corresponding facial expressions across age groups, again due to sample size limitations. The association between inferring emotion states and the quantity of corresponding facial expressions may have also been influenced by the age of the infants. It is possible to speculate, for example, that no association would have been found between positive expressions and attributions of positive emotion states in the face to face condition for age group 2. The frequent episodes of positive expressions, and relatively lower frequency of attribution of emotion states in FF, suggest that this may be the case. This would have suggested that mothers were ignoring positive displays of infants in that age group and interpreting other aspects of infant behaviour such as exploration of the environment.

Methodological limitations in eliciting maternal interpretations concerned the types of information that could be obtained. For example, although mothers used identifiers to explain what they used to infer emotion states, these were not numerous enough to be included in the analysis. Future research, using more direct prompts and a larger sample size, is needed to examine to what cues mothers attended when making an attribution of emotion state and what they perceived as causing the emotion state. For example, we need to know whether they use behavioural categories consistently to infer emotion states, whether the same behavioural cues are used to infer all emotion states, whether mothers perceive infant states to be caused by the same events, and how these causal factors and identifiers change as infants get

older. Similarly, maternal descriptions of their own behaviour would have benefited from being more detailed. This would have provided more differentiated information on the types of responses mothers saw themselves as making when they attributed particular meanings to infant acts. However, in this particular study, it was necessary to conceal the mothers' behaviour when obtaining their accounts, to provide the closest approximation to interpretative processes in interaction.

The research presented here has provided an important initial step in examining a very complex issue. This step will provide crucial guidelines for further research. It is evident from the above discussion that there is much to be done to further our understanding of the role of inferential processes in expressive interaction. To approach these issues more directly requires different types and levels of analysis and integration between them. This should facilitate a greater understanding of the relationship between different aspects of emotional development, and of the most promising directions for future research. In the following and final section, some proposals to that end are presented.

10.4 Directions for Future Research

In answering questions about one aspect of maternal perceptions of infant expressions, other questions have been generated. Future research should fulfil two purposes. On the one hand, it should broaden the findings already presented by extending them and discovering their range of applicability. On the other hand, it should focus on specific hypotheses that are generated from extending and broadening the findings. As specific relationships are uncovered, these relationships should be examined in broader scope by examining under what conditions these relationships are true, and those under which they are false. In other words, there needs to be a dialectic process of establishing the adequacy of these constructs over a range of contexts, and elaborating the conditions under which these constructs hold true and when they are false (McGuire, 1983).

With this in mind, the next section is divided into two parts outlining the main areas of future research on the caregivers' interpretation in development. Drawing on an excellent review of research on parents' beliefs and actions by Goodnow (1988), research proposals stemming from this particular study will be presented. The first

part of this section is concerned with outlining research to examine more precisely the relationship between maternal interpretations and infant expressivity, that is, outlining ways of further assessing the source of parental interpretations and perceptions, and the conditions in which they are likely to change or develop. The second part explores the relationship between maternal interpretations and their actions. This section deals specifically with developmental outcomes by suggesting ways of assessing the possible relationships between parental perceptions and their actions, possible links to the development of infant capacities, and how these issues may be empirically examined. The point is made that success in understanding caregivers' interpretations in development is dependent upon developing explicit hypotheses on how various aspects of this developmental component fit together.

10.4.1 Specifying Links between Maternal Interpretations and Infant Facial Expressions.

By identifying important dynamics in maternal interpretations, the present study has laid the groundwork for exploring this issue in greater detail. One important requirement for looking at maternal interpretations in future studies is to use a larger sample size. Another is to examine the relationship between interpretations and expressions longitudinally. Using a larger sample permits the examination of several specific questions which can extend our understanding of the relationship between maternal interpretations and infant expressions. For example, what types of co-occurrences of mother-infant facial expressions accompany maternal attributions? Is there a relationship between maternal attributions and durations of facial expressions? It may be, for example, that, when attributing negative infant states, mothers rely on very short segments of infant activities. Other emotion state attributions may require longer durations of specific facial expressions or certain types of activities. To examine these proposals, mothers could be asked to define the beginning and end of the meaningful acts they select. This would partially overcome the problem of truncated durations of facial expressions. It would also provide information on whether they are selecting a composite of acts or focusing on single acts. Behaviours occurring in these segments could be categorised using an independent coding framework. Comparisons could then be made between the mothers'

interpretations and the expressive and behavioural content of selected segments, to determine whether there are characteristic patterns of infant behaviour on which they focus when making an attribution of emotion state.

Maternal interpretations themselves should be examined in more detail. For example, what types of identifiers do mothers use when they deduce an emotion state in their infants? Maternal accounts in the present study found that mothers used information from the face, voice, body, and gaze. The data could not be used because of the low frequencies. Using a larger sample size and more prompts, the researcher could examine whether the use of these identifiers was related to the age of the infants and the situational context in which the infants were being observed.

Another area for extending the scope of the present study is to assess whether all parents interpret expressive behaviour in the same way, that is, to examine interpretations across different groups. In the present study, parents and nonparents were employed and mothers of younger infants were compared with mothers of older infants from within the same socio-economic group. Other comparisons need to be carried out with different socio-economic groups and across different cultural groups.

In particular, it would be useful to determine whether cross cultural consistencies in caregivers' perceptions are related to critical phases of infant development. Cross cultural studies cited in Chapter 3 found that mothers from different cultures interact differently with their infants during the teaching of a task, and that infants from different cultural groups approached these tasks differently. A large body of evidence exists on cross-cultural recognition of emotional expressions. Research now needs to examine what differences in interpretation and selection of infants exist between different cultures and how they may be related to interaction styles and infant capacities. Do differences between maternal interpretations highlight cultural codes for child rearing? Are differences in maternal interpretations between cultures reflected in their interaction styles with their infants? One possibility would be to ask whether mothers cross-culturally use the same distracting or prohibitive strategies with infants in the prohibitive episode. Do they interpret infants using the same types of categories? Do they focus on the same aspects of infant behaviours when making attributions? Do infants respond in the same way? What aspects of mothers interaction styles and interpretations may be associated with differences in the way infants respond in the prohibitive episode?

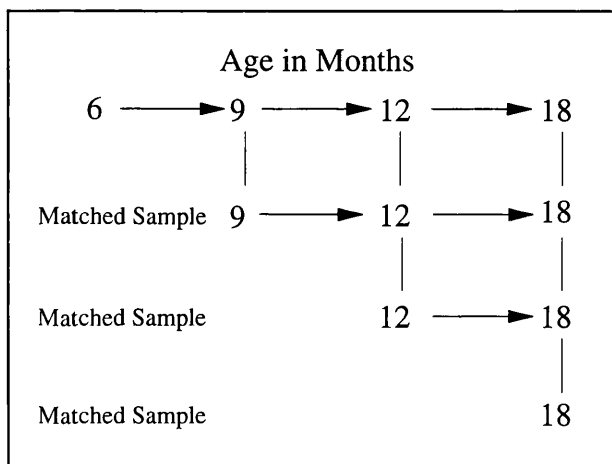
A longitudinal study is also needed to address developmental transitions in signalling function. The present results have suggested that maternal selectivity and interpretations may be based on the mothers' knowledge of their infants derived from a previous history of interaction. It may be that mothers build on recognisable and recurring infant activities in younger ages by reinterpreting them in the light of the greater differentiation of infant capacities for joint engagement and interaction at later ages. For example, the findings presented here demonstrate that emotion states were consistently salient to mothers, whereas mental skills became salient in the oldest age group. This suggests that there may be a transition whereby behavioural modalities become reorganised in later age groups. Are selections and interpretations of older infant acts related to the body movements mothers selected in their younger infants? Are there characteristics of these actions which change and may therefore account for the changes in maternal interpretations? For example, do these body movements become more sustained at later ages? Do they occur as parts of a composite of other acts? Could these changes contribute to mothers' ascription of intersubjectivity to infants in later age groups?

From the present study it appeared that the introduction of language into the communicative process had important effects on infants (for example, in cases where mothers explicitly prohibited infants by saying 'no'). Language development would allow for more specific communication of the significance of emotion states vis-à-vis events. Extending the analysis further, what changes in expressive and emotional development occur after 12 months? Do mothers still focus on infants' affective states after they begin to establish meaningful dialogue based on the child's ability to comprehend language? In what way does language facilitate the communication of affective significance? Such questions may be examined by looking at the age at which mothers start to use emotion labels when interacting with their infants. What words they use and the contexts in which they use them would provide data on how expressive reactions and linguistic categories become linked in naturalistic settings.

Practical considerations also need to be met in assessing maternal interpretations longitudinally. A longitudinal study would necessitate a more complex methodological approach for a number of reasons. Firstly, and as was pointed out in Chapter 6, there are important considerations regarding the effects of repeated interviewing on mothers. Recurrent filming and interviewing would sensitise mothers to the aims of the study and would be likely to affect interaction and accounts.

Alternatively, if interviewing occurred at the end of the longitudinal study problems would arise due to the biases of parental memory. Another consideration would be in the choice of filming situations. In the cross sectional study it was possible to introduce a novel toy and observe the effect this had on the dyad. In a longitudinal setting, the use of the prohibitive condition would be subject to biases resulting from repeated trials. For example, it would be difficult to assess whether the strategies mothers employed as infants got older were the result of practice effects or were due to the natural progression of the mother-infant dyad. One technique for overcoming the confounding effects of repeated trials in longitudinal research is the use of cross-sequential analysis (Baltes and Schaie, 1973). An example of this design is presented in Figure 33.

Figure 33: Cross-Sequential Analysis Design



Although it is not often used, due to its heavy demands on time, this design permits an analysis of developmental processes over successive trials or multiple interventions by partialling out the bias from repeated trials using matched subjects.

Questions pertaining to assessing caregivers in diverse groups, and especially in high-risk groups, also point to another important area of investigation: the relationship between maternal interpretations and maternal behaviour. In the following and final section, a number of research proposals are presented which suggest how this relationship may be examined.

10.4.2 Beyond the Here and Now: Interpretation and Activity

Firstly, and as Goodnow (1988) also points out, links to action should not be the justification for studying maternal interpretations. This form of justification is a residual attachment to the notion that only overt behaviours are worth studying. An alternative argument is that, just as the study of cognition in general does not stand or fall by the demonstration of links to overt actions, so also should the study of parental interpretations. These interpretations warrant attention in their own right. Moreover, enquiring about sequential links between ideas and actions must be approached with caution. Those seeking links often hold inappropriate models of the causes of actions. Ideas do not simply mediate actions. Such a view would be a reconditioned form of behaviourism where interpretations mediate links between real causes (stimuli) and concrete effects (responses). Instead, an alternative position would be to argue that interpretations are the stimulus in the first place. As was stated earlier in the thesis, it is the pre-established images and representations that both determine the choice and restrict the range of responses. Perceptions are not responses to the exterior stimulus as such, but to the category in which we classify such images and to the names we give them (Moscovici, 1984). Mothers' social representations determine both the character of the stimulus and the response it elicits. These representations are created out of a network of transactional processes between a variety of previous experiences and interactions, and future goals; that is to say, they are dynamic and changing.

A number of researchers have proposed that ideas lead to actions. This position is found in "cognitive-mediational" views (e.g., Hess, 1981; Parke, 1978), and in the "theory of action" presented by a number of social psychologists (e.g., Von Cranach and Valach, 1984). Without adopting an extreme position, it may be that the best way forward, rather than trying to sort out the consistency and directionality between actions and beliefs or perceptions, is to examine the circumstances in which caregivers' interpretations or perceptions mediate their behaviour towards their infants, the circumstances under which they do not, and how these relationships may change with development (Dix and Grusec, 1985).

For example, in Chapter 3 it was proposed that the process by which caregivers impose task constraints upon what they regard as meaningful behaviour is an important factor in the development of communicative abilities. This, in turn,

rests on the mothers' socially appropriate interpretation of, and reaction to, the perceived emotion state of the infant within the particular context in which it occurs. One of the key aspects that emerged from the study was that mothers' perceptions of intentionality were related to the situation in which infants were interacting and to a course of action on their own part. This finding points to the importance of incorporating maternal behaviour, subsequent to their interpretation of the infant, in future studies. How does maternal perception of infant intentionality affect their behaviour vis-à-vis their infants? Comparing maternal accounts, where they report that infant states were caused rather than intended, with their subsequent behaviour under the two conditions would clarify the relationship between maternal perceptions and their responses. Such comparisons can also shed important insights into how interactional variables may rest with certain perceptions on the part of caretakers.

Explicating the link between parental interpretations and their interaction with their infants may also be approached by examining high risk groups and depressed mothers. For example, how would depressed mothers select and interpret their infants' behaviour compared to normal mothers? What aspects of infant activities do depressed mothers ignore compared to normal mothers? What changes occur in the interpretations and interactions of depressed mothers when they are not depressed? Are there any associations between changes in interpretations and changes in maternal responsivity when they are and are not depressed? Such research would have important clinical implications.

Implicit in the above questions is the underlying query of how maternal interpretation, mothers' actions, and developmental outcomes in infancy are linked. This is still a grey area in research. However, the studies proposed above can shed some light on this by identifying links between the emotional responses of older infants and parental interpretation of, and interaction with, their infants at earlier times. Beyond this, there are measures which can enhance the way research in this area is conducted. Firstly, researchers should bear in mind that patterns between interpretations, interaction and developmental outcomes are likely to be transactional. This directs research enterprise to exploring how each of these units contributes to any other, and what each contributes independently of the others. For example, assessing maternal responsivity in the belief that it will reveal how it affects the development of infant capacities is misleading if infants do not possess some information processing ability with which they can interpret this responsivity.

Secondly, and as I have done in this study, research should give more room for parents to bring out issues and make connections. Part of the problem of research on emotional development is the researcher's insistence on choosing dimensions. McGuire (1986), for example, believes that the most promising directions for the future lie, not only in looking to connections among components, but in adopting "a low profile to participants - allowing them to select issues, make connections in their own terms, and choose their own response dimensions" (McGuire, 1986, p. 121). This also necessitates considering particular methods of analysis which can retain the critical information contained in these interpretations, while permitting responses to be standardized (McGuire, *ibid*) (for example, by using grounded theory techniques (Strauss, 1987) as in the present study). In addition, investigators should look towards using techniques that can serve to detect interconnections between caregivers' interpretations, possible sources of these ideas, and developmental outcomes. (Goodnow (1988) cites examples of these techniques, such as structural equation modelling and path analysis.) Finally, as was stated at the start of this section, researchers need to build explicit hypotheses about how connections come about. This will allow for accounting for connections and not only documenting them (Goodnow, 1988).

This study was an essential prerequisite to understanding the signalling function of facial expressions in naturalistic settings. Theories of emotion have worked within a closed-system model of development and, by doing so, have regarded emotional development as the property of the infant. In this thesis, I have demonstrated that they have ignored important components which may shape the course of emotional development. A review of the literature on emotionality demonstrated that research methods have been too restrictive in their approach. Using Kaye's (1982) sense 2 criterion from the perspective of an external observer alone only presents half the picture. By relying only on objective criteria and not looking at the significance of these behaviours and events from the perspective of caretakers, it is not possible to understand all the forces that shape emotional development. Even though the research was not able to answer specific hypotheses regarding the precise relationship between emotional development and maternal interpretations, it showed that nonparents interpreted infant expressive behaviour in different ways. They perceived infants to possess interpersonal skills at different ages and attached meaning to infant behaviour to different degrees. Moreover, by examining the

relationship between maternal selections and interpretations of their infants' expressive behaviour, the present research has shown that mothers' perception of their infants' expressive behaviour is related to contextual factors, to developmental changes, and to the growth of intersubjective understanding.

The method that was developed in the present study has proved to be a powerful tool in exploring caregivers' perceptions of their infants. It was able to elicit information on what parents select, how much of it they select, and how they interpret it. Most importantly, it enabled this information to be obtained in a dynamic and relatively naturalistic fashion. By employing this technique, the study presented an ecologically sound method and approach to emotional development.

Theoretically, it has integrated the study of emotional development with the study of social development. Social constructionist accounts of emotion imply that social mechanisms are important without providing a coherent account of these mechanisms. The literature on the social development of skills and on the role of caregivers provides evidence of important inter-personal mechanisms which can account for how caregivers play an important role in the social development of emotions. Approaching emotions from a social and interpersonal perspective was also called for by the lack of studies which attempted to place emotions in social and dynamic contexts. This study showed that caretakers create new and more complex meanings for expressive behaviours as infants get older and that these meanings were not readily accessible to observers. Moreover, by demonstrating how caregivers' perceptions were subject to contextual and developmental influences, this research was essential to the study of the social development of emotion in infancy. It is hoped that this first step will encourage further work and integration in this area.

Appendix 1

Intercoder Reliability of Facial Expression Codes

The MAX manual comes with its own set of instructions for learning the codes, training and achieving reliability.¹ Coders had to achieve 80% reliability² or higher in order to finish the training. This was achieved by coding pre-coded segments of practice material and comparing the results with the manual's master codes. Reliability was obtained when the trainee was able to code three consecutive sets of video segments with 80% reliability or above (Table A1.1).³

The time taken to learn the coding scheme ranged from 7 hours to 10 hours. Further reliability was tested for using segments from the pilot study tapes where the first three tapes coded by a particular coder were coded again by the author, i.e., double coded and the reliability checked again (table A1.2).

Filming Problems

Coding was also affected by filming technique, the following precautions were taken to avoid similar problems in the main study:

Filming: Parts of the mothers' faces were sometimes obscured by their hair. This is a recurrent problem with brow and cheek data and therefore a hair band was bought and mothers with fringes were asked to put it on whilst the filming is taking place.

1. MAX codes the faces by assigning codes to the three regions of the face, the brows, the eyes and cheeks, and the mouth, independently of movements occurring in the other regions. This is to guard against coders making subjective judgements.

2. The calculation of reliability for the scores was defined in the MAX manual as

$$\text{reliability} = \frac{\text{agreements}}{\text{agreements} + \text{disagreements}}$$

Agreements are scored both with regards the correctness of the codes and the onset and offset of their occurrence within a 0.5 sec margin of error. Reliability is achieved only when there is intercoder reliability of over 80% for three consecutive sets of video segments.

3. MAX requires coders to code the three regions of the face independently of each other. These codes are then combined using formulae provided in the manual.

Lighting: there was not enough lighting in some of the films making it difficult to see the movements of the face, therefore lighting equipment was used in the main study. Care was also taken to ensure that the camera was not facing a window creating a silhouette.

Table A1.1: Intercoder Agreement for MAX Training

Coder 1
average reliability = 92%
range = 90%-94%
time to learn codes= 7 hours.

Coder 2
average reliability = 88.8%
range = 81%-100%
time taken to learn codes = 10 hours.

Coder 3
Average reliability = 83%
range = 81%-88%
time taken to learn codes = 9 hours

OVERALL AVERAGE RELIABILITY = 87.9%
RANGE = 81%-100%

Table A1.2: Intercoder Agreement of Pilot Tapes

CODER	PLT. NO.	RELIABILITY
1.	PS4BF	96%
	PS10MF	87%
	PS10BF	93%
2.	PS2MF	85%
	PS4MF	94%
	PS6BF	91%
AVERAGE		91%

Focus: The camera must be sufficiently zoomed onto the faces to enable detailed coding of the facial movements; some of the Pilot video films were difficult to code because of this.

Further ambiguities in the coding were resolved thus:

1. Any baseline movement such as talking, blinking or chewing will be coded O, as is suggested by Izard (1983).

2. Obscure (OBS) will only be coded if it exceeds one second or there is a change of expression when the face is visible again.

3. Codes 36 (gaze downwards, askance) and 39 (gaze cast downward, head tilted back) have been removed as there was no practice of their use at all either in the manual and no demonstration of their presence during the coding of the video films.⁴

Sample of Pilot Study Accounts

The following are a sample of maternal accounts during play. One example from each age group is presented. The figures on the left hand side of each segment is the time in minutes and seconds.

Plt1: Mother of 4-6 Month Old baby Boy in Play

2.18: He's distracted here 'cause he's seen you. He's easily distracted anyway.

2.30: Same again.

2.49: I suppose now he makes noises. That was just his attempt at talking I think. Now he squeals when he pouts...Oh no, he's probably looking for something to put in his mouth. When he knows he's going to the breast, that's the movement he makes.

5.02: See, it could also be a pose of concentration. I stick my tongue out when I concentrate. He likes watches, really fascinated with them.

7.24: He likes the noises and facial expressions more than he likes the toys. I think that's it. If you laugh he laughs back.

4. MAX identifies interest, joy, surprise, sadness, anger, disgust, contempt, fear, distress and the various combinations or blends of two or more of these expressions. Contempt was expressions were not present in the training tapes.

Plt2: Mother of 7-9 Month Old Baby Boy in Play

0.34: Plays with the toy which he plays with in his bath.

1.04: If you talk to him he'll go 'eh?' If anyone talks to him he'll just go 'eh'.

3.48: Makes noises of a dog.

6.24: He's getting excited cause he likes that music.

Tape Plt4: Mother of 10-12 month Old Baby Girl in Play

0.28: She wants to eat him. She wants to bite him. She's particularly fond of those little men.

1.04: The funny face is when she's teething she does that. We always made a joke of it so she does it more.

3.34: Throwing toys means that she's had enough really, but also, she'll pick up a toy and look at it then throw it just to watch it fall. She'll throw things so she can watch them fall.

4.19: She's going to start crying to get out [of the baby chair] in a minute.

5.01: I want to get out Mum.

6.05: It means, 'I've had enough and you'd better make it good'.

Appendix 2

Maternal Account Codes

A. Simple Descriptions

BM: Describing behaviour as body movements or only describing facial movements.

B. Interpretations of Emotional States

H: Happy, pleased, enjoyment.

AT: Concentrating or interested.

NG: Negative emotion states: Frustrated/cross,
tired, distressed, unhappy.

S: Surprise.

E: Excited.

B: Bored.

Identifiers

D1: Identified through vocalization.

D2: Identified through gaze/eye movements.

D3: Identified through body movements/ posture.

D4: Identified through facial expressions.

C. Mental activities

INS: **M7** (understanding), **M8** (social referencing), **M5** (responding),
M9 (deliberate communication).

PL: (**M3**) Checking, exploring, (**M4**) searching for something specific.

D. Interpretations of Intention and Maternal Self Reports

N1: Infant Intention.

T1: Maternal behaviour.

T2: Maternal effect.

Coding Method

Maternal accounts were coded to reflect the predominant themes in each segment. In some cases, two or more codes were used to code one segment. The coding frame reflects different levels of complexity. Categories at the bottom of the chart are broader and reflect more complex activities than categories at the top. Accounts were coded when they referred to current, ongoing activities viewed on video. Statements made about infants referring to general characteristics were not coded. This was to allow for verbal codes to be mapped onto expression codes. These statements were not numerous however. Intercoder agreement was assessed by double coding segments from each of the three age groups in each of the three conditions. Intercoder agreement between myself and another coder was an average of 83%. This was a particularly good score as the second coder was not given any training in the use of the codes, save to be asked to code only segments which referred to current interaction. One point worth pointing out however, is that in some cases maternal accounts were quite vague unless one had access to the infant tape, as when they comment on 'the movement of the head' when referring to their infants shaking their heads, for example. This was easily resolved by describing the movement to the second coder.

Examples of the way codes were used are presented below:

Examples from Attributions of Happiness:

From Age Group 1:

"She's pleased there."

"She was enjoying it."

"She's very happy and contented and she's not disrupted by anything."

From Age Group 2:

"So she's saying 'yes this is fun and I'm joining in this game'."

"This is her enjoying herself, she's having a good time."

From Age Group 3:

"He's been perfectly happy playing with it."

Attributions of Negative State:

Age group 1:

"...in frustration."

"She wasn't enjoying it as much."

"She was getting distressed."

"...was a bit like she wasn't happy, it wasn't that the box wasn't interesting her, I think in a way maybe it was too much for her."

"You see she's building up from here to getting really quite unhappy,"

"...is getting cross with it now."

"At that point she was completely fed up with it."

From Age Group 2:

"She was getting a bit upset."

"She was getting a bit cross."

From Age Group 3:

"Exasperated and 'its not fair' type of thing ."

Attributions of Intention:

From Age Group 1:

"Something there and she wants it."

"Just didn't want any more to do with it."

"Wanted me to carry on."

"In that section he actually wants to reach out and get my hand, he's making his own decision to touch my hand, reach out and take it"

From Age Group 2:

"She's just seeing what I'm doing with it before she tries it herself."

"She was trying to pull the box nearer her"

"I think that he wants to touch it, he seems to want a closer examination of it really."

From Age Group 3:

"I'm doing exactly what she wants there."

"She wanted a hug then, she wanted to be picked up from the chair, or me to come closer or something."

"He just wants to start again, pull my ear and pull my hair out ."

"He doesn't want my hands on it he just wants to be able to pick the box up and examine it because his hands go straight round the box "

Attributions of Intersubjectivity:

Age Group 3:

"She's very much looking at me to see how I was reacting to what was there cause she's not sure."

"There she wasn't quite sure what I was doing cause she was looking... but she was looking round for the dog but then when I said no she smiled sort of as if to say 'well what did you say it for then or what are we doing?'

"She's got her mouth stuck like that because she's sort of making a point to me that she was upset and just letting me know that she , well not upset, but that she didnt like it, the way I've spoken to her or that she couldn't do it."

"She just communicated to me about the lights, ooh look they're flashing, I've never seen anything like it before."

"There he's watched you bring something down and obviously wants to do something with it but he just glances at me to kind of make sure its alright,"

"That's when he fully understands what you mean by no"

Examples from Maternal Self-Report Codes

From Age Group 1:

"I put my finger in her mouth..."

"when I said Rosy..."

"She did look up but only momentarily , I attracted her attention,"

"I started singing the song and then spoke, and when I spoke she went back to looking at the toy instead of looking at me."

"I tried to make him interested by making those noises and pressing the buttons and talking to him a bit more."

From Age Group 2:

"She stopped when she heard my voice."

"I helped her."

"She was following my finger, looking at what I was showing her."

"She was ceasing to pay any attention to me because I called her name and she'd responded and nothing had happened, and I'd flapped my fingers and she'd responded and nothing had happened so she was ceasing to pay any attention to me calling her name or flapping my fingers."

"Um, I think I'm entertaining him by movement and by sound, I'm clearly more exciting than all the other things that have distracted him."

From Age Group 3

"Because I'm carrying on going peebo."

"She did that because she liked what I was doing."

"I tickled her there."

"She's reacting to the tickle and probably saying 'get off' or just 'haha, you're tickling me'."

"That's her having reached out and me saying no."

"Her eyes are looking down and her eyebrows are down and her mouth is definitely down like I've never seen it before cause she's being told not to do it."

"Here I was banging on the table which would normally bring his attention straight round."

"Then I said no, cause I said 'look at me' and 'no you can't do that'."

"I did a certain thing that I knew would catch his attention, which is to say, where is Bertie the dog."

Example of Complete Maternal Accounts

In the following, two examples are given. The first account is an example from age group 1, the second is an example from age group 3. These two accounts provide a good contrast of maternal accounts of the youngest and oldest infants. The figures at the start of each segment are the point in time that mothers placed a bleep on the video tape. The time code represents minutes, seconds, and tenth of seconds.

Maternal Account of Baby Boy, 4-6 months.

Face to face play

0.3.6: Laughing, at my voice and movement. Just the expressions on my face and the clapping of the hands. He's feeling excited and happy. I could tell cause his hands were up in the air, wide grin, just his face.

0.13.1: Just the same, the tickling, just when he's touched and the expression on my face. He's responding in the same excited, coy, giggly type of way.

0.21.9: Inquisitive, watching observing what I'm doing with my hands. Just interested. I could tell he was interested because of the way he was actually concentrating on what I was doing. So his mind goes from being happy and grinning and watching my face to watching my finger.

q: how could you tell he was concentrating on your fingers?

Because the grin has gone, he's just staring but it looks more intelligent than ..its not bewildered and its not excited.

0.29.0: That went from being seemingly intelligent and watching my fingers to concentrating on what they were doing and then once they touched him, taking that as play and giggling, well his response to being poked in the chest is to giggle.

q: How could you tell he had made a switch.

Because his face had been looking serious and focusing entirely on my fingers and then as my fingers moved the expression and my body language, touching his body in the way he sees as play made him giggle and play and look back at my face.

0.31.0: Again, just, by grabbing his hands and sort of wiggling his body he considers that funny looking back at my face, I was probably making some idiot facial expression. He was responding by laughing and seemingly to me he opens out, he expresses himself in really quite an open way.

Q: Is he responding to you or are you responding to him?

He's responding to me.

0.47.1: I had obviously been playing with him physically, touching his face and chest and hands, and I'd be back, so he's almost taking on the play on his side and playing back to me. The tapping on the table is the drawing back of my attention. From tapping him round the face and tickling his sides he's tapping the table and looking back at me to get my attention back again cause my hands have come off the table.

0.51.1: When he had tapped the table and I had gone back to him tapping back on the table, just him finding that amusing and tapping backwards and forth, copying, Copying me or me copying him and then him copying back again.

Q: How did you know he was copying?

Just the way he's concentrating on my hand there and then he'll tap back with his own hand and he's not being distracted by anything else around the room as well.

0.57.5: He's laughing out loud because its always rounding off that section of play with the tapping on the table and the hands and its the peak of his excitement with a giggle. Because he's not really a giggly, giggly baby so when he does laugh it really is the peak of his excitement.

1.7.2: I'm obviously there, moving my hands around the table and its actually taken his fancy, (my hand) he's now not giggling, not smiling but reaching out for my hand. In that section he actually wants to reach out and get my hand, he's making his own decision to touch my hand, reach out and take it, not looking at my face and not making any particular expressions on his own. He's obviously thinking about what my hand is doing and not wanting to touch it, whether he's wanting to feel it I don't know, I don't know what he's thinking about it, there is something about my hand that is interesting him.

1.15.8: The same as before. He actually seems to be concentrating on my hand, he's not looking back at my face.

1.26.5: Its made him laugh now, he's beginning to grin at it...Its become more rather than being something to investigate, its almost like a realization that its actually attached to me and its just Mummy playing a game. The facial expression is more of concentration.

1.47.3: The way he's responding to whatever I've said. By lifting his hands up in the air and that huge aping grin. It just seems that he's content, happy, just responding in a nice way to me.

2.06.4: Again, its from that huge aping happy grin, to more serious face, like the way his mouth has dropped and he's just looking straight at my hands, whatever its doing, crawling across the table and just wants seemingly to be wandering what its doing.

2.19.0: I just held out my hand and he's obviously with the way I'm waving my hand around he's responded to that by a big smile and reaching out to touch my hand.

2.33.7: He's giggling again now which seems to me to be the peak of his excitement. He's excited about the way I'm becoming more frantic with my hands, my voice, the way I am physically touching him, the way I'm grabbing his hands, its just something he finds exciting.

3.10.4: Now I sort of brushed his face and just I suppose the way he touches me with his hands and screws his eyes up, the grins and the aping response.

3.25.0: Boredom setting in, the way the eyes have gone from going up to going down.
q: Why?

No idea.

3.44.2: That winging is a sure sign of wanting to be either outside the chair or to be somewhere completely different, so just be putting my hands up underneath the high chair is a bit of a chair from using my hands around the high chair. He's giggling again and his eyes, whereas when he winges they go down they've gone up again, and the sort of the down mouth is a big grin.

4.2.0: Again he's starting to get more difficult to distract him, from my side, so entertaining him just by my hands he starts rocking like that, grunting and winging. Rocking sometimes goes hand in hand with the winging and that means he wants to do something different, he doesn't want to be where he is, he doesn't want to play the game he's playing, he doesn't want those toys etc.

Prohibitive Condition

0.03.1: He sees the green light on the box and so I'm trying to distract him but he still wants the green light, he's just looking inquisitive.

0.16.3: I was just trying to distract him with my hand cause you didn't want him playing with the box.

0.30.4: He was watching my hand, followed it all the way round the side of the high chair, and then when it stayed on the other side he carried on looking. He was concentrating. I don't know what he wants from what he's looking at but he's obviously finding it interesting. He's being quite inquisitive.

0.37.1: He obviously wanted to look at the box a few moments before I bleeped then and the way he could be distracted just by the movement of the hands, they were moving in circles, you could see his head moving around and he obviously found them quite interesting. When they were at a distance he found them quite interesting. He was quite happy just to look at them but then he found them amusing as they came towards him, he could tell that they were going to touch him, the ultimate excitement was when I pinched his nose at the end which was when the biggest grin came and the giggle.

1.9.0: Again, the way he watched my hand again, and he's just waiting, its the anticipation look on his face, he's just waiting for that hand to come close to him, you can tell, his eyes are flickering.

1.26.3: Again, the way he looks in anticipation for the hand to do something, same as before.

1.27.9: Same as the above, probably why I pressed it above.

1.30.5: Its just the way he's holding his face in the same position, he's not moving again, he's just waiting for that nose to be squeezed again. It's a game to him, he enjoys probably the physical interaction, whether its the noise, cause I'm making a

noise at the same time as I'm pinching his nose. He's still cause he's waiting for the hand to come back again.

2.0.0: It seems to me that his concentration began to wander by the way he was. he started to waver again (before his head?). He held his body still, very still, watching the hand and then his head began to turn, look around and maybe look at me a bit more until I wiggled his nose again and then there was the big grin and it was like it was excitement again.

q: Why was his concentration beginning to waver?

I'd been doing it a long time, it wasn't interesting any more, it wasn't new.

2.19.3: He's responding, he knew that I touched his face the first time he's actually managing to respond the second time by putting up his hand, although he thinks its fun, he knows the hand is going to be there, he knows that he can actually touch it, grab it and help to push it away. He still finds it fun because he's still grinning, in the same way. He soon lets you know by winging when he does not want something.

Toy Play Condition

0.49.7: There, just by the way he moved his head around, looking around the room he's not concentrating on me even though I've been making noises to attract his attention and moving my hands and touching the box. He'd been in the chair a while, he's obviously beginning to get tired of it, the box had been there a while, it wasn't new any more and he'd been distracted from it before but now he was being told to play with it, it took a while to actually drive into him the excitement that it was going to be interesting to play with and eventually by the way he's reached out again focusing to where my hand is and its just focusing his attention on the box. q: did anything start him doing that?

The way I'd become more frantic about the box and the more exciting way I seem to be generating some kind of excitement in my voice, and my body language, and my hand, waving it around a bit more.

0.59.0: Again, he turned away to look over the side of the high chair and then pretending it was interesting to my, the box, pretending it was mine, drew him back to it. Pretending I wanted to look at it, pretending the black button and the green button were interesting to me draws him back to it.

1.22.4: Again, he doesn't particularly want to look at it, he's not grinning any more, there aren't any explicit facial expressions any more except for one of blankness, so I slammed the box down and made a loud noise which seemed a bit different to him, it pulls him round and there is a vague smile there but nothing...there's nothing that is holding his attention there he turns because of the noise and I was probably pulling some face to make it seem that it was supposed to be exciting and he responded to that by the vague grin but it wasn't a true, "I'm finding this really exciting mum" kind of smile.

1.40.9: There again, I'm having to pretend its interesting to me, and the way he's frowning, its rather an expression, the way I see this is an expression of pleading, he

doesn't want to do this any more. More of a ' I'll really do this if you really want me to but..'. Its almost like he's forcing himself to find it interesting now. He's not naturally finding it as something he really wants to do, or really wants to play with, he'll do it because I am being a bit persistent and going on and on about it and really trying to pretend its the most exciting toy he's got.

1.59.3: Again, he really doesn't want to do this now. He's starting to rock now which is his half way sign from 'I am half happy to do this but I'm not quite sure what I want to do next, but I don't think its this.'

2.15.6: The way he's moving his body there, just about to reach out that is a genuine interest in what he's about to look at or what he's looking at now, what I'm pointing out. Its a more positive determined reach rather than the way he looked before, the way he just lollops across the table.

2.34.5: Same as before really.

2.37.0: Its getting more and more difficult to hold his attention on the box because of the rocking, the way he's looking around the room, he seems to me to be looking for something more interesting to play with and he cant , there is nothing there except for the box and me. The rocking seems to be a bit of a protest.

2.48.5: He's focusing on the box again now. I could tell because he's looking at where his hand is and it seems he's interested.

2.56.7: He's stopped rocking, he's playing with the box again and looking at it, which is another positive way of showing he's interested in something rather than the negative which is the negative.

3.05.1: Same as before.

3.16.1: He'd been bored for a while, but now tasting it is something new again, and he's got his arms right round the box, drawing his body into it and really trying to get his chops round it.

Maternal Account of Baby Girl, 10-12 months.

Face to Face Play

0.05.3: She was looking at my whole face expecting me do something

Probe (q): what do you think she is expecting you to do?

Well I don't know, to do something exciting I suppose. Cause I said "Pee bo", I said "Pee bo" there so I expect she is expecting an expression.

0.06.9: I think that's because you were walking by. She wonders what you were doing there or why you are just walking by and not paying any attention to her. The way she raises her eyebrows and looks expectant that sort of thing. She has that certain look.

0.12.5: She is just looking at the camera and not looking at me or what I'm doing. She's bored (because) her face is just a rest expression and its obvious that I am going peebo but she has just looked right by me while I'm doing and looked at the camera which was more interesting.

0.14.3: There she has looked back at me because I'm carrying on going peebo. She's going "Oh mum's keeping on at this what is it after all" cause her eyes are a bit wider there and her eyebrows are a bit lifted up. She's just interested

0.18.6: She did that because she liked what I was doing. I knew because she smiled with her mouth and her eyes and her eyebrows and her whole face and showed her teeth.

q: What was it you were doing that she was so pleased about?
I was playing peebo.

0.21.0: I was playing peebo before the smiling before, now its finished she's wondering what's coming next cause she's got a bit fidgety and her mouth is down a bit and her eyes are looking down.

0.34.2: She is now interested on concentrating on what I'm doing with her feet, with her toes. I know because she's got her mouth open and she's looking at what I'm doing and she's not looking around at anything else that there is that is going on.

0.47.0: I thought she was getting a bit fed up with it again there because she is fidgeting and she's looking up at me and she wasn't smiling or anything, she was looking so.. she wants me to either hurry up or do something different I think.

0.49.0: That's when I finished the piggy thing and she liked that because she is smiling again.

0.58.1: That's her concentrating again or just watching what is happening. I could tell she was concentrating because the fingers were going under the table and she actually follows the noise under the table and looks to expect them on the other side of the table so she's not sort of all over the place. Her eyes are steady and her mouth is open.

1.04.3: She just looked up at me as if to say, this game is alright you can carry on with it. I could tell because her whole body was still, her head was following my fingers and then she just looked up at me just with her eyes and her mouth didnt change or anything. So it meant that I could just carry on with the game.

1.10.5: She raised her eyebrows and looked at me which meant that this is quite interesting or good fun.

q: how would you respond when she does that?
just do the same thing or do it more boisterously or something to make it more involved.

1.14.7: She laughed and...I don't know what I did to make her laugh there I can't remember and I took it that she was enjoying what we were doing.

1.19.9: That was that she was "oh look there is that thing there again" (the camera) and I don't know whether I bleeped because of that or because of my playing fingers again and she 's looking down at those.

q: how is she feeling?

happy, because she is not looking anywhere else apart from what I'm doing.

1.29.2: Well, there just because she doesn't watch what I'm doing it doesn't mean she's not happy. There she's laughing, I cant remember what I was doing, she's looking at the camera.

1.35.8: I tickled her there. She's reacting to the tickle and probably saying 'get off' or just 'haha, you're tickling me'. I could tell by her whole physical wriggle and her laugh and the fact that she doesn't look at me but looks past me.

q: what does she mean when she looks past you?

She means 'you can stop that if you want'.

1.47.5: I'm not doing any thing particularly interesting there and so she's having a look round to see where you are again to see if you've got anything interesting to do or to see what you are doing.

1.58.0: I'm playing peebo again and I think she's enjoying it because she's looking at me and she crinkled her nose as she does when she's having fun and her mouth is open again.

2.0.5: She hit the table as well as laughing which she does sometimes. She means she's having a good time

2.09.4: She's really bored with peebo now and so she's pointing to the camera. I could tell she was bored because she's not looking at me and not anticipating that I'm going to do which she would do if she was following it. She had anticipated before. I know because she was watching me and she was still and her body was still and she wasn't making any noise. These indicate that she's following me and anticipating me going 'bo!'.

2.19.6: She raised her eyebrows a little and she's got that glib look on her face and her lips smack together, as if to say "oh God, what is this woman doing!" She probably wants me to do something more exciting or get a toy out or ...

2.22.6: I bleeped that cause I put my hand in front of her eyes and so affected her vision, took my hand away and so she smiled a lot. She smiled because it was an unexpected thing for me to do and maybe to make me do it again.

2.24.4: But then she looked away and so she didnt want me to do it any more and she physically jerked a bit. She wasn't feeling unhappy or bothered by it she just said 'no I don't want to that any more'. She wants to just look at the things in the garden. By turning her head completely from me and looking out window.

2.30.9: She sighed and so that was she was getting a bit tired of it, of either playing or just sitting in the chair and she was looking around, at the camera, which sort of meant to me "how much longer do I have to sit here and how much longer is this going to go on?"

2.38.1: Well she's looking out at the grass again so she wants to ..
q: what do you think caused her to do that movement just before you bleeped ?
she just wants to look out of the window, she's getting fed up with what I'm doing or what we are doing together. She's getting bored and she wanted me to do something else, in the chair she's not free to control what she does. I can tell just from knowing her. I mean she's not grumpy or grisly and she's not physically trying to get out of the chair and she's not crying, in fact she's being quite nice.

2.49.8: She's looking around for the cat.
q: how could you tell she was looking around for the cat?
Because I was saying cat and she was looking at the door where the cat usually comes in.

2.53.8: She recognises the word dog.
q: How can you tell?
Because usually every time I say doggy or dog she goes woof woof. But I now there because she was looking around and she instantly looked at me and raised her eyebrows and her face looked interested in what I was saying.

3.01.1: There she wasn't quite sure what I was doing cause she was looking (along?) but she was looking round for the dog but then when I said no she smiled sort of as if to say 'well what did you say it for then or what are we doing?'

3.19.6: I don't know what I'm doing there or what she's doing there but there was a smiling in her eye, she looks quite happy with the situation, she was feeling quite alright then.

3.40.3: I was just saying peebo which is a familiar word to her because I say it a lot when I play with her and so she reacted to the word peebo by looking at me and smiling because its familiar. What it looks like that because she's smiling and looking at me that she wanted to play it.

3.50.0: Well she did want to play it, and so we played it and she liked playing it because she opened her mouth even more and crinkled her nose.
q: How did you know she wanted you to play it?
because she kept looking at me, after I said the word peebo she kept looking at me so she was anticipating me to play it maybe.

3.58.5: I'm doing exactly what she wants there. I know because she's giving me a really broad smile and she's reaching out her arms and she's laughing. She wanted a hug then, she wanted to be picked up from the chair, or me to come closer or something.

Prohibitive Condition

0.15.1: She just looked at me and raised her eyebrows and gone 'hm!' which means 'this looks interesting, I wonder what this is'.

0.17.9: And now she's getting a bit more sure of it because she's smiling and she's looking at it more and she hasn't needed to look at me.

q: What happens when she looks at you?

I would either say its good or bad.

0.20.7: That's just her way of showing her excitement about the flashing lights, she does that by going 'hee' and crinkling her nose and her mouth like that.

0.27.1: That was just, she was watching the lights...cause I presume she was watching the lights that were flashing cause her eyes were moving from light to light to light and then I think she's going to reach out for one. She is feeling intrigued, interested because she's watching and she's reaching out.

0.32.8: That's her having reached out and me saying no her eyes are looking down and her eyebrows are down and her mouth is definitely down like I've never seen it before cause she's being told not to do it. So she's feeling a bit upset that she can't do what she wants. She's upset that I've spoken to her in that way maybe.

0.35.8: She's got her mouth stuck like that because she's sort of making a point to me that she was upset and just letting me know that she , well not upset, but that she didnt like it, the way I've spoken to her or that she couldn't do it.

0.39.1: She seems to have forgotten that (or she might have) and she left that and is now quite interested in the light again.

q: Is there anything that she did that indicated her transition?

She seemed to sort of, just in the way she was sitting and she pointed out her finger again.

0.52.0: She's made a 'uh' sound again and she's pointing and she looked up at me.

q: What did she mean by doing this? If you were in front of her what would your reaction be?

It would either be, yes look at the lights and encourage her to touch them or in this case I'd just nod my head and say yes, lights. So she's saying that she can notice, that she's watching the lights, that she can see them .

1.01.6: There her eyebrows moved and that was that she was just intrigued by the lights and that she wanted to touch them but why couldn't she touch them?

1.05.4: She just communicated to me about the lights "ooh look they're flashing, I've never seen anything like it before."

q: How can you tell?

Just cause she looks , well she looks a bit unsure with her eyes and her mouth, she doesn't look sure of the situation.

1.11.1: There again when I said no she's looking at me with her bottom lip swallowed practically and I don't know what it means.

1.22.2: Well that was cause she's saying ' I know she's saying no but I'm going to do it anyway' her lip moved around, it wasn't that she gritted her teeth but it was that sort of determined 'well I think I'll do it anyway.'

1.28.7: She was looking down, because she's got her finger on the black button and she kept it there all the time and she kept looking up at me almost defiantly because she knew I was saying no but she just kept it there and she would look up at me when I would say no and she would just look down on her finger again I think. She's trying to tell me 'well you might be able to stop me touching those little lights but I'm going to touch those little buttons'

1.49.2: There she's looking at the lights again.

2.12.0: That's where I said no again and she's trying to touch the lights and pursed her mouth a little bit and looked down it means that she's not very happy with the situation. She wants me to stop saying no and let her touch the lights.

Toy Play Condition

0.11.3: She'd seen the box and she's smiling because something interesting is going to happen.

0.20.5: She's going ehem ehem and all that, her hands have come to the box because now she can touch it. That sound means its a positive sound, goody.

0.23.2: She's laughed there because she's seen me doing all the three buttons so she thinks its her turn next and she wanted me to touch them.

q: If she is seeking permission, how would you give her permission?

I would look at her or look at the thing and say 'yes you can ' or smile at her or do them and say 'you do it now'.

0.30.9: I think she's interested there in the lights again cause her eyebrows are raised and her face changed from the smiling to the normal concentrating. I think its the lights because its her eyes looking at them.

1.13.4: She raised her eyebrows and that meant that she was having a good time with what she was doing. Although she was looking at ..she looked away cause I think you were behind the camera but she was happy investigating the toy.

1.28.3: She's surprised by the machine because of the way her mouth is and her eyes are, excited eyebrows.

1.44.7: There she's happy, she's pleased with that little trap door thing because she is looking at it and she's got her teeth over her bottom lip and she's smiling, and the way she crinkles her nose.

2.08.6: That's because she went UUUUh ! which is different from the other sounds and that's 'oh, look what that is, this is something here, look what she found, she found the hinge' ..She was drawing my attention to it. She was pointing to it as well and her eyes pointed to it.

2.13.1: She crinkles her nose and smiles with her eyes and mouth which I took as that was interesting, she was responding to me opening the, responding to the door opening.

2.26.4: There she is pleased that she is opening and shutting herself rather than me because she is smiling and watching the hinge shut and watching the door shut and watching her hand doing it.

2.28.3: She's pleased that she's opened it all the way because she followed it with her eyes and was smiling and she made a noise as she pushed it all the way back.

2.34.1: I was pushing it and she wanted to play with something else. She was playing with the yellow lights and I was still playing with the trap door and she was going Rriih! which meant 'no don't! oh alright I'll shut it and open it again but I want to play with all these lights here'

2.46.4: There she's looking at me to say look what I've done, I've opened it. She wants me to recognize that she's pushed it all the way back. She's pleased with herself because she's smiling and looking at me as if to say 'good girl'

2.51.4: 'Cause I said 'Elena shut it' I presume. I bleeped there cause she laughed and made that noise which was a laugh she does when she does something that she thinks is clever (like clapping with her own hands, that sort of thing) so she'd done something that she thought was good by shutting it after I said to her 'Elena shut it'.

3.01.9: There she doesn't want to shut it now, though I said the same thing again and she's looking at the lights.

3.08.5: She raised her eyebrows cause I was playing with them she was watching what I was doing and was interested, not bored at all.

3.12.4: She came back to the door and was pleased with herself again having shut it.

3.21.3: She gave another squeal, she really likes shutting that door, it was different to other times, its a matter of degrees. The first time she did it was the best, 'aah!', and then just the time before that it was ' Ah I thought of it myself rather than Mummy told me to do it' and this time it was 'oh, I'll do it again'.

3.35.7: 'Cause she's making those noises and looking at the lights and the buttons, she's just finding them very interesting and wants to keep playing with them.

Intercoder Reliability of MAX

As in the pilot study, criterion intercoder reliability (85% agreement) on the MAX training tapes was reached before coding the main study tapes. This measure was taken to ensure guard against 'drift' in judgements of movement codes. Intercoder reliability between myself and a second coder was assessed during coding of the main tapes. For these tapes, intercoder reliability ranged from 80% to 89%.

Use of Log-Linear Modelling

A log linear model weighted by time of total sessions was used for the data analysis. For example, if you have a number of 6 scores taken within different time lengths:

Score	Time
13	11
2	12
45	15
6	3
17	6
4	8
sum: 87	55

If all scores are the same $87/6$ is the expected value, weighting by time is:

expected value = $87/55$ x e.g., 11 for first time-score.

observed = 13

Expected value = Number of responses x prob_{row} x prob_{col}

which can be represented as $y = t p_i p_j$

Observed value = time $p_i p_j + \epsilon$.

= $\log(t) + \log p_i + \log p_j$ (additive model)

If you observe 87 in time 55 seconds you would expect to get:

$11 \times 87/55$ (in 11 secs).

The model assumes that the longer the observation time, the more scores are expected. Conversely, the shorter the time span in which the subject is engaged in a particular activity, the lower the score.

Results Analysis of Maternal Facial Expressions

Analysis of maternal expressions revealed similar differences to those found for infant facial expressions. The one discrepancy between the two sets of data was

for interest expressions. Mothers differed significantly in the number of interest episodes they expressed in each age group and situation whereas there were no significant differences between frequencies of interest expressions for infants. The results of the analysis are presented in Table A2.1.

Table A2.1: Chi-Square Statistics Results of Log-linear Model for Main and Interaction effects of Maternal Facial Expressions

Expressions	Age Effect	Situation Effect	Age x Situation Interaction
Positive	2.50	10.76***	18.71***
Negative	3.04	1.86	18.04***
Interest	3.66	2.53	18.71***
Neutral	3.06	7.90**	17.22***

Significance levels: * = 0.05, ** = 0.01, and *** = 0.001

Degrees of freedom for Main Effects = 2

Degrees of freedom for Age x Situation interaction = 4

1. Age: No significant differences between age groups were found for any of the mothers' facial expressions. Comparing the different expressions in each age groups (Table A2.2), mothers display predominantly positive expressions in all three age groups. In age groups 1 and 2, interest expressions are the second most frequent expressions, while in age group 3, neutral expressions are frequently expressed after positive expressions.

Table A2.2: Mean Rates per Minute of Maternal Expressions for Age Groups

Age Groups	Mean Rate of Maternal Facial Expressions			
	positive	interest	neutral	negative
4-6 months	3.55 (1.47-6.73)*	1.32 (0.22-4.40)	1.18 (0.00-2.78)	0.33 (0.00-2.59)
7-9 months	2.90 (0.99-6.56)	1.90 (0.27-3.73)	1.33 (0.00-3.00)	0.16 (0.00-0.62)
10-12 months	3.70 (0.35-6.59)	1.32 (0.00-3.50)	1.61 (0.00-3.18)	0.85 (0.00-4.00)

* Figures in brackets represent the range of rates of expressions.

2. Situations: Maternal expressions differed between situations for positive and neutral expressions. Table A2.3 shows that maternal positive expressions decreased from FF to T and neutral expressions increased, being predominantly expressed in T. The decline in maternal expressivity (neutral expressions are coded when there is no observable movement of facial muscles) may be associated with the infants' attention being increasingly focused on the toy, and directed away from face to face exchanges. Comparing expressions within situations, maternal segments contained predominantly positive expressions. There were however, variations in the other facial expressions. For example, mothers expressed more interest than neutral expressions in T, but more neutral than interest in PR. This would suggest that mothers were using negative and neutral expressions to prohibit the infant, and using neutral and interest expressions when playing with their infants in T.

Table A2.3: Mean Rate per minute of Maternal Expressions Across Situations

Situations	Mean Rate of Maternal Facial Expressions			
	Positive	Interest	Neutral	Negative
Face to face	4.03 (0.35-6.74)	1.80 (0.70-3.73)	1.10 (0.00-2.76)	0.22 (0.00-0.62)
Prohibitive	3.40 (0.99-7.99)	1.70 (0.00-3.50)	1.15 (0.00-3.18)	0.59 (0.00-3.99)
Toy play	2.72 (1.05-6.60)	1.45 (0.00-2.77)	1.88 (0.00-2.75)	0.17 (0.00-2.69)

Overall, if mothers' expressions are compared with infant expressions, mothers smile more frequently than their infants in all three situations. On the whole however, their positive expressions also decrease over consecutive situations in parallel to infant expressions. They are still-faced most often in T compared to the other 2 situations while infants, on the other hand, are still faced most often in PR.

3. Age x Situation:

All 4 maternal expressions differed significantly between age group and situation. That is, mothers displayed different frequencies of facial expressions in each age group and for each condition. Table A2.4 shows that in age groups 1 and 2 mothers positive expressions were most frequent during FF but gradually declined

in subsequent situations. In age group 3 however, mothers displayed the most frequent episodes of positive expressions in PR, and less so, in T. Negative expressions were generally very rare. However, MY displayed some negative expressions in T, as did MM in FF. In age group 3, mothers negative expressions were most frequent in selected PR segments compared to the younger age groups. Neutral expressions were expressed by mothers in selected segments most often in T and least often in FF for all age groups. Mothers also expressed interest predominantly in FF selected segments for age groups 1 and 2. The oldest mothers differed from the rest of the sample. They expressed interest predominantly in PR and least frequently in T (see Table A2.4).

Table A2.4: Mean Rate per Minute of Maternal Expressions for Situations and Age Groups

Age Groups	Situations	Mean Rate of Maternal Expressions			
		Positive	Negative	Neutral	Interest
4-6 Months	Face to face	4.63 (2.24-6.73)	0.07 (0.00-0.28)	0.43 (0.00-0.74)	1.19 (0.74-2.35)
	Prohibitive	3.00 (1.84-4.50)	0.08 (0.00-0.31)	0.79 (0.00-2.86)	1.76 (1.22-2.47)
	Toy play	3.02 (1.47-5.69)	0.37 (0.00-2.59)	2.32 (1.47-3.10)	2.21 (0.22-4.40)
7-9 months	Face to face	4.64 (3.23-6.56)	0.36 (0.00-0.62)	0.98 (0.24-1.93)	2.36 (0.94-3.73)
	Prohibitive	2.50 (0.99-3.33)	0.12 (0.00-0.46)	1.14 (0.00-3.00)	1.61 (0.27-2.33)
	Toy play	1.56 (1.46-2.21)	0.00	1.88 (0.26-2.49)	1.73 (1.05-2.77)
10-12 months	Face to face	2.82 (0.35-4.14)	0.25 (0.00-0.50)	1.90 (1.05-2.76)	1.70 (0.70-2.30)
	Prohibitive	4.70 (1.38-7.99)	1.58 (0.00-3.99)	1.51 (0.00-3.18)	1.79 (0.00-3.50)
	Toy play	3.58 (1.08-6.59)	0.14 (0.00-2.69)	1.43 (0.00-2.23)	0.48 (0.00-1.08)

In all age groups and conditions, mothers expressed the greatest number of positive expressions compared to the other 3 facial expressions. However, some trends are suggested. For example, mothers expressed fewer expressions in FF as infant age increased, mirroring infant expressions. MO expressed the highest rate of positive expressions in PR. This was contrary to the pattern of their infants' facial expressions, where they displayed the fewest episodes of positive expressions compared to other age groups and situations. Infants also displayed the greatest number of negative expressions in that age group. This suggests that mothers may have been attempting to soothe their infants. The high frequency of negative

expressions expressed by MO in PR also suggests that they were using their facial expressions to prohibit their infants from playing with the toy. Both mothers and infants displayed higher rates of positive expressions in T than in FF. This result again supports the proposal that the toy situation has become more interpersonal for mothers and their infants. In the younger age groups, MM showed more neutral than still-faced expressions in T, while MM displayed more neutral than any other expression in T. It may be that infants preoccupation with the toy at that age resulted in mothers preferring to observe them than trying to engage them in any interactive exchanges. Mothers in the youngest age group, on the other hand, may have been trying to encourage their infants to play with the toy by expressing interest in it.

In sum, the results indicate that mothers appear to respond differentially to infant facial expressions depending on the age of the infants and the interactive situation. In most cases, mothers and infants expressions follow similar patterns. However, there are exceptions to this. Mothers appear to respond with particularly high rates of positive expressions when infants express distress, as in age group 3 in PR. Facial expressions of mothers towards their 7-9 month old infants also appear to reflect infants' exploration of the external environment. Mothers' positive expressions in T indicate that they can maintain positive exchanges with their infants during toy play.

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