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EXPERIMENTAL ELICITATION OF GAZE AVERSION IN THE CONTEXT OF NEONATE-CAREGIVER INTERACTION

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Abstract

Research with older infants indicates that maternal stimulating behaviors may have the effect of either increasing or decreasing infant visual attentiveness, dependent primarily upon the type of maternal behavior examined. Those maternal behaviors which serve to decrease attentiveness have been termed overstimulating and seem to produce a state of overload for the infant. This effect assumes particular importance since visual communication between mothers and infants may serve as an important context for the elaboration of other types of communicative behaviors. In addition, gaze avoidance in infants and young children has been related to a variety of pathological anomalies. There have been no studies, however, which have examined the impact of levels of maternal stimulation on the visual behaviors of neonates in the context of nonfeeding social interaction.

Mothers in the present study were asked to increase either their visual behaviors, vocal behaviors, or both, in an attempt to ascertain whether alterations in these aspects of their behavior would have an impact on neonatal visual behaviors. Of particular

interest was whether it is possible to elicit neonatal gaze avoidance through maternal overstimulation. In addition, this design allowed examination of the specific types of maternal behavior changes which might produce an effect.

Infant behaviors during the newborn period were observed in response to the manipulation of maternal behaviors. Data analyses revealed that this sample of newborns was responsive to increases in maternal behaviors, particularly maternal vocal behaviors. Infants looked more when mothers increased their vocal stimulation of the newborns, but only if the infants' baseline levels of looking at mother were low. When baseline levels of looking at mother were high and mothers increased their vocal stimulation, and maintained the increase for an extended period of time, infants looked less at mothers; that is, the newborns gaze avoided more. In addition, maternal tactile stimulation and infant tactile behaviors were differentiated in accordance with the factor of infant gender.

EXPERIMENTAL ELICITATION OF GAZE AVERSION IN THE CONTEXT OF NEONATE-CAREGIVER INTERACTION

CHAPTER I

INTRODUCTION

The important role that eye-to-eye contact plays in early infant-caregiver interaction has been a topic of much discussion (e.g., Brazelton, Koslowski, & Main, 1974; Stern, 1971, 1974a, 1974b). The functions that such contact may play in promoting various aspects of this early relationship have been of particular interest to theoreticians and researchers alike. Robson (1967), for example, discussed the role of eye-to-eye contact as an attachment behavior which is functionally similar to crying, clinging, smiling, and sucking (Bowlby, 1958). Further, Rheingold in 1961, speculated that visual contact was the basis of human sociability.

Researchers of this topic have described in detail the various patterns of gaze behaviors in the context of infant-caregiver interaction (Brazelton et al., 1974; Klaus & Kennell, 1976). A cyclical pattern of attention/withdrawal has been noted to characterize the infant-caregiver play situation. Mother and infant appear to work toward a common goal which Stern (1974a) described as ". . . the mutual maintenance of attention and arousal within some optimal range in which the infant is likely to manifest affectively positive social behaviors. . ." (p. 404). It is suggested that the infant, through control of visual attention, and the mother, through modulating stimulation, each contribute to the regulation of the interaction (Stern, 1974a).

Similarly, researchers have examined what happens when one or the other of the partners' roles is somehow altered. Most of this research has been manipulative; for example, mothers are asked to change some aspect of their interactive behavior and the infant's responses are noted (e.g., Brazelton, Tronick, Adamson, Als, & Wise, 1975; Field, 1977). The most commonly employed procedure of this type is the "still-face" paradigm (Brazelton et al., 1975) in which the infant is confronted with an unresponsive mother.

In addition, studies have examined naturalistic occurrences of different types of gaze patterns. Stern (1971), in a classic example, described a case where the visual interaction between a mother and infant was characterized by a notable lack of reciprocal attentiveness. Patterns such as this illustrate the manner in which individual differences in early infant attentiveness and maternal stimulation, particularly in certain combinations, may have important implications for the future (Kubicek, 1980; Stern, 1971; Thoman, 1975).

Despite the documented importance of visual communication between mothers and infants, few studies have examined the earliest occurrences of this phenomenon. One exception is the work of Self and her colleagues (1981) which assessed neonate-caregiver interaction over the first three days of the infant's life. These researchers found evidence for stability of maternal and neonate behavior patterns during the newborn period.

There are few examples, however, of research which observed the impact of alterations in either mother's or the infant's behaviors on the visual behaviors of the partner during the early period (Arco, 1977). Exceptional in this regard is the work of Arco (1977; Arco, Self, & Gutrecht, 1979). In her 1977 study, Arco examined the effects of response-dependent and response-independent maternal visual and vocal stimulation upon neonatal visual behaviors. Although response dependent manipulations resulted in higher amounts of infant visual interaction with mothers than did response independent manipulations, the overriding effect was an overall decrease in infant social visual behaviors during the manipulation for both groups of infants. Arco et al. (1979) however, found evidence for increased visual regard of mothers when mothers increased their visual regard of the newborns. Both of these studies occurred in the context of feeding; thus, there are no studies which have examined these effects in the context of social interaction. The present study sought to examine this issue in a semi-structured setting. The basic intent was to assess what happens to infant behaviors when mothers are asked to alter some aspect of their role in the interaction. The impact on infant behaviors, particularly visual behaviors, was noted when mothers altered the amount of visual and/or vocal stimulation provided to their neonates. This paradigm is based on the work of Field (1977) with older infants and will be explored in detail in a later section of this paper. In addition, the current study examined the effects of infant sex while holding maternal parity constant.

Prior to examination of the results and discussion of the findings of this study, a literature review will be presented. The purpose of this review is to examine theoretical perspectives and empirical work on the role of eye-to-eye contact in early social development. Although each perspective differs with regard to its view concerning the role of visual contact, all agree that visual contact is important, especially in the context of mother-infant interaction. Following a discussion of each major theoretical perspective, relevant research on visual contact as it relates to long-term development will be discussed. This discussion will include both the positive aspects, i.e., when visual contact is "normal", as well as the negative aspects, i.e., when visual contact is less than optimal. In addition, research concerned with naturalistic visual interaction, and with alterations in maternal behaviors (e.g., the "still-face" paradigm) and how these alterations impact on infant behaviors will be reviewed.

Infant Social Development

There are three historical approaches to social development which have been most influential. Recently theorists have emphasized various aspects of these historical perspectives in order to provide a more comprehensive model of social development. Probably the oldest general perspective on social development is the learning perspective. Within this broad category are included several particular theories; of special interest in studying social development is social learning theory as explicated by Miller and Dollard (1941). This approach focuses on the experiential determinants of development with relatively little concern for genetic contributions.

A second historical approach is that of ethology, which also subsumes several theories. The ethological theory which has had greatest impact in the area of social development has undoubtedly been attachment theory (Ainsworth et al., 1974; Bowlby, 1958). This theory has had a major influence on theory and research during the period of infancy.

More recently, there has been growing recognition that social development is intimately tied to cognitive development and as such, cognitive theories have become increasingly important in attempts to understand social processes. Since much current thought about cognitive development during infancy derives from Piagetian theory, this cognitive theory has had a major impact on the understanding of social development. As a consequence, this is also the cognitive theory which will be a primary focus of the review to follow.

Finally, several theorists interested in social development during infancy have proposed theories which attempt to combine the "best" parts of the learning, ethological, and cognitive perspectives. Included here are such theories as the dyadic approach. This approach will also be reviewed in the following section of this paper.

These theoretical perspectives are important in that they provide the basis for the current study. One commonality across these perspectives of infant development is the notion that visual contact between mothers and infants plays some role in development. Although the specifics concerning this role differ from perspective to perspective, the basic notion remains the same.

Each perspective will now be presented in greater detail by placing emphasis on one particular theory which is derived from the overall perspective. First, a general overview of the theory will be provided. Following this overview, a discussion of how the theory perceives or might perceive (where no actual account exists) the role of eye-to-eye contact in the context of infant-caregiver interaction will be provided since it is thought that this is the context within which various aspects of social development can first be observed (Schaffer & Crook, 1978).

Theoretical Perspectives

Learning Perspective

Within the broad category of learning approaches, one theory which has greatly influenced developmental social psychology has been social learning theory (Miller & Dollard, 1941). According to this theory, social development is the result of the integration of the child into a society which places specific demands upon and has particular expectations of the child. In this view, the role of constitutional components is minimized, although Miller and Dollard (1941) were among the first behavioral theorists to suggest that internal events could play a role in learning.

Like all behaviorists, Miller and Dollard (1941) viewed development as a process that was governed by laws of learning. The basic element of learning was seen to be the habit, which Dollard and Miller defined as the strength of an association between a stimulus and a response, formed on the basis of spatial and temporal contiguity. Unlike their colleagues however, these theorists suggested that associations could form not only between external stimuli and responses, but between internal stimuli and responses as well. Their theory allowed for associations between internal events; for example, an emotional response such as fear could become associated with certain thoughts. This represented an important change from other learning theories and Dollard and Miller further proposed that these internal associations might begin as the result of a biological component. Habit strength could begin as an inborn reaction associated with either an internal or an external event, for example, a startle response associated with a loud noise.

According to social learning theory, there are four elements of learning necessary to the formation and maintenance of habit strength. The first component consists of various drives. Drives represent the motivating forces behind behavior, i.e., drives are what impel the individual to action. Newborn infants come into the world with a set of primary drives (hunger, thirst, contact) which eventually become associated with internal or external events. Once these associations occur, these internal and external events become drive-producing themselves and motivate behavior. These are known as secondary drives.

The second element of learning is the cue which consists of stimuli that tell the individual when, where, and in what manner to respond. Initially, for the infant, cues are relatively simple (e.g., mother's breast), but with development, cues may become quite elaborate and complex.

The third element is the response; this is simply a behavior that becomes associated with a particular drive, or drives, and a cue, or set of cues. The newborn infant possesses an innate hierarchy of these responses. Innate because they are not the result of learning, and hierarchical because some are more likely to occur than others. With development, these innate responses become associated with other responses and the hierarchy becomes increasingly complex. This is the resultant hierarchy, as these responses are the product of learning and experience.

The final element of learning is reward or reinforcement. These are stimuli or events that follow a behavior and increase the likelihood that the behavior will reoccur. Rewards, according to Miller and Dollard, may be externally produced or they may be internal; for example, a reduction in drive may serve as a reward in their model.

Given these four elements, the role of eye-to-eye contact, particularly in the context of infant-caregiver interaction, is possibly one of a reward. Infant visual contact with mother serves to reinforce her ongoing behaviors and likewise, maternal visual regard of her infant serves to reinforce his/her ongoing behaviors. It is also possible, however, that visual regard, when embedded in certain sequences of behavior, could itself play the role of a cue or a response.

With regard to the reinforcing quality of eye-to-eye contact, there is evidence that both the quantity and quality of maternal interaction with their infants changes once eye contact is established (Moss & Robson, 1968; Wolff, 1963). Certainly one of the clearest indications of the importance of infant visual contact for mothers comes from cases where such contact is absent; for example, where the infant is visually impaired. Fraiberg's

(1974) eloquent descriptions of interactions between blind infants and their mothers provide an account of how these dyads must establish a bond in very different ways than sighted infants and their mothers.

As noted earlier, Robson (1967) and his colleagues (Moss & Robson, 1968; Robson, Pedersen, & Moss, 1969) have argued that eye-to-eye contact is a critical aspect of social development. Specific to the current discussion, Robson (1967) suggested that visual contact should be included in Bowlby's (1958) list of attachment behaviors along with smiling, clinging, sucking, etc., as a behavior which elicits maternal response. In a series of longitudinal studies, Robson and his colleagues attempted to relate the occurrence of mutual visual regard between mothers and infants at 1 and 3 months to later attachment behaviors (e.g., fear of strangers). These researchers assessed pre-birth maternal attitudes, as well as frequency of mutual regard, infant attention to geometric stimuli, and approach-avoidance behaviors with strangers over a period lasting from 1 to 9-1/2 months. They found that maternal attitudes during pregnancy predicted the frequency of mutual visual regard at 1 month for both sexes. At 3 months, maternal attitudes still predicted mutual visual regard, but only for female infants and their mothers. Further, the frequency of mutual regard for these dyads at 3 months was also related to the amount of time these female infants spent looking at social stimuli. At 8 and 9-1/2 months, the sex trends were maintained in some respects; females exhibited an earlier fear-of-stranger response. Somewhat paradoxically, however, the frequency of infant-mother mutual visual regard at 1-month for males predicted gaze behaviors and spontaneous social approaches with a stranger at 8 and 9-1/2 months. This was not true for the female infants. For the male infants then, the hypothesis that early gaze behaviors with mother are related to later attachment indices was supported. This hypothesis was not supported for the female infants in this study.

The cueing function of infant gaze has also received some research support. Hutt and Ounsted (1966) hypothesized that gaze behaviors serve as signals; thus, gaze fixation may signify a readiness for interaction, while gaze aversion may serve to terminate interaction. Mothers may utilize their infants' behaviors, particularly gaze behaviors, as signals of alertness by which they can modulate their own behavioral input (Als, 1979). Indeed, studies have indicated that eye-to-eye contact plays an important role in releasing genuinely social and maternal responses (Ambrose, 1963; Wolff, 1963). The data further indicate that mothers are more likely to look at their infants if their infant is already gazing at them than if the infant is not visually engaged (Messer & Vietze, 1982; Stern, 1974b).

The reinforcing and cueing functions of maternal visual contact for infants have received much less research attention, although there is some evidence available. Studies by Arco (1977) and by Arco, Self, and Gutrecht (1979) utilized a conditioning paradigm with neonates and found that increased maternal visual regard of their neonates resulted in increased neonatal visual regard of mothers.

There is additional support for the idea that maternal visual regard may serve as a cue for the infant. Several researchers have utilized transitional probabilities to examine the likelihood that infants will look at mother given that mother is already gazing at her infant. The results of these studies indicate that the infant is considerably more likely to look at mother if she is already looking at him/her than if she is not (Messer & Vietze, 1982; Stern, 1974b). Likewise, infants are less likely to terminate their gaze at mother if she is looking at them than if she is not (Messer & Vietze, 1982; Stern, 1974b).

The social learning approach then, and indeed, the learning perspective in general, has been less concerned with conditioning studies of social responses. There are exceptions, but these studies have usually been with older infants and have typically employed multi-modality social stimulation. Social-visual stimulation is often used in conjunction with other forms of social stimulation (e.g., auditory and tactile). In general however, learning theorists have been more concerned with the application of learning principles to nonsocial responses such as heart rate (Clifton, 1974), or to social behaviors other than eye contact (e.g., smiling or vocalizing) (Gewirtz & Boyd, 1977).

Of those studies which have examined the conditioning of social behaviors such as looking at a social stimulus (Watson, 1968), there remains a major criticism. That is the same criticism which has been made, particularly by developmentalists, of learning approaches in general (Bell, 1968). These approaches often follow a unidirectional model such that development is viewed as a process whereby the early environment (primarily in the form of mother) has an impact upon the infant. The active role played by the infant in constructing the environment is ignored. One exception is the work of Gewirtz and Boyd (1977). There is by now however, ample data to support the contention that interaction between mothers and infants is a mutual process where each partner has an influence upon the other (Bell, 1968). Learning theorists and researchers have not been as cognizant of this position as have theorists and researchers from other perspectives.

Ethological Perspective

The ethological approach to social development during the period of infancy is thought to be best exemplified by attachment theory (Ainsworth, 1972; Bowlby, 1958, 1969). According to Bowlby (1958), attachment behaviors represent a class of social behaviors in much the same way as mating behaviors and parental behaviors. Attachment behaviors are argued to serve a biological function which consists of the maintenance of proximity between an infant and caregiver. Assured proximity, in turn, serves to protect the infant from possible predators.

The development of infant-caregiver attachment is a process which includes four main phases. The first three of these phases normally occur during the first year of life (Ainsworth, 1972). Phase I is an initial pre-attachment period (birth through the first few weeks). The infant comes into the world equipped with certain attachment behaviors. As Bowlby (1969) noted:

> . . . not only is he equipped with a number of behavioural systems ready to be activated, but each system is already biased so that it is activated by stimuli falling within one or more broad ranges, is terminated by stimuli falling within other broad ranges, and is strengthened or weakened by stimuli of yet other kinds. (p. 265)

These behaviors are thought to be species-specific and Bowlby (1958) identified five such behaviors which are exhibited by infants and serve to maintain and/or promote proximity to the caregiver--sucking, clinging, following, crying, and smiling. Later attachment theorists further suggested that certain other behaviors more actively engaged in by the infant should also be included in this list. Included were such behaviors as rooting, grasping, following with the eyes (Ainsworth, 1972) and eye-to-eye contact (Robson, 1967).

Phase II is marked by the beginning of discriminative responding. The infant begins to differentiate persons in the environment, initially by way of the auditory modality (Ainsworth, 1972). During this time, the infant's proximity-promoting behaviors begin to focus on one or a few specific persons--usually the caregiver. The beginning of this phase, known as "attachment-in-the-making", is unclear, but it ends when the child is clearly attached to a specific person. This usually occurs around the age of 7 months. Bowlby (1969) outlined certain conditions which contribute to development during this phase. These conditions included sensitivity to the infant's signals by the figure(s) towards whom the attachment behaviors are directed, and the amount and nature of the interaction between the infant and this figure(s).

During Phase III, usually after locomotion has become possible for the infant, the infant has clearly disciminated one or a few attachment figures. At this time, active proximity-seeking behaviors become more dominant in the child's repertoire. The infant, however, has now become more active in exploring the environment, a behavior which may be incompatible with proximity-seeking. Because of this, the infant has certain set-goals which are contextually determined. After a certain age (approximately 15 months), the systems of attachment behaviors, now complex and elaborate, are only activated when the infant finds himself/herself in a particular situation, for example, a strange situation (Ainsworth, 1972), or one in which the caregiver's whereabouts are unknown (Bowlby, 1969).

The final phase, IV, known as the phase of a goal-corrected partnership, is possible because the child has become less egocentric (Piaget, 1952, 1954) and therefore, more capable of taking-on his/her partner's perspective. With the onset of this skill, the child is able for the first time to do more than merely accomodate his/her behavior to that of the partner. Rather, the child is now able to exert influence over the partner and hence, to enter into a partnership.

The attachment bond then, develops as a result of a ". . . system of mutual signaling and mutual gratification" (Maccoby, 1980, p. 47). The infant comes into the world with sensory equipment which is preadapted for social interaction (Ainsworth, Bell, & Stayton, 1974). Although most researchers have been interested in signalling behaviors such as crying and smiling (e.g., Ainsworth et al., 1974), others have included early visual behaviors between mothers and infants as among the first attachment behaviors (Robson, 1967). Klaus and Kennell (1976), for example, observed that given the first opportunity, mothers will gaze into their newborn's eyes and have even been noted to relate the condition of the baby to some feature of his/her eyes. Mothers communicate concern when their infants do not look at them and exert much effort in attempts to establish eye contact with their infants (Klaus, Kennell, Plumb & Zuehlke, 1970).

Ainsworth (1972) also commented on the role of visual behavior in the development of attachment. Initially, according to Ainsworth, visual following is a non-differential, proximity-promoting behavior. As this behavior becomes differentially directed toward a particular other person, Ainsworth acknowledges it as a true index of attachment. With regard to this behavior and others, she stated: "Nevertheless these behavioral systems, implicated from the very beginning in promoting proximity, later and without great transformation clearly mediate attachment. . ." (p. 107).

To a much greater extent than social learning theory then, attachment theorists and later researchers as well, have studied the role of visual behaviors in early social development. It is difficult to deny the importance of visual contact as a social behavior. The visual system is functional at birth and when the infant is in an alert state, visual behaviors may be the most mature behaviors in the neonate's repertoire (Korner, 1974; Pawlby, 1981).

Cognitive Perspective

Few developmentalists are still willing to deny the crucial interplay between the various processes of development. As Cicchetti and Pogge-Hesse (1981) clearly stated: "Cognitive, social, and affective development proceed in a mutually supportive, interlocking manner." (p. 206) The influence of Piaget's theory of cognitive development has recently extended far beyond purely cognitive concerns. Sherrod and Lamb (1981) argued that the convergence of cognitive research, particularly as influenced by Piaget, with socialization research has clearly contributed to the recent popularity of social cognition. Indeed, with regard to social development, it has been hypothesized that cognitive capacities are the limiting factors on the nature and rate of social development (Sherrod & Lamb, 1981). Frye (1981) argued that Piagetian theory, in particular, has implications for understanding social interaction and therefore, social development.

According to Piaget (1970), knowledge, and indeed, all epistemological relations, originate from the interaction of subject and object. As such, knowledge is always linked to both a transformational process and a constructive process. In order to know objects, the individual must act upon those objects and hence, transform them. As the individual engages in interactions with the object world, the construction of certain structures of action is a natural occurrence. As Piaget (1970) asserted:

> The living organism itself is not a mere mirror image of the properties of its environment. It evolves a structure which is constructed step by step in the course of epigenesis, and which is not entirely preformed. (p. 705)

In order to elaborate more specifically how development proceeds, Piaget (1970) incorporated biological concepts. He argued that development consists of two crucial processes, assimilation and its counterpart, accomodation. Assimilation was defined as the integration of external elements into pre-existing structures; accomodation, on the other hand, represented that modification of pre-existing structures in order to ingest new information. Assimilation then, served to ". . . assure the continuity of structures and the integration of new elements to these structures", while accomodation allowed for the development of new structures (p. 708). Cognitive adaptation derived from the existence of an equilibrium between assimilation and accomodation and it is toward equilibrium that individuals constantly move, according to this model. This is the fundamental process of cognitive development and "only the more or less stable equilibrium which may exist . . .characterizes a complete act of intelligence" (p. 708).

Cognitive development, according to Piaget, involves the progressive construction of structures in an orderly process which is fixed and irreversible. Of particular importance in this paper are occurrences during the sensorimotor period (Piaget, 1952). This period corresponds roughly to the period of infancy (0-2 years) and is also the period during which intention emerges. According to Frye (1981), social interaction requires intention and therefore, studying the development of intention provides information about how the infant becomes social.

As noted earlier, Frye (1981) has applied Piaget's theory, particularly his thoughts about the sensorimotor period, to social interaction development. He traced the course of true sociability and argued that it parallels the course of intentionality. During the first three substages of the sensorimotor period, the infant is neither intentional nor "truly social". Frye argued that studies which indicate that infants gaze longer at faces than other displays may support discrimination skills but do not support the existence of sociability. If the infant does not react differently to social versus nonsocial stimuli, Frye asserted ". . . it is difficult to tell what meaning, if any, the discrimination has for the infant" (p. 321). Rather, he suggested that contingent stimulation, as opposed to infant social reactions, can account for the data from early interaction studies.

With the onset of intentionality, there is also the establishment of object permanence. Similarly, object permanence and attachment have been positively related to one another (Bell, 1970). Hence, Frye (1981) argued that object permanence may be necessary for attachment, which he views as one occurrence which is "surely social". Further, Frye suggested that "intention . . . accounts for the 'why' of attachment while permanence does not" (p. 323). For the first time, behaviors, such as eye contact, are seen to function as a means by which the infant can attain a particular goal, that of influencing the caregiver.

Unfortunately, there is little research to examine the role played by visual behaviors from either a Piagetian perspective or from the perspective adopted by Frye (1981). The research which does exists has been primarily concerned with the role of eye contact in the development of early communicative skills. Notable in this regard is the work of several researchers; Bruner (1975), for example, argued that joint action, or shared experiences, between a caregiver and infant provides the context within which infants can come to understand linguistic concepts. Through joint reference, the child begins to develop an awareness of the sequence of occurrences in segments of joint action. The child thus learns to distinguish segments, to substitute roles, to reverse order, and eventually, learns new ways of signalling different segments of the same sequence. Bruner (1975) further asserted that this entire process is relatively assured, partly as a result of an innate propensity for mother and infant to engage in mutual gaze. Mothers and infants also seem predisposed to some degree to follow one another's line of visual regard (Collis & Schaffer, 1975; Francis, 1980), thus facilitating the establishment of joint attention. Once established, mother can act upon or comment upon the object of their joint attention, thus defining the crucial order of expectancy for the infant. Indeed, there have been supportive data for this argument (e.g., Hubley & Trevarthen, 1978; Milenkovic & Uzgiris, 1979), although the data suggest that it is typically mother who adjusts her visual behaviors to those of the infant rather than vice versa (Kaye & Fogel, 1980; Milenkovic & Uzgiris, 1979).

Piaget's theory then, although intended as a theory of cognitive development, has been applied to other domains such as communication development (Harding & Golingkoff, 1979) and social development (Frye, 1981). Obviously, there are still many unanswered questions, but the key lies in understanding how the various processes of development are interrelated (Sroufe, 1979). More recent theoretical approaches to social development have therefore attempted to integrate certain aspects of the various theories discussed so far. One example of such an attempt is the dyadic perspective described below.

Dyadic Perspective

It is difficult to link this approach to any one theory; rather, it is an approach which guides theory and research (Schaffer, 1977). The dyadic view is nonetheless characterized by certain distinguishing features, according to Schaffer (1977).

The first distinguishing feature of this approach is its emphasis on the dyadic or mutual exchange nature of interaction and how this influences development. Bell (1968, 1971) is often credited with the concept of mutual influence; he argued that both caregiver and infant contribute to social interactions in both an active and passive sense. Further, according to Schaffer and Crook (1978), mutual interchange inevitably involves negotiation which is, in turn, the source of modification and growth for both partners. Brazelton and his colleagues (Als, 1979; Brazelton & Tronick, 1980) have elaborated this concept further by incorporating the notion of system feedback:

> The environment potentiates the newborn's increasing differentiation by offering him a controlling kind of organization from the outside which, because it is adapted to his level of development, provides him with appropriate feedback. This differentiation is further enhanced by a recognition of his capacity to reach out for and shut off social stimuli. This same capacity, in turn, results in growing complexity of the interactional channels and structures and provides increasing opportunities for the individual system to become more differentiated. (Brazelton & Tronick, 1980, p. 313)

Likewise, Brazelton and Tronick (1980) noted that the parent learns and grows as a result of feedback about his/her own capabilities as a nurturing adult.

A second feature of the dyadic approach concerns the necessity to adopt the position that the infant may be prewired for social exchange (Schaffer, 1977). It has been increasingly evident that infants come into the world equipped with behavioral repertoires which predispose them to human relatedness. These behaviors ensure the infant a role in shaping the earliest relationships (Stern, 1983). Stern (1983) developed a list of some of the infant's social "tools", and included among them eye gaze, head movements, and facial expressions. According to Stern, these behaviors are dominant during the first six months of life.

Related to the infant's pre-adaptation for social interaction is the third distinguishing feature of the dyadic approach. That is the notion of temporality. The patterned qualities of interaction between mothers and infants have been documented not only with regard to eye gaze (Brazelton et al., 1974; Self et al., 1981; Stern, 1974a), but facial expressions (Kaye & Fogel, 1980), affective displays (Brazelton et al., 1974), and head movements (Peery, 1980) as well. These patterns allow for the interweaving of behaviors which gives the impression of synchrony often observed in mother-infant interaction. Reciprocity in this system is achieved then, via the contributions of each partner, and, in turn, according to Brazelton (1974), provides the fuel for infant development and for relationship development.

Cairns, Green, and MacCombie (1980) include these three concepts in their theory, but emphasize certain ones more than others. According to Cairns et al., the infant is constrained by the evolutionary and/or ontogenetic status of the human organism which, in turn, provides the basis on which mothers can act in a consistent manner. From birth, the infant enters into social exchanges that are increasingly organized and patterned for the individual. Thus, the bidirectionality of influence is apparent in that characteristics of the individual (e.g., developmental status and prior experiences), and of the broader context, contribute to these interchanges and have further implications for the integration of behaviors. The fact that behavioral integration may occur at different rates for individuals contributes substantially to the variety of individual differences evidenced among people.

According to the dyadic view then, three factors--mutuality, pre-adaptation and temporality--provide the basis for social development. As Schaffer (1977) noted:

> Given an inherent basis of pre-adaptation and the necessary cognitive means, the additional factor required seems to be just the sheer opportunity, repeated day after day for month after month, of taking part in dialogue-like exchanges. (p. 11)

In summary, the dyadic approach attempts to understand social development by looking at the reciprocal patterns of interaction which begin with the infant-caregiver dyad. Each partner brings to the interaction his/her own repertoire of behaviors, as well as some degree of sensitivity and flexibility in adjusting to the other. Brazelton and Tronick (1980) suggested that the interaction provides an "envelope" which is individualized for the dyad because it is determined by each partner's contribution. Within this envelope, communicative exchanges between infant and caregiver are elaborated and made richer; growth is thus assured.

The role of visual behaviors in social development has been of great interest to researchers who subscribe to this approach. To study social development during the early period requires examining how both caregiver and infant contribute to regulating early social interaction and one of the earliest channels of communication available to the infant is the visual modality.

Important work in this regard has been provided by Brazelton, Koslowski, and Main (1974). Their data consisted of longitudinal observations of infant-caregiver interaction across the period of 2 to 20 weeks of infant age. These researchers contrasted infant-caregiver interaction with infant-object interaction and found differences as early as 4 weeks. Although caregivers probably solicit more attention from their infants, attentional behavior varied markedly as a function of the stimulus situation. With caregivers, spans of attention and looking away were shorter and smoother than with objects. A cycle of attention and withdrawal was noted as the infant and caregiver developed an interdependence of rhythms. The infant was free to cycle in and out of the interaction as the caregiver provided a framework. Indeed, the infant's ability to gain control over his/her cycles of attention was postulated to depend partly on the caregiver's sensitivity regarding this cycle which depends, in turn, on the caregiver learning certain "rules" about the infant. Although it may originate as a physiological mechanism for controlling input for the infant, this cycle leads to an interdependence of rhythms which is believed to be at the root of infant-caregiver communication.

Similar results documenting the cyclical nature of infant-caregiver interaction have been reported in several other studies (e.g., Fogel, 1977; Stern, 1971, 1974a; Tronick, Als, & Brazelton, 1977). Particularly notable has been the work of Kaye (1977) who was interested in finding the earliest evidence of cyclical or alternating behaviors. Kaye (1977) noted an "obvious similarity between the burst-pause pattern in sucking during the first month of human life and later burst-pause cycles of activity" (p. 89). In an earlier study with Brazelton (Kaye & Brazelton, 1971), Kaye found that mothers, while feeding their infants, jiggled their infants (or the bottle) more during pause periods, apparently in the belief that this action would arouse the infant and/or elicit sucking. Contrary to expectation, however, the data revealed that those jiggles actually served to increase the duration of the pause. As a result, Kaye (1977) hypothesized that the infant pauses in order to elicit a social response from mother.

Kaye (1977) observed feeding sequences between mothers and their infants when the infant was 2-days-old and again when the infant was 12-18-days-old. He analyzed the data for burst-pause patterns and found changes in maternal behaviors over the two-week period. Mothers altered their response to an infant pause from one of "jiggle" to one of "jiggle-stop" in conjunction with the realization that the infant resumed sucking at the end of a jiggle. Mother and infant, according to Kaye (1977), appeared to develop a very early dialogue-like exchange as mother accomodated to her infant's innately-based, temporally-organized sucking response. Kaye noted: "The newborn's immaturity at birth may be his most important asset--for it guarantees a degree of salient regularity, rhythmicity, and predictability to his behaviour which will not again be possible once higher cortical processes take over." (p. 112) With regard to mother's role, Kaye (1977) argued that she uses this temporal predictability to build a pattern of interaction which is no longer dependent on biological clocks, but rather, on mutual monitoring and feedback.

Schaffer and Crook (1978) also commmented on the importance of "interpersonal dialogues". They suggested that the infant is pre-adapted, both structurally and functionally, and proposed that:

> . . . the biological rhythms that underlie such responses as sucking have a regularity which make it possible for the mother to anticipate the infant's behaviour, and it may well be that the split-second timing that characterizes so much of interactive behaviour is the result of such anticipation. And furthermore, the on-off nature of so much of sensori-motor activity (seen, for example, in the bout structure of vocalization) provides the pauses that enable the other person to take turns with the infant and in this way to set up the pseudo-dialogues so characteristic of the infant's early social life. (p. 63)

A basic compatibility is thus ensured, out of which, through repeated interaction, develops the "mutually integrative and exchangeable roles (speaker and listener, actor and spectator, giver and taker, and so forth)", which are intrinsic to social development (p. 63).

In summary, this section of the paper has attempted to review basic theories concerning the possible role of eye-to-eye contact in the context of early social development. Included in this discussion have been four theoretical perspectives: the Learning perspective, the Ethological perspective, the Cognitive perspective, and the Dyadic perspective. Eye-to-eye contact has been shown to play an important role in understanding the early influences on social development from all four orientations. As such, much research has been generated, searching for various relationships between eye-to-eye contact and indices of social and cognitive development. One area of research has examined the aspects of early visual interaction which provide the optimal environment for facilitating subsequent development.

Social-Visual Behaviors

Since mothers and their infants communicate visually and since this modality may provide one of the earliest channels of communication, it should be possible to identify relationships between early visual interaction and subsequent developmental processes. Research concerning both optimal and less than optimal visual interaction and how each relates to future development will be considered. Two developmental events have been related by past research to early visual contact between mothers and infants. These two events are attachment and communication.

Significance for Attachment

The association between eye-to-eye contact and the development of attachment has already been mentioned. Klaus and Kennell (1976), for example, stressed the importance of eye contact to the bonding process and studies have found relationships between visual interaction and later attachment indices. At least in the case of male infants, Robson and his colleagues (Moss & Robson, 1968; Robson, 1967; Robson, Pedersen, & Moss, 1969) found that the frequency of early infant-caregiver visual contact predicted certain indices of attachment 7-8 months later. Further, Waters, Vaughn, and Egeland (1980) found that infants classified as anxious/resistant in terms of attachment behaviors at 1 year of age scored lower on certain Brazelton items at 7 days of age. These infants performed more poorly on items which assessed orientation; these items are typically used to infer something about the infant's interactive capabilities (Als, Tronick, Lester, & Brazelton, 1979). In particular, these items assess the infant's ability to orient to certain animate and inanimate visual and auditory stimuli. It may have been that the infants who later scored as anxious/resistant on attachment were not as responsive to early visual stimulation. More specific studies are needed, however, to explore both the quantitative and qualitative aspects of early visual interaction and how such interaction relates to the development of attachment.

Studies which have examined the attachment process between mothers and their infants in cases where infant visual contact is impaired in some way (e.g., due to blindness) provide additional information. Most notable in this regard has been the work of Fraiberg (1974, 1975, 1977). She longitudinally observed 10 infants, totally blind from birth, over the first 18 months of life. Differential responsiveness to mother and other familiar and unfamiliar persons was noted. Although all but one of the infants demonstrated attainment of a focused relationship with mother by 18 months, the process occurred in a very different way from that of sighted infants and their mothers. Mothers of blind babies were noted to experience estrangement from their infants, as the absence of eye contact leaves the infant with few behaviors with which to initiate social exchange. The absence of an "eye language" may in turn, leave mother with a sense that her infant is disinterested. As Fraiberg (1974) noted:

> And while we know that under all favorable circumstances the blind baby will come to know his mother and that the course of human attachments will closely parallel that of a sighted child, the imagination of the mother may be strained to encompass a 'knowing' without vision. (p. 221)

The lack of visual contact then, may have a profound effect on the attachment process, particularly dependent upon maternal attitudes and acceptance of her infant's situation and her ability to adapt accordingly.

Hutt and Ounsted (1966) noted a similar situation in their discussion of autistic children. In conjunction with the syndrome of infantile autism, children often manifest extreme forms of gaze aversion (Kanner, 1943). Hutt and Ounsted (1966) suggested that autistic children are in a chronically high state of arousal and that gaze aversion may be a built-in mechanism for reducing such arousal. As a consequence, the child fails to develop typical eye-to-eye contact behaviors which, in turn, may result in ambivalent maternal attitudes toward the child (Hutt & Ounsted, 1966).

Significance to Communication Development

There is also research which suggests that early visual contact is related to later language development. In a recent paper, for example, Francis, Self, and Noble (1982) examined how mutual gaze and visual co-orientation may be related to different types of maternal verbal control techniques (Schaffer & Crook, 1978). They observed infant-caregiver dyads in each of these two visual contexts and found that context was associated with the types of controls mothers employed. Mothers, during visual co-orientation episodes, were more likely to attempt to regulate their infant's visual behaviors, while during mutual gaze episodes, mothers were more likely to encourage infant motor activities. Visual behaviors then, may provide a context within which infants can learn specific linguistic concepts (Bruner, 1975).

Other studies have indicated that visual co-orientation frequently serves as a context within which mothers are likely to comment upon or label the object of joint attention (Collis & Schaffer, 1975; Collis, 1977; Milenkovic & Uzgiris, 1979). These findings assume particular relevance given Ruddy and Bornstein's (1982) recent data. These researchers found that mothers who more frequently encouraged their 4-month-old infants to attend to objects had 12-month-old infants with larger vocabularies.

There are less data to examine specifically the relation between mutual gaze and specific communicative processes. One exception however, is recent work by Stern, Spieker, and MacKain (1982). They found that mothers utilized different intonation patterns in accordance with the context of interaction and with the type of sentence expressed while interacting with their 2-6-month-old infants. Specifically, in situations where the infant was looking away, mothers were more likely to utilize a pattern which apparently functioned to request visual attention; a rising contour. During periods of mutual visual engagement, mothers were more likely to vary their pitch contour, either in an attempt to intensify the level of engagement or because they were satisfied with the presence of gaze. Finally, in cases where the infant was both visually engaged with mother and displaying positive affect, mothers attempted to maintain these behaviors via sinusoidal and bell contours.

Stern et al. (1982) suggested, on the basis of these data, that differences in maternal acceptance of gaze alone as a behavioral end point accounted for the variability in pitch contours exhibited by mothers in this context. Unfortunately, the effectiveness of the various contours was not assessed. These data, nonetheless, support the hypothesis that maternal intonation patterns in specific contexts, provide an example of a recurring pattern for the infant which serves as information carrying units around which later communicative developments may begin (Stern et al., 1982). These data are also consistent with more general data which have suggested that mothers alter their behavioral displays in accordance with their infant's visual attention (DeBoer & Boxer, 1978; Fogel, 1977; Kaye & Fogel, 1980; Milenkovic & Uzgiris, 1979).

Finally, there are data pertinent to this perspective from studies which have assessed communication development between blind infants and their parents (Urwin, 1978). Urwin (1978) reported longitudinal observations of two such infants between the ages of 7 and 20 months. Her data revealed that the early word usage of these infants was significantly delayed and she suggested that this happened because "both babies' blindness posed constraints on establishing communication about objects and events located outside their own immediate sphere of action" (p. 106). According to Bruner's (1975) model, these infants have been deprived of the joint attention/action contexts which are crucial to understanding agent-action-object relations, as well as to the development of sequencing and signalling rules.

This introduces a second, though related, perspective on how early visual contact is related to later language development. Specifically, infant-caregiver interaction has been suggested to provide a context within which the infant can learn communicative skills, one of which is that of alternation or turn-taking (Kaye, 1977). As noted earlier, Kaye (1977) described the mutual dialogue which is evident between mother and infant in the burst-pause-jiggle pattern of the feeding situation. Also important to the development of turn-taking skills however, may be the "conversation-like" exchanges which occur with the visual interaction patterns of mothers and infants (Bateson, 1975; Brazelton et al., 1974; Stern, 1974). These exchanges may be especially important because mothers impute meaning to certain of their infant's acts, eventually allowing the infant to constitute these acts as meaningful (Newson, 1978). As has been suggested in many studies, mothers focus from the beginning on their infants' attention-paying behaviors, particularly eye-to-eye contact (Klaus & Kennell, 1976; Robson, 1967).

One final perspective which emphasizes the relation between early visual behaviors and communicative/language development comes from the work of Brazelton and his colleagues (Als, 1979; Als et al., 1980; Brazelton & Tronick, 1980). Mother-infant communication, such as described by these researchers, provides the main process wherein the infant can learn to establish control over self and ultimately the environment (Als, 1979).

The dominant role for mothers in this view is one of regulator. Mothers control the amount of stimulation provided their infant based on their own sensitivity to the infant's needs to cycle in and out of the interaction, particularly as these needs are expressed in the visual modality (Brazelton & Tronick, 1980). The infant's role, on the other hand, is initially based on a bimodal, homeostatic motivation system. The infant, motivated internally by striving for competence and externally by the need to absorb information, interacts with his/her environment, primarily the caregiver. The goal is homeostatic regulation and the result is feedback and growth (Brazelton & Tronick, 1980).

Data supporting this model came from the early study by Brazelton and his coworkers (1974) discussed previously. In addition, Als (1979) reported observational data from the interactions of a mother and her congenitally blind infant which also documented the increasing differentiation of the infant and mutual regulation of the dyad. Detailed descriptive analyses of infants and caregivers in interaction illustrate how the infant moves from predominantly visual exchanges with the caregiver to exchanges which include a rich repertoire of behaviors utilizing other modalities of interaction (Als, 1979; Brazelton & Tronick, 1980).

In summary, this section of the review has been provided to accentuate the importance of eye-to-eye contact. Regardless of the theoretical position one assumes, it is obvious that visual contact has important implications, at least for future social and communicative competence. A case can be made, based on these data, for optimizing visual interaction between infants and caregivers. Given this desire to optimize visual interaction for these dyads, it becomes important to examine the kinds of situations that may result in less than optimal visual interaction. Factors which have been shown to be particularly important in optimizing interaction are infant behaviors and maternal behaviors, and the feedback each provides for the partner.

Mother-Infant Interaction

One important source of feedback for the infant consists of maternal sensitivity in responding to the infant's signals, not only in terms of quickness, but also, appropriateness of mother's response. Many researchers have emphasized the concept of maternal sensitivity or responsiveness; for example, Ainsworth and her colleagues argue that maternal sensitivity is an important promoter of securely attached infants during the first year of life (Ainsworth et al., 1974). More generally, maternal responsiveness to her infant's signals provides the infant with an important source of information about his/her ability to have an impact on the environment. Others have discussed the concept of responsiveness not solely as a characteristic of mothers, but have noted instead the reciprocal responsiveness of both partners (Brazelton & Tronick, 1980) as important in optimizing communication. In this section of the review, research which documents the mutual responsiveness of both mother and infant in the context of interaction will be discussed. Also included will be research concerned with the characteristics of mother and infant which have been associated with responsiveness. Finally, studies which have employed experimental manipulations of maternal behaviors in order to examine the role of interactive feedback for the infant will be reviewed.

Naturalistic Interaction

Observational studies of naturalistic interaction between infants and caregivers have contributed much information concerning the reciprocal aspects, particularly in regard to gaze behaviors as a communicative mode. Stern, for example, has commented on the regulatory functions of infant gaze initiations and terminations in the context of infant-caregiver play. He provided data which described infant and maternal behaviors, as well as dyadic patterns of interaction for mothers and their infants who were between 3 and 4 months-old (Stern, 1974b). Maternal behaviors during interaction were characterized as "deviant" when contrasted with her own behaviors in interaction with an adult. Mothers, while interacting with their infants, were found to introduce variations, particularly with regard to vocalizations, facial expressions, and gaze behaviors. These variations were apparently elicited by the infant and were within a range which is preferred by the infant. Stern (1974b) also noted that these maternal variations were most consistently elicited by infant gaze at mother:

> These striking maternal facial and vocal behaviors are elicited not simply by the presence of the infant, but specifically by his gaze at her. If the infant then smiles, coos, or otherwise is facially expressive while gazing at her, the likeli-

> hood of elicitation of the maternal behavior will be increased, or if already in action, heightened. (p. 193)

As many others have also documented, maternal gazes at the infant were likely to be longer and dependent on the direction of the infant's gaze, either at or away from her (Brazelton et al., 1974; Fogel, 1977; Messer & Vietze, 1982; Stern, 1974b).

The infant's behaviors in this context were also found to be varied and dependent not only on ongoing interactive events, but also on the infant's internal state. Gaze behaviors by the infant seemed to be particularly dependent on the internal state of the infant; given that the infant was in an alert, accessible state, gazes at or away from mother were primarily dependent on maternal behaviors. Maternal gaze at the infant, especially when paired with vocal and facial behaviors, was most likely to elicit and maintain infant gaze at mother. Infants were considerably less likely to look at mother when she was not looking at the infant. The resulting dyadic outcome noted by Stern (1974b) was a cyclical pattern of attention and withdrawal, one "in which mutual gaze is the probable consequence of each member's responsivity to the other" (p. 205).

Several researchers in the early 1970's documented this pattern of visual interaction (Brazelton et al., 1974; Fogel, 1977; Stern, Beebe, Jaffe, & Bennett, 1977; Trevarthen, 1977). The data of Brazelton et al. (1974) however, represent the earliest documentation of the cyclical pattern. Brazelton et al. (1974) found evidence for this pattern with infants as young as 2 weeks of age, but a recent project by Self et al. (1981) suggested that there may be a similar pattern present during the neonatal period.

Likewise, a recent study by Kaye and Fogel (1980) traced changes in infant-caregiver face-to-face contact over a 20-week period which began when the infants were 6 weeks old. These researchers found that as infants grow older, they spend less time looking at their mothers, but the time they do spend in this activity becomes elaborated by the inclusion of a greater variety of expressive acts. Also, the amount of time infants spent looking at mother while she was also looking at them changed very little. Both mother and infant became more adept with time at enriching the periods of joint attention. Kaye and Fogel (1980) argued that this marks the transition from "mere responsiveness to spontaneous, reciprocal communication" (p. 463).

Relationship to Maternal Characteristics

The importance of maternal attitudes and adaptation to the visual behaviors of her infant have been implicated in some studies (Kubicek, 1980; Stern, 1971). Stern (1971) described how maternal intrusive stimulation may be related to infant visual behaviors which may, in turn, be related to developmental sequelae. His case study data consisted of videotaped interactions between a mother and each of her twin sons. Longitudinal observations were made over a 12-month period beginning when the twins were 3-1/2 months old. Stern noted that maternal behaviors with one twin (A) were "overstimulating" and "insensitive", while this was less true with the other twin (B). After coding the videotapes for sequences of making and breaking face-to-face contact, differential patterns of interactive behaviors were identified for each dyad. Specifically of interest in this review, the overstimulated infant (A) was shown to engage in a repetitive sequence with mother, exemplified by difficulty not only in maintaining face-to-face contact, but in terminating it as well. Five- to eight-months later, as compared to Twin B, Twin A was noted to be a fearful and more dependent child who regularly evidenced face aversions in social situations.

Kubicek (1980) described a similar interchange between a mother and each of her 16-week-old twin sons. Similar to Stern's observations, Kubicek noted that the interaction between mother and one twin was characterized by a lack of reciprocal attentiveness, as well as frequent active avoidance behaviors on the part of the infant (e.g., head turns). Interaction with the other twin, however, was described as much more mutual. Approximately two years later, the first twin was diagnosed as autistic while no problems were noted with the other son. In more extreme cases then, gaze aversion may be associated with pathological outcomes.

In a more subtle situation, Thoman (1975) provided an insightful description of how even a "normal" infant can disrupt the ongoing interactive process through gaze aversion. In a study designed to explore the general characteristics of infant-caregiver interaction from birth, Thoman and her colleagues

(Thoman et al., 1973, reported in Thoman, 1975) observed one infant who was uncommonly inattentive during social interactions. The infant consistently exhibited a dazed stare or drowsiness anytime he was picked up and held. Thoman (1975) followed the case and found that maternal visual attention to this infant showed a substantial decrease over the first five weeks of the infant's life.

In general, all of these studies illustrate that eye-to-eye contact serves as a form of early communication that has implications for subsequent social processes. It may also be suggested from these data that the outcome is to some degree mediated by maternal attitudes and adaptation to the visual tendencies of her infant (Brazelton et al., 1974).

In accordance with this idea, one study proposed to examine the impact of infant gaze aversion upon specific maternal behaviors using a larger sample than had previously been reported (Noble, Shafaie, & Self, 1982). In addition, this study was unique in its exploration of this issue during the neonatal period, and in its assessment of neonatal vocal and tactile behaviors as these behaviors were associated with infant gaze behaviors. Mothers and their newborns were videotaped while engaged in nonfeeding interaction on each of the first three days after birth. Specific maternal and infant behaviors were coded and assessed relative to the degree of visual attentiveness evidenced by the infants. The results indicated that mothers and newborns are more actively involved with one another in other modalities (vocal and tactile) when visual regard is more frequent. The implication is that visual contact serves as a signal of readiness for interaction (Hutt & Ounsted, 1966), and that given such contact, mothers and neonates enhance their interaction through behaviors in the vocal and tactile modalities. This was particularly true in the case of first-born male infants (Noble et al., 1982). In addition, based on other studies, it may be expected that facial expressions will become more elaborated in the context of mutual visual regard (Kaye & Fogel, 1980).

Gender Influences in Mother-Infant Interaction

Infant gender has also been implicated as an important variable in mother-infant interaction. Research has supported differential maternal treatment of infants in accordance with gender, as well as differential social behavior by infants in accordance with gender.

Studies with older infants often report sex differences in maternal visual, vocal, and tactile behaviors. At 3 weeks, mothers have been shown to look at and stimulate their male infants more than their females (Moss, 1967). By 3 months, some of these differences have disappeared, although mothers are reported at this time to hold their male infants longer and vocalize more to their females (Lewis, 1972, Lewis & Freedle, 1973). Likewise, sex differences in infant behaviors are reported during this period. At 3, 6, and 9 months, boys are more responsive to social stimuli (Lewis, 1969; Moss & Robson, 1968), although females are more responsive to their mothers' vocalizations (Gunnar & Donahue, 1980).

Data with newborn samples are less consistent with regard to sex differences. Self et al. (1981) found no differences in maternal treatment of males versus females in naturalistic interaction over the first three days of life. Noble et al. (1982) however, found that mothers engaged in longer vocalizations and more tactile contact with their male newborns, but only those males who attended more frequently to mothers. Similarly, Rosenthal (1980) found that mothers responded more to vocalizations in their newborn females and to movement in their newborn males. Parke, O'Leary, & West (1972) reported that mothers touched their male newborns more, while Brown, Bakeman, Snyder, Frederickson, Morgan, & Hepler (1975) found that males received more tactile and vocal stimulation from mothers than did females. Thoman et al. (1972b), in the only study reported in a feeding context, found that firstborn girls were talked to more. These data on sex differences in maternal treatment during the newborn period have been more variable and may be related to maternal parity more during this period than later (Thoman et al., 1972b). There have been no studies to date to report sex differences in the spontaneous social behaviors of newborns.

Alterations in Interaction

One final source of data with regard to interactive feedback comes from those studies which have employed experimental manipulations of maternal behaviors. Infant responses to these alterations in maternal behavior are noted in order to infer whether the infant had some expectation about what should have or should not have happened. These studies have most commonly used some version of the "still-face" paradigm first introduced by Brazelton and his colleagues (Brazelton et al., 1975). During the procedure, mothers are instructed to remain silent and facially unresponsive while gazing at their infants. This produces a distortion of "normal" feedback to the infant and has been shown to have a reliable effect on infants as early as 1 month of age, although Brazelton has argued that a similar phenomenon can be noted with newborns (cited in Lamb, 1981). In addition, infants have been observed to respond to changes in more subtle aspects of interaction, such as changes in maternal pace (Arco & McCluskey, 1981) and maternal mood (Tronick, Ricks, & Cohn, 1982).

Few researchers have used neonatal samples in studies of this sort. Arco and her colleagues reported two such studies (Arco, 1977; Arco et al., 1979). Arco (1977) employed an experimental procedure in order to examine the effect on neonatal social visual behaviors of response dependent versus response independent maternal stimulation. The results indicated that both manipulations of maternal behavior, response dependent and independent resulted in decreased infant visual regard of mother. These data contrasted the results of another study (Arco et al., 1979) in which it was found that increased maternal visual regard had an enhancing effect on infant regard of mother.

According to Arco (1977), the different results may have been due to differences in the two samples in their baseline behaviors. When baseline rates of infant visual regard were low, the manipulation had a heightening effect on infant visual behaviors. When baseline rates were high, however, the effect was one of decrement. Although Arco (1977) does not address this issue, these results are also consistent with Field's (1977) data with older infants in which she found similar effects as a function of overstimulation of the infant.

More commonly, studies of this type have utilized older infants in their sample and have employed some version of a "still-face" paradigm. Tronick and his colleagues (Tronick et al., 1978) had mothers either interact naturally or remain still-faced with their infants who ranged in age from 1 to 4 months. Videotapes allowed detailed observations of the resultant interactions and Tronick et al. found contrasts between infant behaviors in the natural and still-face conditions. When mothers were unresponsive, the infants reacted as though they were appropriately affected by the disturbance in interaction. As compared to their behaviors in natural interaction, infants in the still-face condition smiled less, oriented their eyes and head toward mothers less, and slumped down in their seats more frequently. Further observation revealed the seriousness of the disturbance; the infants reacted with intense wariness and eventual withdrawal. Tronick et al. (1978) also reported anecdotal evidence of this same pattern in infants as young as 2 weeks of age.

Several researchers have reported similar results, including Field (1977) who used a slightly different, "overstimulation" paradigm. In addition, she was interested in how neonatal status would affect these findings and therefore, included premature, normal term, and postmature infants in her study. She instructed mothers to engage their infants (who were 3-1/2 months post expected date of delivery at the time) in one of three ways: (a) a spontanous condition where mothers were to interact with their infants normally; (b) an attention-getting condition in which mothers were to attempt to keep their infants looking at them and; (c) an imitation condition in which mothers were asked to imitate all of their infants' behaviors as these behaviors occurred. All infants received all conditions; order of presentation was counterbalanced. Dependent measures included the percentage of interaction time that the infant gazed at mother, the percentage of infant gaze-away time during which mother was behaviorally active, and the percentage of infant gaze time that mother was performing one of six particular behaviors (gaze away, talking, smiling, poking, caretaking, or game playing).

The results indicated that the maternal attention-getting and imitation conditions each had an impact on infant behaviors, primarily through the way these situations modified maternal behaviors. The attention-getting situation resulted in increased maternal activity and decreased infant gaze, whereas the opposite occurred in the imitation condition. Imitation decreased maternal activity and increased infant gaze. According to Field, imitation facilitated the interaction because it required greater attentiveness and contingent responsiveness from mothers and was less demanding in terms of information processing for the infant. The attention-getting manipulation, however, appeared to produce an "information-overload" for the infant, resulting in a greater percentage of time looking away. Gaze aversion in this instance, may have represented the infant's way of breaking the flow of the interaction in order to process information (Field, 1977). Field reported that these findings held for all three groups of infants, but were most pronounced for the two at-risk populations.

Other researchers have used similar procedures and found similar results (Crnic, Ragozin, Greenberg, Robinson, & Basham, 1983; Field, 1979; Fogel, Diamond, Langhorst, & Demos, 1982; Trevarthen, 1977). Additional information has been provided by some of these studies, particularly concerning the infants' physiological responses which occur concomitantly with their behavioral reaction. Field (1979), for example, found that the infant's behavioral reaction to an unresponsive mother is accompanied by a particular physiological reaction. In association with gaze aversion, she found an elevated heart rate, which she suggested is indicative of an aversive response.

In order to explore the relationship between behavioral and physiological responses more closely, Field (1981a) reported the results of a study designed to investigate the temporal relationship between gaze aversion and heart rate in the face-to-face interactions of infant-caregiver dyads. She utilized a paradigm which included both a still-face condition and an atttention-getting condition since both had previously been associated with gaze aversion.

Several important findings emerged from this study. First, Field (1981a) replicated earlier studies which noted increased gaze aversion in association with maternal attention-getting behaviors and nonresponsiveness (still-face). In addition, these two conditions were found to be associated with elevations in tonic heart rate. Temporal analysis revealed that heart rate acceleration occurred prior to gaze aversion and associated limb movements. Likewise, gaze aversion was followed by a deceleratory trend in heart rate which may be due to an arousal modulating response, or an orienting-elsewhere response (Field, 1981a). These data then, supported Field's (1977) proposal that non-optimal stimulation produces a stimulus situation which is arousal inducing for the infant. The longer the situation persists, according to Field, the greater the infant's arousal. Similarly, Fogel et al. (1982) found that infants may take a period of time to return to "normal" interaction even after mother's behavior returns to normal.

In another related study, Arco and McCluskey (1981) found that 3- and 5-month-old infants are aware of even more subtle changes in maternal behaviors. These researchers had mothers slow down and speed up their natural pace of play with their infants; temporal patterning was thus altered and infant reactions to these alterations were observed. The results revealed that both the younger and older infants recognized these pace changes and responded differentially to the various conditions. The natural temporal pattern was associated with the most positive interactions, characterized by high levels of infant social behaviors and mother-infant interactive variables. High levels of these behaviors were also apparent in the phase of faster-paced play, particularly as compared to the slow-paced interactions. There was evidence that the order of presentation of each play pace may have had an effect and in some instances, infant recovery time (return to baseline behaviors) was quite prolonged. These data, according to Arco and McCluskey, support the hypothesis that infants are able to estimate temporal patterns and have some expectancies about the appropriateness of pacing in interactions as early as 3 months of age.

Infants at 3 months of age have also been shown to be responsive to changes in maternal mood (Tronick et al., 1982). During normal interaction, mothers were asked to simulate a depressed mood and infant affective responses to this change in interaction were noted. The results indicated less positive, and more negative, infant behaviors in the depressed condition as compared to normal interaction. The organization of infant behaviors was also markedly different in each of these conditions. Infants, while in the depressed condition, transitioned in a "loosely organized way" among the predominantly negative behaviors. In the normal condition, cycling was smoother among the primarily positive behaviors. Infants who attempted to elicit maternal responses in the depressed condition and were unsuccessful averted gaze and thereby disengaged. These data indicated that infants confronted with unexpected behaviors (depressed condition) remained appreciably more wary even after mothers returned to normal (Fogel et al., 1982).

One of the important implications of these various studies has to do with baseline behaviors. Brazelton (cited in Stoller & Field, 1982) has commented that the still-face situation, for example, may actually have the effect of increasing infant attentiveness in cases where maternal behavior is normally overstimulating. Indeed, Field (reported in Stoller & Field, 1982) reported data which support this argument. She found that an attention-getting manipulation increased infant attentiveness for a group of infants whose mothers' baseline behaviors were suppressed. Likewise, Tronick, Ricks, and Cohn (1982) reported that in a stressful situation, infants whose mothers were either over- or under-controlling were less likely to make positive attempts to engage mother than were infants whose mothers were responsive to their infants' actions. These data suggest that initial maternal sensitivity and style, or control, are related to infant reactions in a subsequent stressful situation.

Studies by Arco and her colleagues (Arco, 1977; Arco et al., 1979) indicated that infant baseline behaviors are also critical. She found differential effects on infant visual behaviors of alterations in maternal behaviors dependent on baseline levels of infant visual behaviors. When baseline rates were low, a facilitative effect was obtained (Arco et al., 1979) and when baseline rates were high, the manipulation had a detrimental effect on infant visual engagement with mothers (Arco, 1977).

In addition, these data highlight what may be a very serious confound in these studies. The assumption has been that infant reactions to changes in maternal behaviors results in a violation of expectancy which is arousal producing and leads to infant behaviors designed to reduce the arousal (e.g., gaze aversion). Based on Field's data (1977) however, an equally plausible explanation is that the infant looks away simply because he/she is over- or under-stimulated. Few studies using the "still-face" paradigm have examined this possibility. This issue could be especially critical during the neonatal period when the infant has less control over physiological and psychological states of arousal (Als, 1979). It may be predicted that gaze aversion, as a response to over- or under-stimulation, will be even more pronounced during this early period of life. This hypothesis is consistent with findings that 3-month-old and 4-month-old preterms are more susceptible to this effect than similarly-aged full terms (Crnic et al., 1983; Field, 1977). Maturation seems to attenuate this effect by the age of 8 months (Crnic et al., 1983).

Infant Arousal in Mother-Infant Interaction

Sroufe (1979) and his colleagues (Sroufe & Waters, 1976) have proposed a tension relief model to explain these data. This model suggests that a particular behavior (e.g., a smile) is emitted by the infant once tension surpasses some hypothetical threshold. In accordance with this model, Fogel et al. (1982) manipulated this by having mothers assume a still-face condition following either the first look (beginning of excitation) or the first smile (tension release). Naturalistic interaction preceeded and followed the manipulation phase for all infants in the study. As expected by Fogel et al. (1982), the still-face following the first look resulted in more infant distress behaviors (e.g., gaze aversion, fussing) than when it followed the first smile. Infants in the latter condition were presumably ready to terminate interaction, whereas the former group of infants were not. Stoller and Field (1982) obtained similar results in their replication study. They included heart rate data, however, and found results which contradict what would be expected given Sroufe's (1979) model.

Field (1981b) has offered an alternative model based on differential thresholds and ranges of responsivity to stimulation. Field and her colleagues (Field, 1982; Stoller & Field, 1982) have tested the model and the results have been generally supportive. Field (1982), for example, compared the attention and aversion thresholds of groups of term, postterm, and preterm infants observed in the context of a game playing manipulation. Specifically, a period of natural interaction was followed by a game playing period during which mothers were instructed to play a particular game repeatedly until the infant laughed. In this way, Field (1982) hoped to determine the infants' thresholds to laughter and at the same time, assess the probability that some rejecting or aversive response would follow, indicating that a hypothetical upper limit had been exceeded.

The results were complex, but supportive of Field's (1981b) model. The preterm infants required the greatest number of repetitions before laughing, postterm infants the fewest. Both of these high-risk groups however, were more likely than the term infants to subsequently avert gaze or cry. These data suggest that different thresholds were operative for each of the groups. Adding to the complexity however, were the findings concerning maternal behaviors in spontaneous interaction and in the game-playing situation. Mothers in the two at-risk groups were less likely to spontaneously play games and when they did, were more restrictive in the variety of games they played as compared to mothers of term infants. In the game-playing situation, mothers of at-risk infants were more likely to persist in stimulating the infant even following an aversive response by the infant. Field (1982) concluded that it is difficult to determine the origins of the problem in high-risk dyads, but suggested:

> There appears to be a relationship between the infant's ability to modulate arousal with smiles and laughter without reverting to gaze aversion and crying and the mother's immediate reduction in stimulation following the smiling and laughing behaviors. (p. 120)

The implications of this model during the neonatal period have yet to be assessed.

In summary, this section of the paper has attempted to review research which has examined the earliest period during which the infant is aware of alterations in mother's role in the interaction. These data are important in that they provide information about the kinds of behaviors, particularly maternal behaviors, which seem to facilitate interaction. Unfortunately, there have been no studies to address this issue in the neonatal period despite the possibility that using a manipulation of maternal behaviors with neonates might allow a test of the expectancy-arousal hypothesis versus the over-/under-stimulation hypothesis. Since there are no data to suggest that neonates have an expectancy based on prior interaction, any effect due to alterations in maternal behavior are more plausibly attributed to over- or under-stimulation. In addition, by using a baseline-manipulation-return to baseline procedure, a direct assessment of this question is possible.

Statement of the Problem and Hypotheses

Although the preceding review of the literature indicates that much is known about the role of visual behaviors in early mother-infant interaction and its consequences for later development, many questions remain unanswered. One important area which is relatively unexplored focuses on the neonatal period. Few researchers have examined visual communication between mothers and their neonates. The few exceptions have shown that mothers and their neonates are actively involved with one another in the visual modality and other modalities as well (Self et al., 1981). Studies have also suggested that these post-partum interactions may have important implications for the future (Noble et al., 1982, 1983). The present study represents an attempt to extend our understanding of interaction during the neonatal period by addressing certain issues suggested to be important with older infants.

Specifically, one purpose of the present study was to examine the extent to which neonates are responsive to alterations in maternal behaviors. Given data with older infants which reveal that at least by 3 months, infants may become distressed over maternal behaviors which are either unexpected or noncontingent

(Field, 1977; Tronick et al., 1978), and the suggested consequences of this (Stern, 1971), it seems critical to determine whether similar responses occur during the newborn period. There is some suggestion that this is the case as neonates have been shown to respond to changes in maternal visual and vocal behaviors in the feeding context (Arco, 1977; Arco et al., 1979). The present study sought to assess whether neonates are responsive to alterations in levels of maternal stimulation in the context of social interaction. In addition, since it can hardly be argued that the neonate has built up expectations in the context of social interactive sequences, the present study also provides the possibility of exploring the adequacy of an expectancy model versus one which postulates some tension threshold (Sroufe, 1979) or a range of responsivity (Field, 1981b). Since an ABA design was employed, in which Phase II consisted of asking mothers to increase stimulation levels, any infant behaviors exhibited in response to this manipulation can reasonably be attributed to changes in stimulation rather than to a break in the infant's expectations.

Because there was little evidence available in the neonatal period, hypotheses concerning the effects of the manipulation upon infant behaviors were based primarily on studies with older infants. It was suggested, based on the tension reduction models of Sroufe (1979) and Field (1981b), that any effects due to increased arousal found with older infants should be amplified with newborns. Arco's data (1977) provide some support for this prediction, although she did not examine her data from the point of view of over- versus under-stimulation. Less clear were predictions concerning any enhancement effects such as those obtained by Arco et al. (1979). Thus, the following predictions were made concerning the effects on infant behaviors, particularly visual behaviors, of altering maternal behaviors in the context of interaction.

Overall, phase-by-group interactions were expected such that the three experimental groups were predicted to differ significantly from the control group during the experimental phase. In addition, within each experimental group, certain results were expected dependent on which infant behavioral modality was the focus of observation. These specific predictions will now be presented.

For the group experiencing increased maternal visual stimulation during the experimental phase (Visual only), only differences in infant visual behaviors as a function of phase were expected. Based on the findings of Arco et al. (1979), increased maternal visual regard of the infant was expected to elicit increased neonatal visual regard of mother. Thus, infants in this group were expected to evidence longer durations of visual engagement than infants in either of the other two experimental groups or the control group. No other effects, either vocal or tactile, were predicted for this particular group.

For the group experiencing increased maternal vocal stimulation during the experimental phase (Vocal only), differences were expected for both visual and vocal neonatal behaviors. Although no significant differences were predicted as a function of phase alone, a significant sex-by-phase-by-condition interaction was expected, and is based on previous data which indicate that females are more responsive to maternal vocal behaviors (Gunnar & Donahue, 1980). For this study, it was expected that females would exhibit heightened responsivity to maternal vocal behaviors by engaging in more, and longer, vocal and visual sequences during the experimental phase. Male infants in this group, however, were expected to remain relatively stable in terms of their visual, vocal, and tactile behaviors from baseline to manipulation.

For the neonatal group experiencing both increased visual and vocal regard by their mothers, the effects were expected to parallel those obtained by Field (1977) with 3-1/2-month old infants. A significant interaction effect was expected to occur such that these infants would engage in fewer and shorter visual attentive behaviors during the experimental phase as compared to the baseline and return-to-baseline phases. In addition, it was predicted that this effect would be most pronounced for male infants. This prediction is based on Field's (1977, 1979) suggestion that maternal overstimulation produces decreased visual attention because the infant is unable to modulate stimulation adequately. Further, Field (1979) found that preterm males were most susceptible, presumably because these infants are less physiologically mature than their normal-term or pre-term female or normal-term male peers. Similar effects were expected with the present sample since only newborns were utilized and again, their physiological maturity is not yet complete. This was expected to be particularly true for males in the sample. In addition, for the same reasons, it was expected that males would have more difficulty re-establishing an optimal state during the return-to-baseline phase. No other differences in either infant vocal or tactile behaviors were expected in this group.

Finally, for the control group, no particular differences were predicted to occur as a function of sex or phase. Rather, these infants were expected to remain relatively stable in behaviors across the entire videotape session.

CHAPTER II

METHOD

Subjects

Subjects for this study were obtained at a local university-affiliated hospital. Mothers were approached on the first or second day after birth and asked to participate. Only mothers of first-born infants, determined through reference to hospital records to be full-term and to have experienced no pre- or post-natal complications, were approached. Of the approximately 88 mothers who were contacted, 78% agreed to participate in the study.

Of the total of 69 mothers who agreed to participate, 40 dyads (20 males, 20 females) were included in the final sample. Data from approximately 11 mother-infant dyads were eliminated due to various technical problems. The most common reasons included failure to communicate instructions adequately to the mothers or the infant became too fussy or sleepy during the procedure. The remaining dyads which were lost occurred prior to videotaping for such reasons as early release from the hospital or mother changing her mind about participating in the study. The final sample of 40 dyads consisted of infants who ranged in age from 25 to 57 hours of age. The average age was 43 hours. In addition, 47.5% of the mothers breast-fed their infants; 47.5% bottle-fed; and 2 mothers, or 5%, employed both breast- and bottle-feeding. The sample was 70% Caucasian, 25% Black, and 5% other (Mexican-American, Indian) in terms of racial identity. Finally, as noted earlier, all mothers were primiparae; no multiparous mothers were included in the study by design.

Procedure

The experimental procedure occurred in the mother's hospital room and was basically an adaptation of the procedure used by Arco et al. (1979). A three-phase (ABA) paradigm was utilized and the general instructions to mothers included three parts: (a) "Try to keep your baby in a position in which he/she can see your face if he/she wishes."; (b) "Do not worry if your baby should cry; we do not expect you to keep that from happening."; (c) "There will be three parts to the study. In the first part, we just want you to play with your baby as you would if we were not in the room. In the second part, we will ask you to do something in particular." Mothers were then instructed to begin. The interactions were videotaped initially for four minutes and videotaping began whenever the observer judged that mother was comfortable with the observer's and the camera's presence.

After four minutes, the videotape was halted and mothers were given particular instructions in accordance with the design. The instructions depended on which of four groups the dyad had been randomly assigned prior to beginning the procedure. Group 1 was the experimental Increased Visual condition. Mothers in this group were asked during Phase II to look at their infants more than they had during the previous four minutes. Group 2 comprised the experimental Increased Vocal condition. Mothers in this group were asked to talk to their infants more than they had during the preceding four minutes. For the third experimental group, Increased Visual and Vocal, mothers were asked to increase both visual and vocal regard of their infants over the preceding four minutes. The fourth group constituted the Control group and mothers in this group were simply encouraged to continue playing with their infants in the manner they had been for the preceding four minutes.

Phase III of the procedure consisted of a return-to-baseline period. After four minutes of Phase II, the videotape was stopped once again and mothers were encouraged in Groups 1 to 3 to return to their natural style of play, while mothers in Group 4 were asked asked to continue as they had. Phase III was also videotaped in its entirety.

In most cases, videotaping was completed without pauses, other than those required for providing instructions to mothers. There were some exceptions however, where short breaks had to be included due to infant fussiness, phone calls, doctors making rounds, etc. In all instances, where possible, pauses were introduced between phases; there were no cases where taping was delayed into the following day.

Following the completion of the procedure, mothers were debriefed about the purpose of the study. No information was provided however, about her performance, or her newborn's performance, relative to other participants in the study. Mothers were given the option of scheduling a subsequent date to view the videotapes; few chose to do this and none of the mothers who did indicate an interest pursued it later.

Coding

Two observers were trained, and coded the videotapes independently according to a version of the microanalytic method of DeMeis, Francis, Arco, and Self (1984). The Observational System Event Recorder, Model OS3, was used to facilitate continuous scoring precision. In addition to allowing continuous recording of events, this instrument provides raw data and summary statistics for each behavior coded. The summary statistics provided include frequency, mean duration, standard deviation of duration and minimum and maximum durations for each event.

The coding method used in this study allows multiple measures of maternal and neonate behaviors. Each video segment (Phase) was coded a total of six times. Three modalities (visual, vocal, and tactile) were scored separately for each partner. A total of seven basic behavioral categories were scored: Initiate, Monitor, Action, Terminate, Off, Other and On Other. Certain adjustments were made to these categories in accordance with which modality was being observed. This allowed the observation of particular behaviors within a modality which may not have been of interest in another modality. A detailed description of each behavior within each modality for both infant and mother are provided in Appendices A and B, respectively. Both the average duration and frequency for each behavior were noted and used in a variety of statistical analyses to be reported in a subsequent section.

Interobserver reliability was computed for each behavioral category within each modality by calculating the percent of total agreement. Similar to past research which examined the visual behaviors of infants, reliability for the duration of visual behaviors in the current study was calculated by dividing the total number of seconds of agreement by the number of second of agreement plus disagreement. The reliability for the frequency measures was calculated by dividing the lesser frequency of occurrence of a behavior by the frequency of occurrence recorded by the other observer. While less conservative measures (e.g., Pearson product moment correlation) could have been used (Newton, Reed, Kanai, & Self, 1974), it was felt that the agreement/disagreement method was more appropriate for these data. For maternal visual, vocal, and tactile behaviors, average reliability estimates were .93, .95, and .71, respectively. For neonatal behaviors, average reliability estimates for the visual and tactile modalities were .88 and .84, respectively. No reliability estimates are reported for neonatal vocal behaviors since these were eliminated.

<u>Summary</u>

The present study was designed to examine the impact of alterations in maternal behaviors upon neonatal behaviors, especially newborn visual behaviors. Male and female neonates were randomly assigned to one of four conditions: Visual, Vocal, Visual + Vocal, or Control. Videotapes were made of interaction as the dyad moved through a three-phase experimental procedure: Baseline, Manipulation, Return-to-Baseline. The design is illustrated in Table 1. Maternal and infant behaviors in each phase and condition combination were coded, with reference to seven basic behavioral categories. Dependent measures included the average frequency and duration of each behavior for both mother and infant in the visual, vocal, and tactile modalities. As such, the results of analyses of maternal behaviors will be reported separately from those of analyses of infant behaviors. Maternal behaviors were observed in order to assess whether mothers followed experimental instructions. Infant behaviors were analyzed with reference to the impact of alterations in maternal visual and vocal interactive stimulation. The results of these analyses are reported first and are followed by the results of analyses of maternal behaviors.

Table 1

Design of Study

		Experimental Condition											
		Visual			Vocal			Visual + Vocal			Control		
	Phase	1	2	3	1	2	3	1	2	3	1	2	3
Infant Sex													
Male			5			5			5			5	
Female			5			5			5			5	

* Figures indicate number of subjects contained in each cell.

CHAPTER III

RESULTS

Description of Data Analyses

In order to examine the primary hypotheses, data were analyzed in accordance with a Condition-by-Phase (4 X 2) repeated measures design with phase as the within-subject variable and condition as the between-subject variable. In actuality, two sets of multivariate analyses were performed--one set focused on analyses of neonatal behaviors and the second set on analyses of maternal behaviors. In addition, within each of these primary analyses, the data for visual, vocal and tactile behaviors were analyzed separately. Frequency and duration measures were computed for each behavior of interest and these were also analyzed independently. In the section to follow, the results of analyses of neonatal behaviors will be presented first and will be followed by the results of analyses of maternal behaviors. All of the raw data for this study are shown in Appendix C.

Analyses of Neonatal Behaviors

As noted, analyses of infant behaviors proceeded separately for each modality. The frequency and duration of various infant behaviors comprised the dependent measures; these behaviors are defined in Appendix A. Contrary to the initial proposal however, only two modalities were utilized in the final data analyses. Coding revealed that this sample of newborns was relatively inactive in the vocal modality and, therefore, infant behaviors in this modality were subsequently eliminated. Only visual and tactile behaviors were subjected to data analyses and visual behaviors were of primary interest. Initial analyses were performed in order to determine whether infant visual or tactile behaviors were differentiated according to infant sex. Following these initial analyses, the data were subjected to examination for condition and phase effects. Results of analyses of infant behaviors in the visual and tactile modalities will now be presented.

Visual behaviors. Initial analyses for the effects of infant sex on infant visual behaviors utilized the frequency and duration of the following behaviors as dependent measures: Initiate, monitor, terminate, off, and on other. Infant visual action was eliminated from these analyses due to infrequent occurrence and short durations. Analysis of the duration measures revealed no significant effects. The frequency measures however, indicated a significant effect due to sex, $F\ (5, 114) = 4.01$, $p. < .002$, for the following dependent measures:

Terminate, $F\ (1, 118) = 5.78$, $p. < .017$

Off, $F\ (1, 118) = 7.21$, $p. < .008$

On other, $F\ (1, 118) = 14.75$, $p. < .0002$.

In addition, the measure of initiate approached significance in univariate analyses, $F(1, 118) = 3.13$, $p < .080$. Examination of the means for these measures indicated that females more frequently ended visual interactions and became nonengaged as compared to males, even though no differences were significant with regard to which gender more frequently initiated visual interactions with mothers. In addition, females were shown to be more frequently engaged with environmental stimuli than males. The results of these analyses and the corresponding descriptive statistics by sex are shown in Appendix D.

Because sex differences emerged in these initial analyses, this factor was included in subsequent analyses of visual behaviors for condition and phase effects. Condition-by-Phase-by-Sex (4 X 2 X 2) multivariate repeated measures analyses of variance were thus performed using frequency and duration measures of the following dependent variables: Initiate, monitor, terminate, off, and on other. Infant visual action was eliminated due to infrequent occurrence and short durations. For the duration measures of infant visual activity, only the main effect due to phase approached significance, $F(10, 120) = 1.75$, $p < .078$. As such, no univariates were indicated for this effect.

For the frequency measures of infant visual behaviors, two significant effects were found. A main effect due to phase, $F(10, 120) = 2.02$, $p < .037$ was obtained. In this case, the following dependent measures were significant:

Monitor, $F(2, 64) = 5.30$, $p. < .007$

Terminate, $F(2, 64) = 3.21$, $p. < .046$

Off, $F(2, 64) = 3.86$, $p. < .026$

On other, $F(2, 64) = 3.04$, $p. < .054$

These univariates were subsequently subjected to examination by individual comparisons. For the measure of visual monitor, these comparisons revealed that this behavior occurred significantly less often during the return-to-baseline phase of the procedure. For the measures of infant visual off and on other, individual comparisons revealed differences only between the initial and final phases. Thus, infants were less likely to engage in these behaviors in Phase III as compared to Phase I of the procedure. These data overall, suggest that this sample of newborns became significantly less active in the visual modality as the procedure progressed.

In addition, for the frequency measures, the 2-way interaction of condition and sex approached significance, $F(15, 77) = 1.75$, $p. < .059$. For the interaction however, no significant univariates were obtained in subsequent analyses. No other interactions were found to be significant. The results for the Condition by Phase analyses of the frequency and duration measures of infant visual behaviors and the corresponding descriptive statistics and individual comparisons are shown in Appendix E.

Tactile behaviors. Neonatal tactile behaviors were first examined with regard to effects due to infant sex. Dependent measures for these analyses included the frequency and duration of initiate, monitor, action, terminate, and off. Although no effects due to sex were found for the frequency measures, a significant effect due to sex was obtained for the duration measures of neonatal tactile behaviors, $F(5, 114) = 3.53$, $p < .005$. For this effect, subsequent analyses indicated that the following univariates attained significance: Monitor, $F(1, 118) = 13.76$, $p < .0003$; and off, $F(1, 118) = 11.83$, $p < .0008$. Male infants were significantly more likely than females to engage in prolonged tactile contact with their mothers. Female newborns in this sample were nonengaged in the tactile modality for more extended periods of time. The results of the analyses for effects due to sex for infant tactile behaviors and the corresponding descriptive statistics are shown in Appendix F.

As a result of the significant effect due to infant sex, this factor was included in subsequent Condition-by-Phase-by-Sex (4 X 2 X 2) multivariate repeated measures analyses. These analyses were computed for the frequency and duration measures of the following infant tactile behaviors: Initiate, monitor, action, terminate, and off. For the duration measures, no significant effects were obtained. For the frequency measures, the 3-way interaction of condition, phase and sex emerged as a significant influence, $F(30, 242) = 1.56$, $p < .037$. No other interactions were significant, nor were any main effects obtained. Further, subsequent analyses of the 3-way interaction indicated that none of the univariate measures were significantly influenced by the combination of these three factors. The results of the Condition-by-Phase-by-Sex analyses of infant tactile behaviors and the corresponding descriptive statistics are shown in Appendix G.

To summarize the results of analyses of neonatal behaviors, there was little evidence that the experimental manipulation had significantly influenced infant behaviors in either the visual or tactile modality. Rather, the only factors which had any impact were infant sex and phase. Significant effects were found which suggested that male newborns were more actively engaged in the tactile modality and were less likely to be nonengaged in the visual modality as compared to females, whose attention was more likely to be environmentally focused. Also, the phase effects suggested that neonatal visual activity generally decreased across the three phases of the study.

Additional Analyses

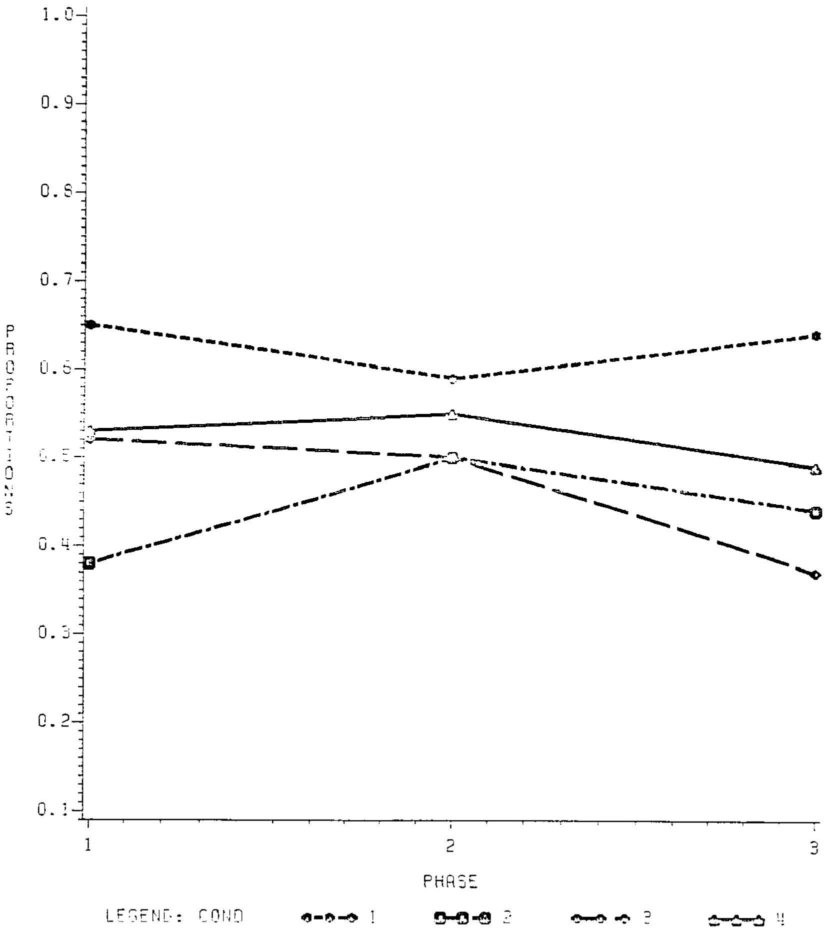
In order to further explore the data for neonatal visual activity, additional analyses were included. Two derived variables consisting of the proportion of total visual activity directed toward mother rather than the environment (frequency and duration) were used as dependent measures in two post-hoc Condition-by-Phase-by-Sex (4 X 2 X 2) analyses of variance. Thus, infant visual behaviors directed toward mother (initiate, monitor, action) were combined and divided by total alert activity (all visual behaviors combined). In this case, nonengagement (off) was not included since experimental interest was in alert activity only.

A main effect due to phase was found for the duration measure $F (2, 64) = 3.58, p. < .034$. Individual comparisons were performed on the means for this effect and revealed that the proportion of time spent looking at mother was signficantly greater during the manipulation phase as compared to the return-to-baseline phase. No other significant effects were obtained for the duration measure.

For the derived frequency measure of infant visual behaviors, one significant effect was found, an effect due to the interaction of condition and phase, $F (6, 64) = 2.69, p. < .022$. This interaction is depicted in Figure 1. Individual comparisons were performed on those means which were thought to account for the differences. These comparisons indicated several differences among these means. Figure 1 illustrates the differences which emerged between the control condition and all other conditions during the baseline phase. Specifically, newborns of mothers in the increased vocal condition exhibited the lowest proportion of visual behaviors directed toward mother; this group differed significantly from the control condition. Infants exhibiting the highest proportion of visual activity directed toward mothers during baseline were those infants whose mothers were assigned to the increased visual condition. These infants had significantly higher proportions than infants in the control condition. These differences, which were apparent from the beginning, may help explain the lack of significant effects

FIGURE 1

DERIVED VARIABLE FOR THE FREQUENCY MEASURES
INFANT VISUAL BEHAVIORS
MEANS FOR THE INTERACTION OF CONDITION AND PHASE



CONDITIONS: 1=VISUAL INCREASE, 2=VOCAL INCREASE
3=VISUAL+VOCAL INCREASE, 4=CONTROL

due to the manipulation for some conditions.

Similarly, these individual comparisons indicated significant differences during the manipulation phase of the procedure. In this case, the control condition differed from all three experimental conditions. As Figure 1 shows, infants in the increased vocal condition and the increased visual + vocal condition, during Phase II, exhibited significantly lower proportions of activity directed toward mother as compared to control infants. Infants in the increased visual condition however, continued as in Phase I to engage in higher proportions of activity as compared to control infants.

Finally, these individual comparisons revealed differences during the return-to-baseline phase for infants in the various conditions. These contrasts are also apparent in Figure 1; during this phase, infants in the increased visual condition continued to evidence the highest proportion of visual behavior directed toward mothers. The proportion for this group of infants was higher than for the control group. The group of infants who exhibited the lowest proportion of visual behavior directed toward mother during this phase were those infants whose mothers had been instructed to increase their visual and vocal activity during the manipulation phase. Infants in this condition exhibited less visual activity directed toward mother than infants in the control condition.

Of greater interest however, were the differences which were revealed when certain means within conditions were compared.

Because the analyses of maternal behaviors revealed that only mothers in the increased vocal and the increased visual + vocal conditions significantly altered their behaviors during the procedure, the mean proportions for infant visual activity in these conditions were subjected to individual comparisons and only those means which appeared to account for the effect were examined. These comparisons revealed that indeed, infants in the increased vocal condition increased significantly the proportion of visual activity directed toward mother during the manipulation phase. For infants in the increased visual + vocal condition however, comparisons indicated the significant difference to be from Phase II to Phase III and consisted of a significant decrease. Infants in this condition were the only subjects to evidence a steady decline in the amount of visual activity directed toward mother. The results of the analyses of the derived measures for infant visual behaviors by Condition, Phase, and Sex are shown in Appendix H. The corresponding descriptive statistics for these analyses are also included.

To summarize the results of analyses of the derived measures of infant visual behaviors, there is some support provided for an effect due to the manipulation. Unfortunately, it is suggested that these effects may have been attenuated by differences between conditions which were apparent prior to the manipulation. Of some interest however, is the finding that infants whose mothers increased their visual and vocal activity during the manipulation were found to look less frequently at their mothers during this phase, although nonsignificantly, when proportions rather than absolute times were examined. This effect is more salient given that newborns in this condition had significantly decreased the frequency of looking at mother versus the environment by over 70% during the return-to-baseline phase as compared to the manipulation phase. Infants in the increased vocal condition however, were found to look more at their mothers during the phase where their mothers talked more.

Analyses of Maternal Behaviors

As noted, analyses of maternal behaviors in each of three modalities proceeded separately using both the frequency and duration of various maternal behaviors as dependent measures. For all three modalities, initial analyses were performed to examine any effects due to infant sex. Next, the primary analyses of maternal behaviors were performed; these allowed examination of whether mothers had followed the experimental instructions. In general, these latter analyses consisted of repeated measures multivariate analyses of variance in accordance with a Condition-by-Phase (4 X 2) design. As will be shown, however, in the case of maternal tactile behaviors, infant sex was included as a factor in a Condition-by-Phase-by-Sex (4 X 2 X 2) design due to its emergence as a significant factor in the initial analyses. The analyses, as performed for each modality, will now be presented in greater detail.

Visual behaviors. Maternal visual behaviors were initially examined with regard to whether these were influenced by the gender of the newborn. The frequency and duration of the following dependent measures were utilized in these analyses: Initiate, monitor, terminate, off, and on other. Maternal visual action was eliminated as a dependent measure due to infrequent occurrence and short durations. The analyses for effects due to infant sex produced no significant findings for either the frequency or duration measures of maternal visual behaviors. The results of these analyses and the corresponding descriptive statistics are shown in Appendix I.

Infant sex was not included in the subsequent analyses of maternal visual behaviors. The frequency and duration of the behaviors of initiate, monitor, terminate, off, and on other were utilized as dependent measures. For the duration measures, no significant effects were obtained for either condition, phase, or the interaction of these two factors. For the frequency measures, however, a main effect due to condition was obtained, $F(15, 88) = 2.03$, $p. < .022$. Subsequent univariate analyses indicated that the frequency of maternal visual off was the only dependent measure to achieve significance in this case, $F(3, 36) = 3.01$, $p. < .04$. Individual comparisons were performed on these means and indicated that those mothers who were asked during the manipulation to increase their vocalizations to their infants were more frequently visually non-engaged, especially as compared to those mothers who were instead asked to increase the amount of looking at their infants. No other main effects, nor any interactions were observed to be significant in these analyses. The results of the Condition-by-Phase analyses for maternal visual behaviors and the corresponding descriptive statistics and individual comparisons are shown in Appendix J.

Vocal behaviors. Initial analyses of maternal vocal behaviors were performed to determine whether these behaviors were significantly influenced by the sex of the newborn. Dependent measures for these analyses included the frequency and duration of the following maternal vocal behaviors: Initiate, monitor, action, terminate, and off. In this case, maternal vocal action occurred often enough to be included while maternal vocal on other did not. The vocal behaviors of this sample of mothers were not significantly affected by infant sex; therefore, this factor was eliminated in subsequent analyses of maternal vocal behaviors. The results of the analyses of maternal vocal behaviors for effects due to infant sex and the corresponding descriptive statistics are shown in Appendix K.

Maternal vocal behaviors were next examined for any effects due to condition, phase, or the interaction of these two factors. The dependent measures for these analyses included the frequency and duration of maternal vocal initiate, monitor, action, termiate, and off. For these analyses, no significant effects were obtained for the frequency measures. The duration measures, however, revealed a significant main effect due to condition, $F\ (15, 88) = 2.04$, $p. < .021$; and a significant main effect due to phase, $F\ (10, 136) = 2.50$, $p. < .009$. For the effect due to condition, subsequent univariate analyses indicated that the following three dependent measures were significantly influenced by this factor:

Initiate, F (3, 36) = 6.42, p. < .001

Terminate, F (3, 36) = 3.94, p. < .016

Off, F (3, 36) = 5.59, p. < .003

Individual comparisons were performed on the means for these three measures. The results of these comparisons revealed that for all three measures, each condition differed significantly from every other condition. Further, mothers in the increased vocal condition engaged in significantly longer vocalizations than mothers in all other groups and were also more likely to be quiet for the shortest periods of time. The opposite trend was observed for the control group.

For the main effect due to phase noted above, subsequent univariate analyses indicated that two univariates were significant: Initiate, F (2, 72) = 6.00, p. < .004; and terminate, F (2, 72) = 3.22, p. < .007. Examination of the means using individual comparisons, indicated that, for both of these measures, each phase differed significantly from every other phase. These results indicated that maternal vocal activity showed an overall increase during Phase II of the procedure. Further, there was more maternal vocal activity during Phase III than during Phase II. The results of the Condition-by-Phase analyses for maternal vocal behaviors and the corresponding descriptive statistics and individual comparisons are shown in Appendix L.

Tactile behaviors. Consistent with the visual and vocal modalities, maternal behaviors in the tactile modality were initially analyzed for any effects attributable to infant sex. Dependent measures for these analyses consisted of the frequency and duration of the following behaviors: Initiate, monitor, terminate, off, on other (gross body stimulation), and other (caretaking). Maternal tactile action was eliminated due to infrequent occurrence and short durations. In contrast to the results of analyses of maternal visual and vocal behaviors, maternal tactile behaviors were found to be significantly influenced by infant sex; for the duration measures, $F(6, 113) = 4.42$, $p < .0005$ and for the frequency measures, $F(6, 113) = 5.50$, $p < .0001$. Subsequent univariate analyses of the duration measures indicated that the following univariates were significantly influenced by infant sex: Monitor, $F(1, 118) = 13.4$, $p < .0004$; and gross body stimulation, $F(1, 118) = 17.07$, $p < .0001$. Examination of the means for these variables suggested that mothers of male infants engaged in longer durations of tactile engagement, while mothers of female newborns engaged in longer durations of gross body movements, such as rocks, jiggles, or position changes.

For the frequency measures of maternal tactile behaviors, four of the six univariates were significantly influenced by infant sex. Those which were significant included:

Initiate, $F(1, 118) = 6.91$, $p. < .010$

Terminate, $F(1, 118) = 4.83$, $p. < .030$

Off, $F(1, 118) = 6.30$, $p. < .013$

On other, $F(1, 118) = 17.40$, $p. < .0001$

In addition, the behavior of tactile monitor approached significance, $F(1, 118) = 3.73$, $p. < .056$. The means for these effects indicated that mothers more frequently engaged in tactile stimulation of their males and gross body stimulation of their females. These findings are consistent with the findings of the duration measures as well. The results of the analyses of maternal tactile behaviors for effects due to infant sex and the corresponding descriptive statistics are shown in Appendix M.

Because the factor of infant sex emerged as significant with regard to maternal tactile behaviors, subsequent analyses were performed using a Condition-by-Phase-by-Sex (4 X 2 X 2) design. Dependent measures for these analyses were the same as those above; the frequency and duration of initiate, monitor, terminate, off, on other, and other were included. Neither the frequency or duration measures of maternal tactile behaviors however, were found to be significantly influenced by condition, phase, sex, or any 2- or 3-way combination of these factors. The results of these analyses and the corresponding descriptive statistics are shown in Appendix N.

To summarize the results of analyses of maternal behaviors thus far, significant effects were obtained for maternal behaviors in all three modalities. Specifically, for the frequency measures of maternal visual behaviors, a significant effect due to condition was indicated and revealed that mothers in the increased visual condition were least frequently nonengaged in the visual modality with their newborns. Mothers in the increased vocal condition however, were much more likely to be looking somewhere other than their newborn. It should be noted, however, that mothers in this sample were highly engaged with their infants in the visual modality across all conditions of the study.

For maternal vocal behaviors, main effects due to condition and phase were found for the duration measures only. According to the means for these effects, mothers in the increased vocal condition engaged in the longest vocalizations to their infants and were least likely to be quiet for extended periods of time. Also, it was shown that maternal vocal activity generally increased during the manipulation phase of the study.

For maternal tactile behaviors multivariate analyses revealed overall that mothers were actively engaged with their infants. The type of stimulation differed however, in accordance with infant sex. Mothers were more likely to engage in stimulating behaviors with males such as stroking or poking, but with their females, mothers were more likely to engage in gross body movements. Maternal tactile behaviors were not differentiated by the factors of condition or phase or the interaction of these. Thus, the experimental manipulation had no effect on maternal tactile behaviors.

Additional Analyses

Although these results provide partial support for the contention that mothers did follow the experimental instructions, two additional sets of analyses were performed which employed two derived measures. These measures used the frequency and duration of specific maternal behaviors in the visual and vocal modalities. Specifically, individual behaviors were combined in order to derive a measure of the proportion of maternal engagement time, which was directed toward the infant versus elsewhere or being non-engaged. For the derived measure of maternal visual activity, for example, maternal visual behaviors (frequency and duration) which were directed toward her infant were combined and divided by the total amount of maternal visual activity (frequency and duration). This provided a measure of the proportion of total maternal visual activity which was directed to the infant. Likewise, for maternal vocal behaviors, a measure was derived which indicated the total proportion of interaction time during which vocalizations were directed toward the infant. In the case of maternal vocal activity, behaviors directed toward the infant were contrasted to a total activity time which included not only vocal behaviors directed toward others (e.g., the experimenter), but also quiet behaviors. This was not done for maternal visual activity primarily because there were no instances during which mothers were completely nonengaged visually (i.e., eyes closed). Thus, the two derived proportions for maternal visual activity (frequency and duration) were used as dependent measures in

Condition by Phase (4 X 2) repeated measures analyses of variance, and, the proportions of vocal activity (frequency and duration) were used similarly.

For the derived measures of maternal visual behaviors, the only significant effect found in the Condition-by-Phase analyses was for the frequency data. A significant interaction effect of condition and phase was revealed, $F(6, 72) = 2.47$, $p. < .032$. Individual comparisons were performed only for those cell means which were thought to account for the effect. These comparisons revealed that none of the differences between those means which were examined were significant. The trends in these data included increases in Phase II for the increased visual + vocal and increased vocal conditions, and for the control condition, but decreases in the proportion of visual activity from Phase I to Phase III were evidenced by mothers in the increased visual condition. Contrary to the experimental instructions, mothers in the increased visual condition decreased the amount of visual activity directed toward their newborns across the three phases of the procedure, and by Phase III the decrease was substantial. No significant effects of any other sort were obtained, nor were any significant effects found for the derived maternal visual duration measures. The results of the analyses for the derived measures of maternal visual behaviors and the corresponding descriptive statistics and individual comparisons are shown in Appendix O.

Of interest is the fact that no support was obtained for the contention that asking mothers to increase their visual regard of their infants was successful. In fact, any effects which were indicated were in a direction opposite of what was desired. Interest in this issue led to a reexamination of the means for maternal visual behaviors during the baseline phase across all conditions. Observation of these means revealed one possible reason for the direction of effects with regard to this aspect of the manipulation; mothers across all conditions were observed to be visually engaged during baseline interaction with some aspect of their newborn (face or body) approximately 236 out of 240 seconds of recorded interaction. Further, examination of the means for the derived proportion measure for the duration of maternal visual activity during the baseline phase indicates that mothers in all conditions watched their newborn's from 88 to 93% of the time. In addition, during baseline interaction, mothers in the increased visual condition were already exhibiting the highest proportion of visual activity directed toward their infant. Thus, there was little room for increase in this category of behavior.

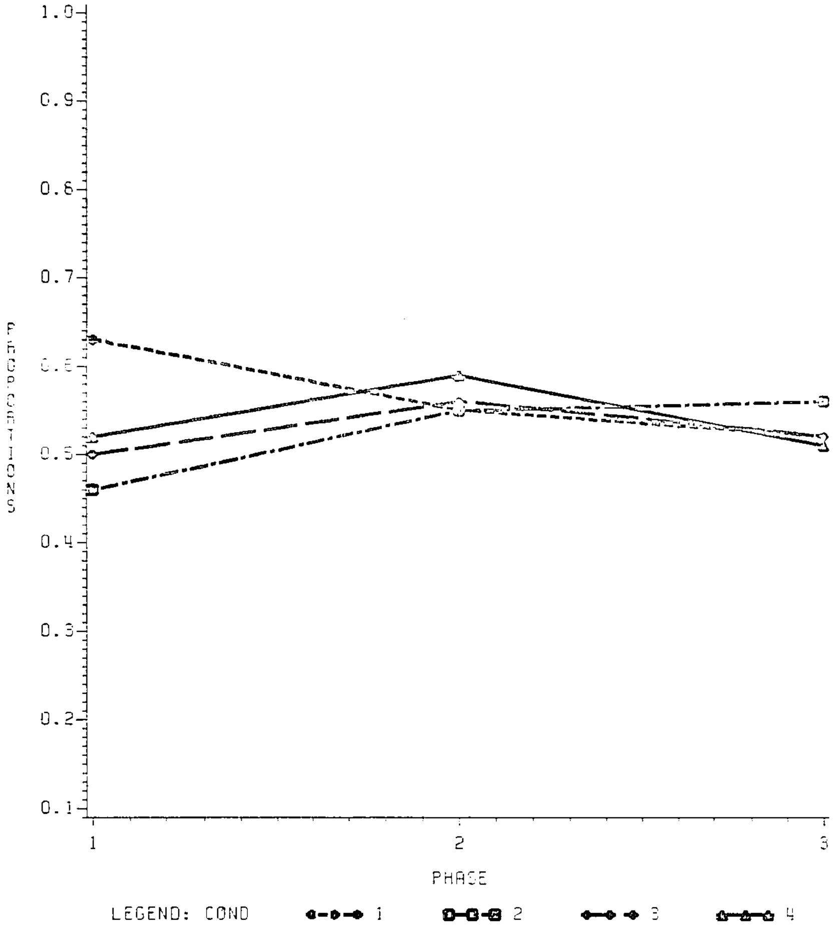
For the derived maternal vocal measures however, effects were found for both the frequency and duration data. For the frequency measure, a significant main effect due to phase, $F(2, 72) = 3.12$, $p. < .05$, was obtained. Individual comparisons were performed on these means and indicated that all three phases differed significantly from one another, with mothers' proportion of vocal activity directed toward their newborns being greatest during the manipulation phase.

Analyses of the derived vocal duration measure also revealed significant effects. Specifically, significant main effects due to condition, $F(3, 36) = 4.91$, $p. < .006$; and phase, $F(2, 72) = 10.59$, $p. < .0001$, were found. Also significant was the 2-way interaction of condition and phase, $F(6, 72) = 2.39$, $p. < .036$; therefore, only the interaction cell means were subjected to individual comparisons. The results of these comparisons are depicted in Figure 2. The increased vocal condition produced a significantly greater proportion of vocalization time directed toward the newborn as compared to baseline interaction. In addition, the increased vocal condition produced significantly greater proportions of vocalization time during the manipulation phase, as compared to the control condition for all three phases of the procedure. Differences were also revealed for the increased visual + vocal condition; it was found that the proportion of vocalization time directed toward their newborns increased significantly for this group of mothers between baseline and manipulation. No other significant differences were noted for the derived vocal duration measure. The results of the Condition-by-Phase analyses for the derived measures of maternal vocal behaviors and the corresponding descriptive statistics and individual comparisons are shown in Appendix P.

Based on the results of the analyses of the derived measures of maternal vocal behaviors, it appeared that mothers in the

FIGURE 2

DERIVED VARIABLE FOR THE FREQUENCY MEASURE
MATERNAL VOCAL BEHAVIORS
MEANS FOR THE INTERACTION OF CONDITION AND PHASE



CONDITIONS: 1=VISUAL INCREASE, 2=VOCAL INCREASE
3=VISUAL+VOCAL INCREASE, 4=CONTROL

increased vocal and the increased visual + vocal conditions were essentially the same in terms of their vocal behaviors. To examine whether this was the case, the vocal data for mothers in these two conditions were compared in terms of the numbers of vocalizations per minute. These data indicated that mothers in the increased visual + vocal condition exhibited a more dramatic increase in the number of vocalizations per minute during the manipulation phase than did mothers in the increased vocal condition. In addition, mothers in the increased visual + vocal condition, when instructed to return to "normal" during the last phase of the procedure, maintained their previously high levels of vocal stimulation, while mothers in the increased vocal condition decreased to their baseline levels. Appendix Q reveals the mean average durations, that is, total duration divided by frequency, by condition and phase, for the behaviors of initiate and off. This provides a measure of the average length of a vocalization and the average time between vocalizations by phase for mothers in each condition. From these, an estimate of the average number of vocalizations per minute was made.

These analyses provide additional support that the manipulation had its intended effect on maternal behaviors. Mothers in the increased vocal condition and in the increased visual + vocal condition were found to increase their vocal activity when instructed to do so. Although mothers in these two conditions appeared initially to be the same in terms of their vocal activity, further examination revealed this was not true.

Mothers in the increased visual + vocal condition exhibited a more dramatic increase in vocal activity which was sustained for a longer period of time as compared to mothers in the increased vocal condition.

CHAPTER IV

DISCUSSION

The data from the present study are important in that they support the contention that newborns are responsive to alterations in their mothers' behaviors and suggest the impact of those changes on newborn attention to mothers. The present study also documents the influence of infant gender on maternal and infant behaviors during this period and indicates that newborns are characterized by wide individual variations in behavior in the context of interaction with mothers.

The primary goal of this study was to determine whether alterations in levels of maternal stimulation would have the effect of increasing or decreasing infant visual attentiveness. Secondary goals were to distinguish the types of maternal stimulation which might have such an effect on infant behaviors and to examine the effects on infant behaviors other than visual. In the following discussion, each of these goals will be assessed. Prior to this, however, the influence of variables such as infant sex and phase will be discussed.

To summarize the results of the study first with regard to whether maternal behaviors could be successfully altered, there was some evidence that this was achieved. As hoped, maternal tactile behaviors were not affected when mothers were asked to alter either their visual or vocal stimulation of their infants, or both. There was some evidence however, that maternal vocal behaviors were altered. For mothers in the increased vocal condition and in the increased visual + vocal condition, a greater proportion of vocalization time was spent talking to the infant during the manipulation phase, as compared to baseline interaction. For mothers in the increased vocal condition, this proportion also exceeded the proportion of activity directed toward the neonate by control mothers during this phase. Mothers in the increased vocal condition increased the length of their utterances during the manipulation phase. Thus, particularly for the increased vocal condition, it was clear that the manipulation had been successful.

Somewhat disappointing was the evidence concerning the effects of asking mothers to increase their visual behaviors. In the two conditions affected by these instructions, the increased visual condition and the increased visual + vocal condition, maternal visual behaviors during the manipulation phase either showed a decline or increased nonsignificantly. Although mothers in the increased visual condition were less likely than mothers in other conditions to look away from their infants, these mothers decreased across the three phases in terms of the proportion of visual activity directed toward their newborn's face rather than toward the body or elsewhere. Mothers in the increased visual + vocal condition increased the proportion of visual activity directed toward the infant's face during the manipulation phase, but nonsignificantly as compared to their baseline interaction or to the control condition during this phase.

Because there was some support that mothers had altered some aspects of their behavior, it was possible to examine the primary question of the study: What was the effect of these changes in maternal behaviors on neonatal behaviors, particularly in terms of visual attentiveness to mother. Overall, the analyses of specific infant visual behaviors indicated that this sample of newborns became significantly less active in the visual modality as the procedure progressed.

In order to assess whether the neonates were looking less at mother because they were looking elsewhere more, a derived measure of visual activity was employed which considered only alert activity of the newborns. These data revealed differences which supported an effect due to the manipulation. In general, it was found that this sample of newborns, across conditions, looked proportionately longer at mothers rather than the environment, during the manipulation phase as compared to the return-to-baseline phase.

More interesting, however, were the visual activities of newborns in the increased vocal condition and the increased visual + vocal condition, since these were the conditions in which there was some support that maternal behaviors had been significantly altered. For the increased vocal condition, infants, during baseline interaction, exhibited a significantly lower proportion of activity directed toward mother as compared to control infants. During the manipulation phase, this proportion increased significantly for this group of newborns, but was still significantly lower than the control condition. This continued to be the case during the return-to-baseline phase, although the proportion returned to a level closer to that exhibited in the baseline phase.

For infants in the increased visual + vocal condition, intriguing trends were revealed. Specifically, visual activity for these infants did not differ significantly from control infants during baseline interaction, but did during the manipulation and return-to-baseline phases. During these latter phases, these infants directed less activity toward mother as compared to the control condition. Of interest also, was the finding that the proportion of activity directed toward mother consistently declined across the three phases of the study and was significantly lower during the return-to-baseline phase as compared to the manipulation phase.

Finally, secondary effects which emerged in the analyses of newborn behaviors centered on the impact of infant sex on the tactile behaviors of mothers and newborns in this sample. These data indicated that male newborns engaged in more prolonged instances of tactile contact and were more likely to receive tactile stimulation, as compared to females. Females were more likely to receive gross body stimulation from their mothers. The tactile behaviors of these mothers and newborns were not affected by any aspect of the manipulation however.

Influence of Phase, Gender, and Individual Differences

Findings of the current study have implications for various aspects of the infancy literature. Important in this regard are decreased responsiveness in newborn visual behaviors across time, initial group differences, sex differences, and the lack of neonatal vocal behaviors.

There was evidence that this sample of newborns decreased their visual activity as the procedure progressed. This finding is consistent with other studies which reported decreased neonatal social activity across time in the context of feeding (Arco, 1977). Arco attributed the decline in her sample to changes in the goals and structure of the context. Likewise, in the present study, the discrete phases introduced changes in the context which significantly altered the goals and structure of the interactions. These changes, in turn, may have had the effect of decreasing visual activity of the newborns. Visual alertness in neonates has been shown to be particularly responsive to a variety of interventions (Korner, 1970; Korner and Thoman, 1970).

Further, differences in newborn visual behaviors were present from the initiation of the procedure and continued to be apparent during Phases II and III. These differences are also consistent with prevailing literature concerned with neonatal visual activity. Various studies have reported wide variation among newborns in terms of the capacity for visual alertness and visual exploratory behaviors (Korner, 1970; Korner & Thoman, 1970). Such differences, in turn, would contribute to variation such as that seen in the present study during naturalistic baseline interaction. In addition, there are data to support the stability of neonatal visual behaviors in the context of interaction (Self et al., 1981); thus, it might be expected that these differences for individuals would remain relatively stable in the present study.

The factor of infant sex was shown to influence both the visual and tactile behaviors of this sample of newborns. With regard to visual behaviors, female newborns were more likely than males to terminate visual interaction with their mothers and become nonengaged. Females were also more frequently engaged in looking at environmental stimuli as compared to males.

As has been noted by other authors, data on behavioral sex differences are best characterized as fragile (Lamb, 1977). Some studies report sex differences, others do not. Most studies with neonatal samples do not even examine for such differences, apparently on the assumption that they are not there. While numerous studies find evidence for differences in maternal behaviors relative to infant sex, no studies to date have reported differences in neonate spontaneous behaviors, visual or tactile, as a function of sex. There are some data for elicited behaviors, however, which indicate that males may be less responsive to auditory items on the Brazelton Neonatal Behavioral Assessment Scale

(Self, 1971). It would be speculative to suggest that decreased auditory responsiveness may have mediated the present effect for neonatal visual behaviors. Perhaps females are more likely to respond to auditory stimuli in the environment by looking in the direction of the sound. Unfortunately, it was not possible to control all sources of external noise in the busy hospital environment. In addition, there was evidence that female newborns in this study were more likely to experience tactile stimulation from their mothers in the form of gross body stimulation. Such stimulation includes vestibular stimulation and an upright position, both of which have been shown to be highly effective in enhancing visual alertness (Korner & Thoman, 1970).

Similarly, there have been no studies with neonatal samples to report sex differences like those found in the tactile data for the present study. Studies which have examined tactile phenomena generally examine sensitivity and find no differences between boys and girls in this regard (Jacklin, Snow, & Maccoby, 1981; Stanton, 1972). There are some early studies which are exceptional and indicate that female neonates have greater tactile sensitivity than males (Bell & Costello, 1964; Bell, Weller, & Waldrop, 1971).

The sex differences in the present study are probably related to differences in maternal behaviors. This is suggested because mothers in this study were found to engage in more frequent and more prolonged tactile stimulation of their males, including initiating behaviors (e.g., sticking a finger into the palm of the newborn's hand). With their females however, mothers were more likely to engage in gross body sorts of stimulation such as rocking or jiggling the infant, a type of stimulation which essentially prohibits a tactile response by the neonate. These differences in the types of maternal tactile stimulation are suggested to account for the differences seen in newborn behaviors as a function of sex.

The data on tactile interaction, taken as a whole, are interesting, since few studies, even with older infants, include infant tactile behaviors in their observations. Until recently, tactile interaction has not been viewed as a modality in which reciprocal interaction was likely to occur. Secondly, these findings are consistent with earlier reports concerning differential treatment by mothers of boys versus girls. Parke, O'Leary, and West (1972) found that male firstborns were touched by their mothers more frequently than female firstborns. Similarly, Brown, Bakeman, Snyder, Frederickson, Morgan, and Hepler (1975) found that their sample of Black inner-city mothers rubbed, touched, patted, rocked, and kissed their males more than their females. The data from the present study also mirror data with older infants concerning sex differences in maternal tactile behaviors (Lewis, 1972; Moss, 1967). Two things are worth noting in this regard. First, differences in maternal behaviors may originate in differential perceptions of males and females. Rubin, Provenzano, and Luria (1974) documented that both mothers and fathers perceive their male newborns to be endowed with different characteristics than their female newborns. These differences in how male and female newborns are perceived probably contribute to their differential treatment from then on. It should also be noted that this differential treatment has implications for later development. A recent study found that parental sensory stimulation is positively associated at 6 months with infant persistence at problem solving. Further, this study found that sensory stimulation and attention focusing by mothers is related to more varied mastery motivational behaviors for boys than is true for girls (Yarrow, MacTurk, Vietze, McCarthy, Klein, & McQuiston, 1984). It is possible, though untested at this time, that these differences have their origins in the differential stimulation of male versus female newborns. This question should be examined in future research.

The elimination of neonatal vocal behaviors as dependent measures in this study deserves some comment. As noted earlier, infant behaviors in this modality were infrequent; as such, these were omitted from the analyses. There are studies which document the important role of vocal interactions even between mothers and their newborns. Most notable in this regard is the work of Rosenthal (1980, 1982) who found evidence for a pattern of mutual responsivity which is basically co-actional in nature. That is, the neonate is more likely to start vocalizing if mother already is; he/she joins in (Rosenthal, 1982).

On the basis of these data, it was expected that the vocal interaction of mothers and their newborns in the present sample would merit attention. This was not the case however; approximately one vocalization per 4-minute phase was noted in the present sample of newborns. One possible reason for the lack of vocal activity in the present sample relates to differences in the procedure as compared to Rosenthal's. While the present study examined dyads engaged in social interaction, Rosenthal used primarily a feeding situation, with additional recording during nonfeeding time; thus, the context of her study is best characterized as mixed. Perhaps there is something about feeding or the transitions from feeding to nonfeeding which tended to elicit more vocal behavior from the newborn sample. This possibility should be examined in future research.

Another issue which must be addressed concerned the ineffectiveness of the increased visual manipulation on maternal behaviors. Although, there was a nonsignificant increase in maternal visual behaviors as evidenced by mothers in the increased visual + vocal condition, mothers in the increased visual condition decreased in visual activity directed toward the newborn during the manipulation. Perhaps this aspect of the manipulation did not succeed because the instructions were unclear to mothers and they perceived looking at the infant's body to be the same as looking at the infant's face. This is unlikely, however, given that mothers, especially of newborns, place much emphasis on eye-to-eye contact with their infants (Klaus & Kennell, 1976). Secondly, it has been documented that mothers look almost constantly at their newborns without being told to (Klaus & Kennell, 1976; Self et al., 1981). Support for this emerged in this study as well; across all conditions, mothers were found to watch their infant's faces from 88- to 93% of the time, even during baseline interaction. Thus, there was little room for increase in this aspect of maternal behavior.

Observations similar to this have been made by other studies as well, the one exception being the work of Arco, Self, and Gutrecht (1979). When these researchers asked mothers to increase visual regard of the infant, it worked, and a corresponding increase was shown in neonatal visual attention to mothers. The primary difference between the early study and the present one is situational in nature. Arco et al. (1979) utilized a feeding situation, whereas the present study utilized a social interactive setting. Perhaps the feeding situation provides a context in which mothers are not as likely to engage naturalistically in high amounts of visual monitoring of their infants' faces. One study reported that mothers looked at their infants approximately 70% of the time while feeding (Stern, 1983), which is considerably lower than the percentage of time observed in the present study. Another possible explanation for these different results however, is that the feeding situation constrains the infant in such a way that mothers' face and eyes are extremely accessible. Thus, the feeding situation may promote visual contact moreso than the social interactive setting (Robson, 1967).

Neonatal Responsiveness to Maternal Behavior Changes

In the remainder of the discussion, the effects of specific alterations in maternal behaviors will be examamined. The most interesting findings to emerge from this study are those dealing with the effects of increasing maternal vocal stimulation of their newborns. For those two experimental conditions in which the data indicated that mothers altered this aspect of their behavior, the evidence indicated a corresponding change in infant visual behaviors. This overall finding is important because it supports the contention that newborns are responsive to changes in their mothers' behaviors. Such a finding is consistent with other studies which provide evidence for newborn sensitivity to maternal behaviors (Arco, 1977; Arco et al., 1979). Even from birth, the bidirectional nature of the behaviors of each partner can be seen in studies such as the present one. The newborn affects and is affected by the behaviors of mother.

The importance of the reciprocal influences of each partner on the other has been a topic of much discussion. Brazelton et al. (1974) postulated that it is the reciprocal aspects of mother-infant interaction that provide the basis for the interdependence of rhythms which is thought to be at the root of infant-caregiver communication. Indeed, there has been research support for this contention; studies of dyads where the reciprocal aspects of interaction have been impaired find evidence for a variety of later developmental sequelae (Kubicek, 1980; Stern, 1971; Thoman, 1975). Impairment has also been shown to have implications for various developmental processes (Fraiberg, 1974; Urwin, 1978).

The present study also found evidence however, that the impact on infant visual behaviors of altering maternal behaviors differed from the findings of earlier studies. In particular, when compared to Arco (1977), the results of the present study were essentially opposite in direction. In the section to follow, the nature of the effects found in the present study will be examined, and where relevant, comparisons will be made with earlier studies such as Arco (1977). It seems important at this point to point out two procedural differences between the present study and Arco's (1977). First, she utilized a feeding context, while the present study chose a social interactive setting. This is important since past studies implicate situational differences in gaze behaviors between mothers and infants (Peery, 1980). In addition, during her manipulation, Arco made maternal responses to the infant either dependent or independent of infant responses. In the present study, increases in maternal stimulation were implemented regardless of infant responses; thus, the procedure is response independent only. This difference is also important since some studies have suggested that the lack of contingency of maternal stimulation can contribute to increased infant arousal and result in an overstimulation effect (Field, 1977). Some of Arco's data (1977) also supported this contention.

Neonatal Response to Increased Vocal Stimulation

For infants in the increased vocal condition, visual behaviors directed toward mother rather than the environment, were significantly affected by mothers' increasing their vocal stimulation of the infants. The effect was basically one of enhancement; newborns in this condition looked more at mother when she talked more. This finding is consistent with data which indicate that infants are responsive to the vocalizations of their mothers (Gunnar & Donahue, 1980; Rosenthal, 1980). Data from other studies, however, have sometimes reported sex differences in this regard; female infants have been reported to be more responsive than males to maternal vocal behaviors (Gunnar & Donahue, 1980). Contrary to the hypothesis of the present study, no such sex differences were obtained for this sample of newborns. Both males and females in the increased vocal condition showed a substantial increase in the frequency and duration of looking at mother during the manipulation phase. The amount of looking at stimuli in the environment during this phase did not evidence a similar increase for these neonates.

It has been suggested that differential responsiveness of females may increase with age. Gunnar and Donahue (1980), for example, assessed mother-infant interaction in a free-play situation at 6, 9, and 12 months infant age. These researchers found that maternal vocal behaviors were not differentiated by sex, but infant behaviors were differentiated by both sex and age of infant. Specifically, girls were more responsive to maternal vocalizations, but both boys and girls increased their amounts of engagement in vocal exchanges with age. Gunnar and Donahue postulated that mother-daughter vocal interactions are more reciprocal than mother-son interactions. Since no studies have reported differences in neonatal responsiveness to maternal vocalizations, but differences in maternal responsiveness to neonatal vocalizations as a function of sex have been found (Rosenthal, 1982), it may be suggested from Gunnar and Donahue's data that greater female responsiveness to maternal vocalizations develops over the course of the first several months of life as a result of differential maternal responsiveness to male versus female vocal behaviors. Given this, sex differences should not be apparent in a newborn sample such as the present one.

The finding of enhanced visual attention to mothers as a result of increased maternal vocal stimulation is inconsistent with the findings of Arco (1977). The comparable group of mothers in her study were mothers in the response independent maternal talking group. During the manipulation phase, these mothers were instructed upon signal to look away from their infants and say a 2-3 word phrase. The signals were presented randomly and occurred with a mean frequency of 3.7 per minute. The impact of this manipulation on infant visual attention to mothers was a decremental one.

The reasons for discrepancy between Arco's findings and those of the present study may have been procedural. In conjunction with increased vocalization, mothers in Arco's study decreased visual attention to the infant. This was not true in the present study. The differences in results may also be related to differences in baseline behaviors among the various conditions of both studies. Both Brazelton (Brazelton et al., 1974) and Stern (1974) have suggested that optimum interaction between mother and infant is a function of an accurate integration of maternal stimulation and infant arousal. High amounts of maternal stimulation provided at a time when the infant is less aroused will have the effect of enhancing attention (Arco et al., 1979), while the opposite occurs in cases where the infant is already in a high state of arousal (Arco, 1977). In the present study, infants in the increased vocal condition were nonengaged visually, relative to infants in other conditions during baseline interaction. Their proportion of activity directed toward mother was lower than for control infants. Apparently, during baseline interaction, these infants were looking to the environment and/or were totally nonengaged more. Thus, it can be assumed that their arousal was low and the effect of increasing maternal stimulation was to enhance attentiveness. Arco (1977) noted, however, that for infants in her response independent maternal talking group, infant attention levels were relatively high during baseline; the effect of increasing maternal vocal stimulation for these infants then, was to interfere with and decrease their visual attention to mothers.

It is also possible that when mothers were asked to talk more to their infants, they increased other aspects of their behavior which in turn, elicited and/or maintained, infant attention to them. Although maternal visual activity directed toward the newborn showed an increase in this phase for mothers in this condition, it was not significant and thus, is unlikely to have caused the effect. Likewise, no differences as a function of the manipulation were found for maternal tactile behaviors either. Still another possibility is that mothers became more facially expressive. Kaye and Fogel (1980) found that maternal exaggerated facial activity is an effective source of stimulation for maintaining infant attention at 6-weeks of age, but not later. The present study found more evidence for an elicitation effect than a maintenance one, since frequency, but not duration, increased significantly.

Infant Visual Response to Increased Visual and Vocal Stimulation

It was predicted that infants in the increased visual + vocal condition would decrease visual attention to mothers when mothers increased both their visual and vocal regard of the newborn. This prediction was supported; infants in this condition showed a steady decline in terms of the proportion of visual activity directed toward their mothers. This decrease did not attain significance however, until the return-to-baseline phase of the procedure. This trend is not as consistent with the prediction as it might seem however, since mothers in this condition appeared initially to be functionally equivalent to mothers in the increased vocal condition. There was no support for a significant change in visual behaviors for mothers in the increased visual + vocal condition. There was support for a significant increase in these mothers' vocal behaviors.

In order to understand these seemingly contradictory results, in terms of infant visual activity, the vocal data for mothers in these two conditions were examined with regard to the numbers of vocalizations per minute. As these data indicated, mothers in the increased visual + vocal condition exhibited a more dramatic increase in the number of vocalizations per minute during the manipulation phase than did mothers in the increased vocal condition. In addition, when told to return to "normal" during the last phase of the procedure, mothers in the increased visual + vocal condition maintained their high level of vocal stimulation.

These differences are important when considered in the context of early studies which described the temporal organization of maternal vocalizations in the context of interaction. Stern, Beebe, Jaffe, and Bennett (1977) discussed the importance of the consistency of repetition as used by mothers in this context. They proposed that mothers use repetition, not only in terms of content, but timing as well, to regulate infant attentiveness. Thus, repetition in maternal vocalization contributes to the formation of runs and episodes, larger units which serve to maintain infant attention. It can be argued from the present study that there was little evidence for the existence of such repetition, particularly in terms of timing. Rather, maternal vocalizations particularly for the increased visual + vocal condition appear to have a more choppy quality, i.e., short, far apart, and characterized by little regularity. In addition, mothers in the increased visual + vocal condition continued to "bombard" their newborns with these vocalizations during the return-to-baseline phase, and, therefore, it seems plausible that the cumulative effect of this may have been one of increasing newborn arousal to the point of overstimulation. This is consistent with data from older infant samples which supported that stimulation may cause arousal to surpass some hypothetical threshold as the infant attempts to process incoming information (Field, 1977). Perhaps the newborns in this condition were unable to process the incoming vocal stimulation for the extended period of time that their mothers were asking. One way that infants have been suggested to regulate input is via gaze behaviors; thus, averting gaze from mother provides a mechanism by which to halt the excessive input (Brazelton et al., 1974; Field, 1977; Stern, 1971).

Influence of Arousal on Infant Behaviors

Taken together, the differential visual behaviors evidenced by newborns in the increased visual + vocal condition are consistent with theoretical accounts concerning the cyclical nature of mother-infant visual interaction. According to Brazelton et al. (1974), interaction is characterized by cycles of attention and withdrawal as mother and infant work toward the goal of optimizing interaction (Stern, 1974a).

One role of mothers in this context is the regulation of stimulation; in this way, she keeps infant arousal at an optimum level for promoting visual attention. When stimulation is too high, so is arousal, and the infant engages in behaviors designed to reduce both. In the present study, this effect was evidenced by the decreased visual attentiveness of newborns in the increased visual + vocal condition. When stimulation is too low, a similar effect on infant visual attention can be seen; i.e., the infant will be less attentive. One way mothers can reestablish attention is to increase stimulation to a more appropriate level. In the present study, infants became more visually attentive when their mothers talked more.

These data are consistent not only with theoretical accounts, but with other studies as well. Research with older infants (Arco & McCluskey, 1981; Field, 1977, 1979; Fogel et al., 1982) and with newborns in a feeding context (Arco, 1977; Arco et al., 1979) has documented the impact on infant attention to mothers of alterations in maternal behaviors. The present study extends this effect for newborns to the social interaction context and further, suggests that the effect is due to changes in infant arousal as a result of over- or under-stimulation. This proposition is in contrast to the notion that such an effect is due to a discrepancy in infant expectations concerning maternal behaviors in the context of interaction (Tronick et al., 1978). Since newborns have not had sufficient experience in the context of interaction to have an established set of expectations concerning maternal behaviors, the latter explanation could not apply.

Conclusions and Implications

The main goal of the present study was to document whether neonates are responsive to changes in their mothers' behaviors in the context of social interaction. Of additional interest were examination of the types of changes in maternal behaviors to which newborns might be most responsive (i.e., visual, vocal, or both), and the effects of those changes on newborn visual behaviors. Newborns were shown to be responsive to alterations in their mothers' behaviors, especially changes that were vocal in nature. Problems with the procedure prohibited assessment of infant responsiveness to maternal visual behaviors. In addition, the question of whether neonatal vocal behaviors would be altered in accordance with changes in maternal behaviors could not be assessed.

Several researchers have discussed the important role that visual contact plays in the context of early interaction (Brazelton et al., 1974; Noble et al., 1982; Stern, 1974). In addition, visual contact has been related to several developmental events, including mother-infant attachment (Fraiberg, 1974; Moss & Robson, 1968), communication (Bateson, 1975; Francis, Self, & Noble, 1982; Stern et al., 1982), and to developmental sequelae (Stern, 1971; Kubicek, 1980). These studies all support the need to promote optimal visual interaction patterns between caregivers and their infants. Mothers, in fact, reported greater satisfaction under conditions of heightened visual contact with their newborns (Arco et al., 1979).

Data from studies with older infants suggest that certain factors can serve to enhance or deter visual contact between mothers and their infants. Maternal sensitivity to the cycles of attention and withdrawal evidenced by the infant (Brazelton et al., 1974; Stern, 1974) has been implicated. Also important in this regard is the readiness of mothers to adjust their own behaviors in accordance with infant cues, as too much or too little stimulation can result in infant gaze aversion (Field, 1977; Tronick et al., 1978).

Data from the newborn period are less available, although studies in a feeding context indicate that these same factors are important during this period (Arco, 1977; Arco et al., 1979). The present study has extended these findings to the context of non-feeding interaction by showing that newborns in this context are responsive to changes in their mothers' behaviors. Further, there was evidence that the effect of the alteration on neonatal visual attention to mothers was dependent on the type of change in maternal behaviors and on the visual activity of the neonate at the time the change occurred. When newborns were engaged in high amounts of visual activity directed elsewhere or had their eyes closed, increases in maternal vocal stimulation had the effect of eliciting newborn attention to mothers, i.e., an enhancement effect. When newborns were already engaged in high amounts of visual activity directed toward mothers and mothers increased their vocal stimulation and maintained the alteration for an extended period, the effect was to decrease newborn attentiveness to mothers. This finding suggests an overstimulation effect such as Field (1977) obtained with older infants. In the present study, neonatal attentiveness to mothers declined, perhaps as the infant attempted to process incoming information (Field, 1977) or to reduce the stimulation (Stern, 1974). These findings provide important information about the types and amounts of maternal stimulation that may serve to enhance or deter infant attentiveness during the newborn period.

Infant attention to mother has consequences for the occurrence of mutual visual gaze or eye-to-eye contact, since it is the infant who controls the course of the interaction by making and breaking visual contact with mother. Previous data support that when infants look more at mother, mutual gaze increases also (Arco et al., 1979; Messer & Vietze, 1982; Stern, 1974b). Mutual gaze, in turn, has implications for a variety of developmental phenomena; eye-to-eye contact has been associated with attachment (Fraiberg, 1975; Moss & Robson, 1968; Waters, Vaughn, & Egeland, 1980) and with communication development (Francis et al., 1982; Stern et al., 1982).

In the case of less than optimal patterns of visual interaction between mothers and infants, previous research suggests that the outcomes can be severe. Studies with blind infants and their mothers suggest that problems in the development of attachment (Fraiberg, 1975) and in communicative competence (Urwin, 1978) can result. In addition, patterns of overstimulation by mothers have been associated with developmental pathologies (Kubicek, 1980; Stern, 1971; Thoman, 1975). The most severe example was a case study reported by Kubicek. This researcher described an interaction characterized by maternal overstimulation and a lack of reciprocal attentiveness. The infant in this case was eventually diagnosed as autistic.

Future research should address the long-term impact of various levels of maternal stimulation in different modalities. In addition, research is needed which differentiates other variables which may attenuate this phenomena (e.g., newborn arousal, maternal naturalistic levels of stimulation of various types, maternal attitudes/perceptions of her newborn, and any compensatory mechanisms used by mothers or other family members). With reference to the latter issue, for example, it is of interest whether a mother who is an "under-stimulator" in one modality may compensate in another, or whether other family members compensate in some way.

In closing, perhaps one of the most important observations to emerge from this study and one which received relatively little attention of a direct nature, concerned the complexity of the interaction of mothers and neonates. Again, these data strongly support that from birth on, mother and baby mutually influence one another in ways that can promote either positive or negative outcomes. It is critical then, that researchers be concerned with early intervention and prevention studies designed to learn more about optimizing these early interactions.

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Appendix A

Behavioral Categories Coded for Newborns

by Modality

Visual Modality

Initiate-The infant emits a behavior which can be regarded as beginning or setting the stage for visual interaction.

Monitor-The infant engages in visual behaviors designed to maintain an initiated visual interaction or maintains a visual behavior emitted in response to a maternal behavior.

Action-The infant engages in a visual behavior which is clearly in response to a behavior emitted by mother.

Terminate-The infant behaves in such a way as to end an ongoing visual behavior directed toward mother's face. Terminate is not coded in cases where some behavior emitted by mother causes the infant to terminate visual contact. Thus, for example, if mother changes the infant's position and this results in an end to visual interaction, terminate is not coded because it was an involuntary end.

Off-The infant is not engaged in visual behavior of any sort. This is only coded for the infant in cases where the eyes are closed or blocked in some other way.

Other-This category is included for any instances in which visual interaction is involuntary initiated by the infant. If the infant startles for example, and this leads to eye contact, visual other would be coded.

On Other-For infant visual behaviors, this category is used to code instances when the infant is visually engaged with something other than mother, i.e., something in the environment.

Vocal Modality

Coding was initially begun for infant behaviors in this modality. It became apparent very quickly however, that this sample of infants was relatively inactive in this modality. As such, this modality was eliminated from the coding scheme.

Tactile Modality

Initiate-The infant emits a tactile behavior which can be regarded as beginning or setting the stage for an interaction.

Monitor-The infant maintains an initiated tactile behavior or one which occurred in response to a behavior emitted by mother.

Action-The infant engages in a tactile behavior which is clearly in response to a behavior emitted by mother. A good example of this behavior and monitor is provided by the common sequence which follows: Mother places an extended finger into the palm of the infant's hand; in response, the infant grasps mother's finger (action) and maintains the grasp (monitor).

Terminate-The infant engages in a behavior designed to end tactile contact; e.g., pulls his/her hand away in the example above. As noted with visual behaviors, terminate is not coded if something the partner causes the break in contact.

Off-The infant is not engaged in any sort of active tactile contact with mother.

Other-Any instance of a behavior which serendipitously begins a tactile interaction, i.e., an involuntary initiate. An example is the case where a startle leads to contact with mother.

On Other-This behavioral category was not utilized in coding infant tactile behaviors.

Appendix B

Behavioral Categories Coded for Mothers by Modality

Visual Modality

Initiate-Mother emits a behavior which can be regarded as beginning or setting the stage for visual interaction. An attempt to change or alter an ongoing interaction is also considered an initiate.

Monitor-Mother maintains an initiated visual interaction or maintains a visual behavior she made in response to an infant behavior. After initiating visual contact, for example, mother continues to watch her infant.

Action-Mother engages in a visual behavior which is clearly in response to a behavior emitted by the infant. Often this will occur within the same modality, but not necessarily. The infant may exhibit a startle response, for example, and mother may look at the body part involved. The cross-modality and within-modality aspects apply for all instances of action, i.e., for both maternal and infant behaviors in all modalities of interaction.

Terminate-Mother behaves in a way which is obviously an attempt to end an ongoing visual behavior directed toward the infant's face. One exception is where nonengagement was the result of something the partner did, i.e., it was involuntary. In this case, terminate is not coded prior to coding off.

Off-Mother is not engaged in visual interaction. This is coded when mother looks anywhere other than the infant's face or body.

Other-This behavioral category included any maternal visual behaviors which were not included elsewhere.

On Other-Mother engages in visual behavior which is directed toward some part of her infant other than the face.

Vocal Modality

Initiate-Mother emits a vocal behavior which can be regarded as beginning or setting the stage for an interaction. Only behaviors directed toward the infant in an attempt to elicit or maintain attention were included here.

Monitor-Vocalizations emitted by mothers which were not apparently designed to elicit or maintain infant attention, but were directed toward the infant, were included here.

Action-Mother emitted a vocalization which was clearly in response to some behavior performed by the infant. The infant may cry, for example, and mother may respond, "Oh, you're so hungry."

Terminate-Mother behaves in such a way as to end her vocal behavior directed toward the infant.

Off-Mother is quiet.

Other-Mother emits a vocalization directed toward someone other than the infant.

On Other-This behavioral category was not utilized in coding maternal vocal behaviors.

Tactile Modality

Initiate-Mother emits a tactile behavior which can be regarded as beginning or setting the stage for an interaction.

Monitor-Mother continues to engage in tactile stimulation designed to maintain an initiated behavior.

Action-Mother engages in a tactile behavior which is clearly in response to a behavior emitted by the infant; for example, the infant sneezes and mother strokes his/her cheek.

Terminate-Mother behaves in such a way as to end a tactile interaction; for example, she pulls her hand away from contact with the infant.

Off-Mother is not engaged in any sort of active tactile behavior directed toward her infant.

Other-For maternal tactile behaviors, this category includes caretaking activities only, such as straightening the infant's gown or wiping the infant's face.

On Other-Maternal gross body movements of the infant were coded using this category. Included were such behaviors as rocking, jiggling, or position changes.

APPENDIX C

RAW DATA
NEONATAL VISUAL AND TACTILE BEHAVIORS

---------------------- COND=1 PHASE=1 ----------------------

SS	SX	VIF	VID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIUFF	VIUFD	VIOTF	VIOTD	VINF	VIND
3	2	0	0.0	9	28.4	0	0	29	8.7	29	73.1	0	0	33	131.4
6	2	0	0.0	9	32.6	0	0	22	6.8	23	92.0	0	0	24	110.0
8	2	0	0.0	10	82.8	0	0	5	2.0	7	43.5	0	0	14	112.8
13	2	0	0.0	10	22.2	0	0	20	6.1	20	47.8	0	0	29	154.0
14	2	9	7.3	8	133.1	0	0	8	3.0	6	62.6	0	0	7	35.8
30	1	0	0.0	14	184.3	0	0	9	2.9	9	23.6	0	0	5	31.7
33	1	0	0.0	9	67.4	0	0	9	3.2	9	171.1	0	0	1	2.0
34	1	0	0.0	4	100.3	0	0	4	1.4	5	133.8	0	0	1	6.0
37	1	0	0.0	7	137.7	0	0	8	2.8	8	22.0	0	0	12	79.5
38	1	0	0.0	13	179.1	0	0	14	6.2	10	18.5	0	0	8	37.3

SS	TIF	TID	TMF	TMD	TAF	TAD	TTF	TTD	TUFF	TUFD	TOTF	TOTD	TONF	TUND
3	0	0.0	0	0.0	2	1.8	2	0.6	3	239.2	0	0	0	0
6	2	1.4	10	147.9	6	6.1	7	2.3	10	83.8	0	0	0	0
8	8	7.2	10	82.5	0	0.0	2	0.6	8	151.1	0	0	0	0
13	1	1.2	1	29.4	3	8.5	2	0.6	5	200.7	0	0	0	0
14	0	0.0	1	6.4	1	3.8	1	0.4	2	231.2	0	0	0	0
30	0	0.0	5	40.0	7	10.2	3	1.1	8	190.4	0	0	0	0
33	1	0.3	11	92.0	10	12.6	10	4.0	11	133.5	0	0	0	0
34	0	0.0	6	72.9	5	7.1	1	0.4	6	161.7	0	0	0	0
37	0	0.0	7	64.2	7	8.4	3	1.1	8	168.1	0	0	0	0
38	0	0.0	1	3.8	4	17.3	2	0.7	5	219.6	0	0	0	0

APPENDIX C

RAW DATA
NEONATAL VISUAL AND TACTILE BEHAVIORS

---------------------- COND=1 PHASE=2 ----------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF	VIOND
3	2	0	0.0	23	52.3	0	0	24	7.6	24	67.1	0	0	31	113.8
6	2	0	0.0	15	45.7	0	0	23	7.3	24	91.3	0	0	28	97.8
8	2	0	0.0	7	29.2	0	0	7	2.1	8	139.8	0	0	14	70.3
13	2	0	0.0	9	20.7	0	0	21	6.8	21	62.4	0	0	28	150.1
14	2	4	2.2	5	135.1	0	0	5	5.4	5	51.6	0	0	4	47.4
30	1	0	0.0	7	53.2	0	0	3	1.1	3	6.9	0	0	8	180.7
33	1	0	0.0	8	90.6	0	0	6	2.2	6	146.8	0	0	1	2.7
34	1	0	0.0	8	179.7	0	0	5	1.7	6	47.4	0	0	3	13.0
37	1	0	0.0	5	174.5	0	0	3	1.2	4	32.9	0	0	4	25.7
38	1	0	0.0	11	101.0	0	0	10	4.1	10	123.6	0	0	2	7.3

SS	TIF	TID	TMF	TMD	TAF	TAD	TTF	TTD	TOFF	TOFD	TOTF	TOTD	TONF	TOND
3	1	1.6	3	23.5	2	1.3	1	0.30	4	214.6	0	0	0	0
6	5	2.1	13	139.0	9	6.6	7	2.20	13	91.6	0	0	0	0
8	4	12.2	7	25.5	0	0.0	5	1.80	7	202.0	0	0	0	0
13	2	2.7	5	57.3	4	18.7	5	1.90	7	159.5	0	0	0	0
14	0	0.0	2	7.4	5	10.1	2	0.90	6	223.3	0	0	0	0
30	0	0.0	7	73.1	8	9.6	4	1.40	9	158.0	0	0	0	0
33	0	0.0	7	123.3	7	7.6	5	0.15	7	109.5	0	0	0	0
34	0	0.0	4	31.9	3	5.1	2	0.70	4	204.4	0	0	0	0
37	0	0.0	3	97.5	3	3.2	1	0.40	4	133.3	0	0	0	0
38	3	3.7	5	26.0	5	16.9	5	1.80	9	193.3	0	0	0	0

APPENDIX C

RAW DATA
NEONATAL VISUAL AND TACTILE BEHAVIOURS

---------------------- COND=1 PHASE=3 ----------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF	VIOND
3	2	0	0.0	17	50.3	0	0.0	14	4.6	14	17.3	0	0	30	168.2
6	2	0	0.0	3	14.9	0	0.0	20	6.4	21	182.5	0	0	22	37.7
8	2	0	0.0	8	54.3	2	1.7	15	4.7	15	70.2	0	0	15	108.5
13	2	0	0.0	5	36.2	0	0.0	11	3.4	12	11.9	0	0	16	189.8
14	2	5	2.7	5	92.7	0	0.0	7	4.0	3	9.1	0	0	7	133.4
30	1	0	0.0	10	110.8	0	0.0	2	0.7	2	3.1	0	0	9	128.0
33	1	0	0.0	7	104.8	0	0.0	7	2.7	8	132.5	0	0	1	2.2
34	1	0	0.0	6	143.5	0	0.0	6	2.1	6	57.1	0	0	5	38.4
37	1	0	0.0	9	88.2	0	0.0	9	3.4	9	23.2	0	0	12	129.5
38	1	0	0.0	9	89.0	0	0.0	9	3.1	9	123.2	0	0	2	26.4

SS	TIF	TID	TMF	TMD	TAF	TAD	TTF	TTD	TO=F	TO=D	TOTF	TOTD	TONF	TOND
3	0	0.0	3	23.6	3	3.2	0	0.0	3	208.5	0	0	0	0
6	3	3.0	8	60.5	6	10.8	5	1.6	10	156.2	0	0	0	0
8	1	0.4	2	1.7	0	0.0	0	0.0	3	237.9	0	0	0	0
13	0	0.0	3	95.0	6	54.5	4	1.2	6	90.6	0	0	0	0
14	0	0.0	2	16.1	2	7.6	1	0.3	3	217.7	0	0	0	0
30	0	0.0	5	42.1	5	3.1	4	1.4	5	195.7	0	0	0	0
33	1	2.6	11	115.8	14	22.0	16	7.8	16	91.9	0	0	0	0
34	0	0.0	4	19.9	7	12.3	2	0.8	8	214.1	0	0	0	0
37	0	0.0	4	51.5	4	8.1	3	1.1	4	185.0	0	0	0	0
38	1	0.5	1	16.4	0	0.0	0	0.0	2	224.4	0	0	0	0

APPENDIX C

RAW DATA
NEONATAL VISUAL AND TACTILE BEHAVIORS

---------------------- COND=2 PHASE=1 ----------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF	VIOND
4	2	2	1.1	3	65.8	0	0.0	3	1.9	3	122.7	0	0	1	50.6
5	2	0	0.0	22	72.5	0	0.0	7	2.3	8	17.7	0	0	23	149.2
15	2	0	0.0	10	192.8	0	0.0	6	2.4	7	32.6	0	0	3	13.1
18	2	0	0.0	19	130.1	0	0.0	23	8.1	23	67.1	0	0	19	42.0
20	2	0	0.0	14	135.0	0	0.0	15	5.5	15	64.2	0	0	10	36.6
21	1	9	6.3	10	196.3	0	0.0	9	5.1	9	31.6	0	0	1	2.2
23	1	0	0.0	24	101.0	0	0.0	36	12.2	36	78.4	0	0	22	49.8
26	1	0	0.0	3	10.4	4	3.2	11	3.4	11	153.6	0	0	7	65.6
29	1	0	0.0	14	85.8	0	0.0	4	1.2	5	8.9	0	0	19	145.5
40	1	0	0.0	8	108.4	0	0.0	8	3.5	3	125.4	0	0	1	4.3

SS	TIF	TID	TIMF	TIMD	TIAF	TIAD	TITF	TITD	TOFF	TOFD	TOTF	TOTD	TONF	TOND
4	6	18.5	4	29.0	6	24.1	10	5.1	14	165.4	0	0	0	0
5	0	0.0	1	2.2	2	2.3	2	0.7	3	235.5	0	0	0	0
15	0	0.0	5	17.6	6	6.8	4	1.3	7	216.2	0	0	0	0
18	0	0.0	11	67.4	12	29.2	4	1.4	12	143.5	0	0	0	0
20	1	0.5	9	80.2	8	5.5	6	2.0	10	155.2	0	0	0	0
21	4	6.7	2	4.3	5	21.1	8	2.8	9	206.9	0	0	0	0
23	5	3.5	11	162.5	6	3.0	10	3.3	11	69.9	0	0	0	0
26	1	0.9	0	0.0	5	34.1	3	1.0	7	205.0	0	0	0	0
29	0	0.0	0	0.0	1	1.8	1	0.3	2	239.7	0	0	0	0
40	0	0.0	7	78.3	7	17.8	4	1.3	8	144.4	0	0	0	0

APPENDIX C

RAW DATA
NEONATAL VISUAL AND TACTILE BEHAVIORS

---------------------- COND=2 PHASE=2 ----------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF	VIOND
4	2	4	4.0	4	65.7	0	0.0	5	1.9	6	165.1	0	0	1	5.4
5	2	0	0.0	24	71.7	0	0.0	10	3.1	10	13.4	0	0	33	153.1
15	2	0	0.0	12	193.2	0	0.0	4	1.6	4	13.0	0	0	8	33.9
18	2	0	0.0	12	193.0	0	0.0	5	1.8	6	15.8	0	0	11	31.3
20	2	0	0.0	3	27.5	0	0.0	5	2.0	5	192.6	0	0	4	19.7
21	1	10	7.5	11	165.4	0	0.0	10	5.1	10	62.2	0	0	0	0.0
23	1	0	0.0	23	90.1	0	0.0	29	9.7	29	79.7	0	0	33	62.8
26	1	0	0.0	6	22.8	2	3.1	14	5.0	14	111.7	0	0	13	98.6
29	1	0	0.0	10	25.4	0	0.0	2	0.5	2	4.3	0	0	10	209.8
40	1	0	0.0	12	115.5	0	0.0	16	5.8	13	110.2	0	0	4	14.4

SS	TIF	TID	TIMF	TIMD	TIAF	TIAD	TITF	TITD	TOFF	TOFD	TOTF	TOTD	TONF	TOND
4	4	7.2	3	10.3	5	19.6	8	4.7	10	200.4	0	0.0	0	0
5	0	0.0	1	0.5	1	0.4	1	0.3	2	240.1	0	0.0	0	0
15	0	0.0	2	5.5	3	11.2	5	1.7	7	223.2	0	0.0	0	0
18	0	0.0	8	41.5	8	15.9	0	0.0	8	185.5	0	0.0	0	0
20	0	0.0	7	24.5	8	7.4	8	2.9	9	206.4	0	0.0	0	0
21	5	8.2	11	66.2	12	44.8	14	7.1	17	115.1	0	0.0	0	0
23	1	0.4	19	114.9	22	33.7	7	2.9	17	90.0	0	0.0	0	0
26	3	13.7	7	53.5	2	2.9	5	1.5	12	169.5	0	0.0	0	0
29	4	3.0	3	1.6	4	5.4	7	2.3	9	228.5	1	0.6	0	0
40	0	0.0	2	33.4	2	5.3	0	0.0	2	203.0	0	0.0	0	0

APPENDIX C

RAW DATA
NEONATAL VISUAL AND TACTILE BEHAVIORS

---------------------- COND=2 PHASE=3 ----------------------

SS	SX	VIF	VID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF	VIOND
4	2	3	1.2	3	175.0	0	0.0	3	1.2	4	63.3	0	0	0	0.0
5	2	0	0.0	16	29.8	0	0.0	11	3.5	11	7.4	0	0	27	201.0
15	2	0	0.0	9	149.3	0	0.0	3	1.4	3	8.2	0	0	7	82.9
18	2	0	0.0	23	120.7	0	0.0	20	7.2	20	30.4	0	0	19	81.7
20	2	0	0.0	4	12.9	0	0.0	5	1.5	5	224.3	0	0	2	3.6
21	1	4	1.7	5	225.3	0	0.0	3	1.1	4	14.1	0	0	0	0.0
23	1	0	0.0	15	35.2	0	0.0	17	5.9	19	194.4	0	0	7	6.2
26	1	0	0.0	3	17.0	1	1.9	7	2.3	7	167.1	0	0	8	53.1
29	1	0	0.0	19	71.1	0	0.0	2	0.6	2	1.1	0	0	20	168.3
40	1	0	0.0	13	114.3	0	0.0	14	6.7	10	96.7	0	0	5	23.9

SS	TIF	TID	TMF	TMD	TAF	TAD	TTF	TTD	TOFF	TOFD	TOTF	TOTD	TONF	TOND
4	5	11.6	3	16.0	4	15.4	7	3.0	9	196.0	0	0.0	0	0
5	0	0.0	0	0.0	1	1.6	0	0.0	2	239.9	0	0.0	0	0
15	0	0.0	1	1.8	4	6.6	4	1.3	5	232.3	0	0.0	0	0
18	0	0.0	6	74.0	8	6.3	1	0.4	7	159.4	0	0.0	0	0
20	0	0.0	2	17.8	2	1.7	1	0.4	2	224.9	0	0.0	0	0
21	0	0.0	1	8.2	2	14.1	2	0.7	3	218.9	0	0.0	0	0
23	0	0.0	13	66.0	13	6.2	4	1.2	12	168.0	0	0.0	0	0
26	1	1.6	3	10.8	2	3.3	0	0.0	5	224.2	1	1.4	0	0
29	0	0.0	1	16.7	1	11.1	1	0.3	2	213.0	0	0.0	0	0
40	0	0.0	3	62.7	6	10.9	6	2.3	7	165.8	0	0.0	0	0

APPENDIX C

RAW DATA
NEONATAL VISUAL AND TACTILE BEHAVIORS

---------------------- COND=3 PHASE=1 ----------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF
1	2	0	0.0	27	79.4	0	0.0	34	12.3	33	56.9	0	0	32
7	2	0	0.0	14	48.4	0	0.0	23	8.0	25	63.0	0	0	27
9	2	0	0.0	6	21.2	0	0.0	14	4.4	14	84.0	0	0	17
11	2	1	0.8	10	45.5	9	23.2	25	8.0	26	106.2	0	0	17
16	2	0	0.0	13	49.8	0	0.0	27	8.4	29	120.7	0	0	22
25	1	0	0.0	32	103.9	30	10.9	29	10.6	29	54.3	0	0	25
31	1	0	0.0	10	61.1	0	0.0	6	2.4	6	13.0	0	0	12
32	1	0	0.0	0	0.0	0	0.0	7	2.7	7	214.6	0	0	7
36	1	0	0.0	25	93.6	0	0.0	8	2.6	8	4.2	0	0	32
39	1	0	0.0	3	29.8	0	0.0	12	5.1	12	110.0	0	0	10

SS	VIOND	TIIF	TIID	TIMF	TIMD	TIAF	TIAD	TITF	TITD	TOFF	TOFD	TOTF	TOTD	TONF	TOND
1	92.9	0	0.0	6	10.8	7	4.9	3	1.0	8	225.2	0	0.0	0	0
7	122.5	0	0.0	1	0.6	1	0.8	1	0.4	2	240.0	0	0.0	0	0
9	131.7	7	8.5	14	52.5	6	8.2	4	1.2	12	171.0	0	0.0	0	0
11	52.6	1	0.9	3	0.2	0	0.0	3	1.0	5	230.4	0	0.0	0	0
16	60.8	3	3.5	4	46.5	5	13.3	8	2.5	11	172.0	1	1.7	0	0
25	63.5	0	0.0	3	18.4	2	1.5	1	0.4	3	222.2	0	0.0	0	0
31	165.4	0	0.0	0	0.0	0	0.0	0	0.0	1	241.4	0	0.0	0	0
32	24.0	2	5.7	6	27.9	3	26.7	3	0.9	8	180.1	0	0.0	0	0
36	140.9	2	1.1	2	5.6	0	0.0	3	1.0	5	233.5	0	0.0	0	0
39	97.0	0	0.0	3	80.4	3	4.9	1	0.4	4	154.2	0	0.0	0	0

APPENDIX C

RAW DATA
NEONATAL VISUAL AND TACTILE BEHAVIORS

------------------------ COND=3 PHASE=2 ------------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF
1	2	0	0.0	39	105.4	0	0.0	46	15.4	46	102.2	0	0	10
7	2	0	0.0	10	12.3	0	0.0	13	4.4	13	26.5	0	0	21
9	2	0	0.0	21	55.2	1	0.4	10	3.2	10	24.0	0	0	31
11	2	0	0.0	16	90.4	5	2.8	18	5.8	19	66.3	0	0	13
16	2	0	0.0	9	79.8	0	0.0	17	5.3	17	75.6	0	0	15
25	1	23	8.5	26	80.4	0	0.0	28	10.3	28	113.8	0	0	17
31	1	0	0.0	10	84.7	0	0.0	8	2.7	8	23.4	0	0	12
32	1	0	0.0	3	11.0	0	0.0	12	3.8	13	205.8	0	0	9
36	1	0	0.0	15	24.1	0	0.0	3	0.9	3	3.1	0	0	19
39	1	0	0.0	11	167.0	0	0.0	11	5.5	10	41.0	0	0	5

SS	VIOND	TIF	TID	TMF	TMD	TAF	TAD	TTF	TTD	TOFF	TOFD	TOTF	TOTD	TONF	TOND
1	19.0	0	0.0	0	0.0	0	0.0	0	0.0	1	242.0	0	0	0	0
7	198.6	0	0.0	0	0.0	0	0.0	0	0.0	1	241.9	0	0	0	0
9	156.4	4	4.0	3	15.0	1	0.4	5	1.8	8	219.9	0	0	0	0
11	75.5	0	0.0	1	1.1	0	0.0	0	0.0	2	240.4	0	0	0	0
16	78.3	0	0.0	3	44.3	2	9.2	2	0.7	3	185.7	0	0	0	0
25	28.6	2	3.2	7	59.8	0	9.3	8	2.9	11	166.5	0	0	0	0
31	129.3	0	0.0	3	19.1	3	3.6	2	0.7	5	216.6	0	0	0	0
32	20.9	2	1.7	7	29.3	5	5.0	4	1.4	7	203.7	0	0	0	0
36	213.2	2	3.0	6	17.1	5	11.2	5	1.6	7	208.2	0	0	0	0
39	31.8	0	0.0	3	61.7	3	9.0	1	0.3	4	170.9	0	0	0	0

APPENDIX C

RAW DATA
NEONATAL VISUAL AND TACTILE BEHAVIORS

----------------------- COND=3 PHASE=3 -----------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF	VIOND
1	2	0	0.0	9	31.1	0	0.0	25	9.4	25	142.0	0	0	16	59.2
7	2	0	0.0	6	7.3	0	0.0	13	4.4	12	42.6	0	0	18	187.1
9	2	0	0.0	10	67.1	0	0.0	14	4.4	14	30.2	0	0	15	139.9
11	2	0	0.0	14	68.7	12	4.0	19	5.9	20	70.3	0	0	18	72.3
16	2	0	0.0	9	42.3	1	3.9	21	6.7	22	109.7	0	0	18	78.8
25	1	21	7.1	22	75.8	0	0.0	18	5.7	18	100.8	0	0	11	50.1
31	1	0	0.0	8	38.4	0	0.0	8	2.9	8	166.6	0	0	8	33.6
32	1	0	0.0	0	0.0	0	0.0	8	2.7	9	150.5	0	0	5	78.0
36	1	0	0.0	5	12.3	5	13.1	17	5.4	17	95.8	0	0	15	114.4
39	1	0	0.0	13	79.0	0	0.0	12	5.1	14	144.0	0	0	4	14.2

SS	TIF	TID	TMF	TMD	TAF	TAD	TTF	TTD	TOFF	TOFD	TOTF	TOTD	TONF	TOND
1	0	0.0	6	39.9	10	11.2	4	1.4	1	169.5	0	0.0	0	0
7	0	0.0	0	0.0	0	0.0	0	0.0	1	242.0	0	0.0	0	0
9	6	3.5	9	56.0	2	1.3	6	1.9	11	178.8	0	0.0	0	0
11	0	0.0	0	0.0	0	0.0	0	0.0	1	241.1	0	0.0	0	0
16	2	6.7	6	11.3	16	40.9	5	9.2	13	169.6	2	3.5	0	0
25	0	0.0	3	11.9	3	2.7	2	0.6	3	226.8	0	0.0	0	0
31	0	0.0	1	7.2	2	4.7	1	0.3	3	230.0	0	0.0	0	0
32	0	0.0	15	56.9	11	11.3	5	1.7	13	172.1	0	0.0	0	0
36	0	0.0	15	78.0	14	29.1	12	3.9	14	130.9	0	0.0	0	0
39	0	0.0	2	87.0	2	5.5	1	0.4	2	150.8	0	0.0	0	0

APPENDIX C

RAW DATA
NEONATAL VISUAL AND TACTILE BEHAVIORS

------------------------ COND=4 PHASE=1 ------------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOF	VIOFD	VIOTF	VIOTD	VIONF	VICND
2	2	0	0.0	21	96.9	0	0.0	15	5.2	15	92.9	0	0	16	41.0
10	2	0	0.0	34	152.5	0	0.0	34	11.9	35	55.7	0	0	15	22.2
12	2	0	0.0	7	11.2	4	5.0	8	2.7	8	42.3	0	0	14	177.3
17	2	0	0.0	19	32.0	0	0.0	10	3.3	11	9.0	0	0	31	195.5
19	2	0	0.0	9	18.0	0	0.0	11	4.1	12	200.8	0	0	9	17.2
22	1	0	0.0	5	19.3	0	0.0	18	5.7	19	28.4	0	0	22	187.8
24	1	0	0.0	16	82.9	0	0.0	16	5.3	15	57.1	0	0	15	95.6
27	1	0	0.0	9	104.5	0	0.0	8	3.0	8	30.3	0	0	8	53.7
28	1	6	12.7	5	135.7	0	0.0	8	3.9	5	8.9	0	0	4	76.9
35	1	0	0.0	16	94.2	1	5.1	18	6.9	17	77.3	0	0	10	57.6

SS	TIF	TID	TMF	TMD	TAF	TAD	TTF	TTD	TOFF	TOFD	TOTF	TOTD	TONF	TOND
2	0	0.0	5	23.0	5	2.8	0	0.0	7	212.4	0	0	0	0
10	0	0.0	1	8.0	1	0.5	0	0.0	2	223.3	0	0	0	0
12	15	16.0	11	24.1	11	0.4	15	4.6	17	193.3	0	0	0	0
17	0	0.0	8	35.1	12	35.6	4	1.3	4	168.2	0	0	0	0
19	0	0.0	2	24.0	2	2.0	1	0.4	3	213.6	0	0	0	0
22	1	1.3	8	83.0	8	8.0	4	1.3	9	147.9	0	0	0	0
24	4	5.4	6	113.8	5	4.5	5	2.6	9	114.7	0	0	0	0
27	0	0.0	5	11.3	5	3.2	0	0.0	5	227.3	0	0	0	0
28	0	0.0	8	195.5	8	22.7	7	3.0	7	16.3	0	0	0	0
35	3	6.2	2	10.9	1	2.6	3	1.2	5	220.8	0	0	0	0

APPENDIX C

RAW DATA

NEONATAL VISUAL AND TACTILE BEHAVIORS

---------------------- COND=4 PHASE=2 ----------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF	VIOND
2	2	0	0	19	109.3	0	0.0	7	2.4	7	39.8	0	0	12	90.6
10	2	0	0	26	161.8	0	0.0	21	7.1	21	46.7	0	0	16	27.1
12	2	0	0	9	22.4	2	1.8	9	2.8	9	34.7	0	0	16	179.7
17	2	0	0	3	7.3	0	0.0	18	7.4	18	62.2	0	0	20	164.3
19	2	0	0	2	28.3	0	0.0	3	1.0	3	212.0	0	0	1	0.9
22	1	0	0	8	26.4	0	0.0	13	4.0	14	44.5	0	0	21	156.6
24	1	0	0	12	51.1	1	1.9	6	2.0	6	15.2	0	0	18	171.2
27	1	0	0	15	70.5	0	0.0	15	5.7	15	78.5	0	0	12	86.3
28	1	12	6	12	136.2	0	0.0	15	8.1	11	29.1	0	0	8	62.4
35	1	0	0	8	129.7	0	0.0	11	4.4	11	87.8	0	0	5	19.8

SS	TIF	TID	TIMF	TIMD	TAF	TAD	TTF	TTD	TOFF	TOFD	TOTF	TOTD	TONF	TOND
2	0	0.0	16	55.1	16	14.0	3	1.1	16	171.4	0	0	0	0
10	1	0.8	1	4.9	0	0.0	0	0.0	2	236.9	0	0	0	0
12	14	10.0	8	11.5	0	0.0	14	4.8	15	214.9	0	0	0	0
17	1	0.6	9	97.0	15	68.8	10	3.2	10	71.6	0	0	0	0
19	0	0.0	3	8.6	4	2.6	2	0.9	5	229.8	0	0	0	0
22	3	6.5	12	122.2	9	12.4	4	1.2	12	99.4	0	0	0	0
24	16	6.0	21	66.1	2	1.6	14	4.5	22	163.7	0	0	0	0
27	0	0.0	17	32.2	22	28.8	5	1.7	18	178.1	0	0	0	0
28	5	9.7	6	229.2	1	2.7	0	0.0	0	0.0	0	0	0	0
35	0	0.0	7	70.7	6	9.2	2	0.8	7	161.4	0	0	0	0

APPENDIX C

RAW DATA
NEONATAL VISUAL AND TACTILE BEHAVIORS

---------------------- COND=4 PHASE=3 ----------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF	VIOND
2	2	0	0.0	10	48.2	0	0.0	15	5.2	15	108.2	0	0	15	80.2
10	2	0	0.0	31	91.7	0	0.0	35	12.0	35	97.6	0	0	17	40.3
12	2	0	0.0	3	3.3	0	0.0	12	4.0	12	34.2	0	0	13	199.7
17	2	0	0.0	0	0.0	0	0.0	5	1.5	6	236.7	0	0	5	2.7
19	2	0	0.0	4	16.4	0	0.0	5	1.9	5	191.3	0	0	5	22.9
22	1	0	0.0	10	37.3	0	0.0	20	6.0	20	40.3	0	0	18	157.9
24	1	0	0.0	9	33.0	1	0.6	0	0.0	0	0.0	0	0	10	202.0
27	1	0	0.0	2	2.9	0	0.0	12	4.2	12	185.3	0	0	12	49.7
28	1	11	5.6	11	95.3	0	0.0	21	11.5	15	52.9	0	0	19	76.9
35	1	0	0.0	9	108.3	0	0.0	10	5.0	10	67.1	0	0	10	60.6

SS	TIF	TID	TMF	TMD	TAF	TAD	TTF	TTD	TOFF	TOFD	TOTF	TOTD	TONF	TOND
2	0	0.0	14	60.8	13	9.8	3	1.0	14	170.2	0	0	0	0
10	0	0.0	7	16.2	5	2.4	2	0.8	6	222.3	0	0	0	0
12	4	3.7	5	11.4	0	0.0	5	1.6	9	224.7	0	0	0	0
17	0	0.0	0	0.0	0	0.0	0	0.0	1	241.3	0	0	0	0
19	0	0.0	3	7.2	3	1.7	2	0.8	4	223.5	0	0	0	0
22	7	6.7	11	115.8	7	6.2	9	2.8	13	110.0	0	0	0	0
24	10	1.1	11	60.4	9	10.0	2	0.6	6	158.4	0	0	0	0
27	0	0.0	21	86.8	25	21.2	13	4.8	21	129.9	0	0	0	0
28	6	17.4	13	197.5	7	15.5	3	1.3	4	9.2	0	0	0	0
35	0	0.0	3	63.6	3	8.6	1	0.3	4	158.8	0	0	0	0

APPENDIX C

RAW DATA
MATERNAL VISUAL, VOCAL, AND TACTILE BEHAVIORS

---------------------- COND=1 PHASE=1 ----------------------

SSS	SSX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF	VIOND	VOIF
3	2	0	0.0	5	230.4	0	0	1	0.3	1	0.5	0	0	3	10.4	21
6	2	3	6.2	13	206.7	0	0	0	0.0	0	0.0	0	0	9	28.3	24
8	2	1	1.1	9	231.9	0	0	1	0.3	1	0.5	0	0	6	7.7	35
13	2	4	8.5	29	173.4	0	0	6	1.9	6	2.3	0	0	22	53.8	43
14	2	18	10.6	17	199.5	0	0	18	8.9	10	6.1	0	0	9	16.7	23
30	1	0	0.0	12	216.1	0	0	3	1.0	3	5.7	0	0	8	19.1	0
33	1	0	0.0	4	236.6	0	0	2	0.7	2	3.3	0	0	1	1.7	19
34	1	0	0.0	15	189.5	0	0	6	3.0	6	9.2	0	0	10	38.4	28
37	1	0	0.0	9	227.5	0	0	2	0.7	2	3.1	0	0	6	10.4	55
38	1	0	0.0	9	224.8	5	11	1	0.5	1	1.3	0	0	2	4.5	54

SSS	VOID	VOMF	VOMD	VOAF	VOAD	VOTF	VOTD	VOOFF	VOOFD	VOOTF	VOOTD	VOONF	VOOND	TIF
3	15.8	5	3.7	8	7.5	34	10.4	35	204.4	0	0.0	0	0	19
6	20.9	7	2.6	8	4.8	39	12.2	40	200.9	0	0.0	0	0	38
8	34.3	14	20.5	8	10.3	57	18.8	57	158.4	0	0.0	0	0	19
13	29.4	19	18.3	10	10.5	72	23.1	72	158.3	0	0.0	0	0	6
14	23.1	0	0.0	6	8.2	35	18.3	30	200.3	0	0.0	0	0	10
30	0.0	0	0.0	0	0.0	3	0.9	4	232.6	3	8.4	0	0	27
33	22.9	1	3.5	6	6.3	25	10.8	27	198.5	0	0.0	0	0	20
34	27.5	0	0.0	7	6.9	37	12.1	38	195.0	2	2.1	0	0	17
37	64.1	0	0.0	4	4.8	59	20.8	60	151.3	1	1.1	0	0	33
38	37.0	0	0.0	6	5.5	60	19.5	61	178.6	0	0.0	0	0	48

SS	TID	TMF	TMD	TAF	TAD	TTF	TTD	TUFF	TUFD	TOTF	TOTD	TONF	TOND
3	50.7	13	35.2	0	0.0	24	7.5	25	20.2	3	15.6	20	112.1
6	166.8	23	60.1	1	3.5	1	0.3	2	4.4	1	1.4	2	4.9
8	123.2	42	217.6	0	0.0	1	0.3	1	0.5	7	18.0	3	5.2
13	51.5	8	43.5	0	0.0	12	3.9	12	15.8	10	98.5	6	26.6
14	23.8	8	29.1	0	0.0	17	7.0	17	53.3	16	95.2	8	33.4
30	47.0	25	151.1	0	0.0	7	2.5	9	15.7	7	25.6	0	0.0
33	32.4	21	189.3	0	0.0	5	1.8	5	16.6	1	1.7	0	0.0
34	32.1	19	139.7	0	0.0	8	4.2	7	10.8	6	44.9	4	10.6
37	58.3	34	170.1	0	0.0	7	3.0	7	7.6	5	9.6	0	0.0
38	100.5	38	124.9	0	0.0	6	2.5	6	6.7	4	6.0	0	0.0

APPENDIX C

RAW DATA
MATERNAL VISUAL, VOCAL, AND TACTILE BEHAVIORS

---------------------- COND=1 PHASE=2 ----------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF	VIOND
3	2	0	0.0	5	231.9	0	0.0	0	0.0	0	0.0	0	0.0	4	0.0
6	2	6	19.6	27	169.4	0	0.0	0	0.0	0	0.0	0	0.0	21	52.8
8	2	1	3.4	11	167.2	0	0.0	1	0.3	1	4.0	0	0.0	10	61.4
13	2	4	9.4	19	199.4	2	2.0	1	0.4	1	0.3	0	0.0	11	27.5
14	2	11	4.4	12	216.4	0	0.0	11	5.5	5	6.1	0	0.0	7	9.4
30	1	0	0.0	10	187.6	0	0.0	1	0.3	1	0.9	0	0.0	9	52.9
33	1	0	0.0	3	237.1	0	0.0	0	0.0	0	0.0	0	0.0	2	4.9
34	1	0	0.0	14	173.4	0	0.0	1	0.4	1	1.2	0	0.0	13	67.1
37	1	0	0.0	11	223.5	0	0.0	2	0.7	2	3.3	3	14.5	0	0.0
38	1	0	0.0	6	223.3	3	8.1	0	0.0	0	0.0	0	0.0	2	13.4

SS	VOIF	VOID	VOMF	VOMD	VOAF	VOAD	VOTF	VOTD	VOOFF	VOOFD	VOOTF	VOOTD	VOONF	VOOND	TIF
3	29	26.9	6	6.7	6	6.3	41	13.0	42	185.3	0	0.0	0	0	24
6	29	16.0	10	4.6	3	1.4	42	13.5	43	205.9	0	0.0	0	0	36
8	20	22.3	23	22.8	13	15.1	56	17.6	56	160.1	1	2.8	0	0	10
13	60	61.7	6	5.4	14	12.9	80	24.9	80	135.0	0	0.0	0	0	21
14	27	29.0	1	2.4	3	4.0	30	12.0	32	193.9	0	0.0	0	0	14
30	4	3.3	0	0.0	1	1.1	6	2.2	7	234.6	1	0.9	0	0	27
33	19	20.4	0	0.0	7	7.9	25	8.5	27	204.8	0	0.0	0	0	12
34	24	24.2	0	0.0	6	6.5	31	10.4	31	200.6	0	0.0	0	0	25
37	35	43.4	0	0.0	2	1.9	37	13.1	38	170.8	0	0.0	0	0	25
38	74	56.9	0	0.0	13	14.5	87	31.0	88	139.4	0	0.0	0	0	33

S S	T I D	T M F	T M D	T A F	T A D	T T F	T T D	T O F F	T O F D	T O T F	T O T D	T O N F	T O N D
3	102.8	5	10.5	1	1.3	15	4.6	15	10.3	14	70.4	12	41.0
6	141.5	24	90.9	0	0.0	0	0.0	0	0.0	3	9.2	0	0.0
8	32.1	14	98.9	0	0.0	0	0.0	0	0.0	5	90.8	4	19.3
13	93.2	11	57.8	0	0.0	13	4.0	15	51.4	9	29.0	1	4.6
14	27.7	8	32.6	0	0.0	20	10.1	18	53.7	12	77.7	6	39.6
30	65.0	27	145.7	0	0.0	3	1.1	4	6.9	6	22.1	0	0.0
33	25.4	13	191.2	0	0.0	4	1.5	4	23.7	0	0.0	0	0.0
34	55.2	20	112.0	0	0.0	18	13.5	12	24.0	6	26.5	4	10.7
37	55.7	25	157.1	0	0.0	5	2.0	6	9.3	3	5.9	2	5.0
38	74.5	31	115.5	1	3.7	7	4.4	6	5.2	4	21.1	3	17.3

APPENDIX C

RAW DATA
MATERNAL VISUAL, VOCAL, AND TACTILE BEHAVIORS

---------------------- COND=1 PHASE=3 ----------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF	VIOND
3	2	1	0.5	9	231.9	0	0.0	2	0.6	2	2.5	0	0	5	6.5
6	2	1	5.0	10	215.6	1	2.7	0	0.0	0	0.0	0	0	8	17.9
8	2	2	1.8	23	175.9	0	0.0	0	0.0	0	0.0	0	0	23	62.3
13	2	3	5.4	14	213.9	3	3.6	0	0.0	0	0.0	0	0	8	19.2
14	2	10	10.0	10	163.5	0	0.0	12	6.9	1	1.7	0	0	11	59.7
30	1	0	0.0	11	195.2	0	0.0	7	2.5	7	21.2	0	0	5	23.2
33	1	0	0.0	3	239.8	0	0.0	2	0.8	2	1.3	0	0	0	0.0
34	1	0	0.0	10	198.1	0	0.0	0	0.0	0	0.0	0	0	10	45.0
37	1	0	0.0	11	216.9	0	0.0	2	0.8	2	4.6	0	0	8	19.2
38	1	0	0.0	9	226.7	1	3.1	1	0.5	1	2.0	0	0	6	9.4

SS	VOIF	VOID	VOMF	VOMD	VOAF	VOAD	VOTF	VOTD	VOCFF	VOCFD	VOCTF	VOCTD	VOCNF	VOCND
3	43	36.9	6	4.4	5	5.4	55	18.0	56	176.4	1	0.5	0	0
6	44	31.2	6	4.2	13	10.7	63	19.3	64	177.0	0	0.0	0	0
8	22	23.7	28	22.2	6	6.7	55	17.4	55	170.0	0	0.0	0	0
13	66	52.4	2	0.3	4	3.4	73	22.7	74	160.9	1	1.3	0	0
14	29	47.1	4	9.8	2	3.6	31	12.2	32	168.8	0	0.0	0	0
30	0	0.0	0	0.0	2	1.9	3	1.0	4	234.9	1	4.3	0	0
33	22	26.8	0	0.0	7	10.3	29	10.4	30	194.3	0	0.0	0	0
34	25	26.5	0	0.0	4	5.5	29	11.3	29	196.8	0	0.0	0	0
37	26	28.0	0	0.0	3	4.9	29	10.4	29	550.2	0	0.0	0	0
38	54	49.2	0	0.0	6	9.8	60	20.4	61	163.5	0	0.0	0	0

SS	TIF	TID	TMF	TMD	TAF	TAD	TTF	TTD	TOFF	TOFD	TOTF	TOTD	TONF	TOND
3	27	110.7	3	7.7	0	0	26	8.3	27	58.0	7	34.9	6	21.9
6	34	100.6	20	79.1	0	0	7	2.1	10	15.3	9	44.8	0	0.0
8	14	47.5	11	114.6	0	0	0	0.0	0	0.0	7	67.9	3	8.0
13	13	106.5	9	50.7	1	2	5	2.0	8	21.0	5	56.5	1	3.0
14	24	50.7	14	77.2	0	0	18	2.2	19	74.0	6	25.2	3	6.5
30	27	43.1	27	167.6	0	0	6	3.4	6	4.2	5	19.1	1	4.3
33	21	41.0	24	173.5	0	0	5	2.3	3	1.6	1	1.9	4	21.5
34	23	31.9	16	75.5	0	0	21	8.8	22	109.6	4	5.5	6	13.8
37	16	47.3	17	177.3	0	0	6	2.2	6	6.4	2	2.8	1	6.0
38	49	92.7	43	122.3	0	0	15	6.0	15	12.5	3	5.7	1	2.3

APPENDIX C

RAW DATA
MATERNAL VISUAL, VOCAL, AND TACTILE BEHAVIORS

---------------------- COND=2 PHASE=1 ----------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF	VIOND
4	2	15	9.6	16	183.3	0	0.0	4	2.6	0	0.0	4	4.8	11	35.8
5	2	2	34.9	6	203.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
15	2	0	0.0	19	207.7	1	2.7	8	11.8	3	3.1	0	0.0	9	16.2
18	2	0	0.0	10	229.9	0	0.0	0	0.0	0	0.0	0	0.0	9	11.9
20	2	0	0.0	4	236.6	0	0.0	3	1.0	3	3.8	0	0.0	0	0.0
21	1	5	1.8	6	214.6	0	0.0	3	1.9	3	6.9	0	0.0	4	16.1
23	1	0	0.0	2	240.2	0	0.0	0	0.0	0	0.0	0	0.0	1	1.6
26	1	0	0.0	1	240.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
29	1	2	3.8	28	197.1	0	0.0	4	1.4	4	3.0	0	0.0	21	35.8
40	1	3	1.1	4	228.5	0	0.0	3	1.4	0	0.0	0	0.0	3	10.8

SS	VCIF	VOID	VOMF	VOMD	VOAF	VOAD	VOTF	VOTD	VCOFF	VCOFD	VCOTF	VCOTD	VCONF	VCOND	TIF
4	70	78.0	6	6.7	14	19.2	80	31.7	80	154.0	0	0.0	0	0	24
5	23	16.4	6	3.9	3	3.6	32	9.6	32	207.0	0	0.0	0	0	24
15	41	41.9	0	0.0	0	0.0	44	14.6	45	179.2	3	5.0	0	0	25
18	61	66.8	0	0.0	16	16.9	77	25.7	78	137.5	0	0.0	0	0	39
20	43	41.4	0	0.0	4	6.3	48	16.3	49	176.8	1	0.7	0	0	23
21	52	61.9	1	2.2	10	22.9	62	21.3	62	130.0	0	0.0	0	0	19
23	39	31.3	0	0.0	0	0.0	38	12.3	39	198.2	0	0.0	0	0	48
26	85	101.3	0	0.0	3	5.0	87	27.5	88	107.6	0	0.0	0	0	39
29	67	54.7	8	4.5	7	9.5	84	25.9	84	141.9	3	4.8	0	0	39
40	4	4.0	0	0.0	1	1.8	5	1.8	5	233.7	0	0.0	0	0	26

SS	TID	TMF	TMD	TAF	TAD	TTF	TTD	TOFF	TOFD	TOTF	TOTD	TONF	TOND
4	65.9	29	131.5	1	5.3	0	0.0	1	0.5	5	13.2	3	25.7
5	66.8	9	53.6	1	2.9	28	8.7	29	55.2	6	21.2	13	32.9
15	49.5	20	88.5	1	2.7	13	4.4	18	30.1	11	59.9	2	4.9
18	130.8	25	41.8	2	8.2	8	3.7	12	18.1	4	16.8	5	21.9
20	40.9	26	188.3	0	0.0	3	1.2	8	7.6	0	0.0	1	3.7
21	40.8	15	55.1	0	0.0	11	4.1	12	101.6	5	25.0	4	11.0
23	141.7	37	53.8	2	1.0	16	5.7	21	23.5	5	5.4	3	2.8
26	12.5	8	36.5	0	0.0	39	12.5	40	52.7	0	0.0	5	8.1
29	112.8	2	2.2	0	0.0	23	7.5	23	33.4	8	56.8	7	28.8
40	66.3	25	136.3	0	0.0	6	3.0	5	4.3	6	22.7	1	9.1

APPENDIX C

RAW DATA
MATERNAL VISUAL, VOCAL, AND TACTILE BEHAVIORS

---------------------- COND=2   PHASE=2 ----------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF	VIOND	VOIF
4	2	7	2.4	9	203.3	0	0.0	1	1.1	0	0.0	2	5	7	29.7	61
5	2	1	2.2	10	227.2	0	0.0	0	0.0	0	0.0	0	0	8	11.9	27
15	2	0	0.0	9	233.1	0	0.0	2	0.8	2	1.6	0	0	6	6.4	67
18	2	0	0.0	34	152.4	0	0.0	0	0.0	0	0.0	0	0	34	89.3	36
20	2	0	0.0	2	240.0	0	0.0	0	0.0	0	0.0	0	0	1	1.7	41
21	1	9	4.3	10	205.8	0	0.0	10	4.8	2	2.4	0	0	7	23.8	58
23	1	0	0.0	12	206.5	0	0.0	0	0.0	0	0.0	0	0	11	35.0	34
26	1	0	0.0	7	236.1	0	0.0	0	0.0	0	0.0	0	0	6	5.2	79
29	1	2	4.9	19	215.9	1	1.3	1	0.3	1	0.3	0	0	14	18.6	93
40	1	1	0.4	3	236.1	0	0.0	2	0.8	1	2.3	0	0	1	2.4	0

SS	VOID	VOMF	VOMD	VOAF	VOAD	VOTF	VOTD	VOOFF	VOOFD	VOOTF	VOOTD	VOONF	VOOND	TIF
4	77.6	7	11.4	9	17.8	70	24.3	70	111.9	0	0.0	0	0	15
5	18.8	2	2.0	2	1.6	31	9.5	32	209.4	0	0.0	0	0	30
15	53.3	0	0.0	2	2.0	69	25.0	71	161.2	1	0.9	0	0	20
18	54.3	0	0.0	5	4.9	41	14.6	42	167.6	0	0.0	0	0	29
20	40.5	0	0.0	8	10.5	48	15.5	49	174.8	0	0.0	0	0	30
21	75.3	0	0.0	10	19.9	68	22.5	69	123.0	0	0.0	0	0	30
23	26.8	1	0.7	1	0.5	35	11.8	36	201.9	0	0.0	0	0	45
26	91.9	2	3.4	13	22.4	94	30.9	95	93.0	0	0.0	0	0	37
29	90.8	0	0.0	3	3.1	96	30.0	96	117.8	0	0.0	0	0	42
40	0.0	0	0.0	0	0.0	0	0.0	1	241.2	0	0.0	0	0	12

SS	TID	TMF	TMD	TAF	TAD	TTF	TTD	TOFF	TOFD	TOTF	TOTD	TONF	TOND
4	52.5	19	122.2	0	0.0	7	4.0	8	9.6	3	15.4	10	38.2
5	110.2	3	37.2	0	9.0	30	9.0	30	76.4	1	3.2	4	5.2
15	31.3	16	44.2	0	0.0	28	10.6	26	82.6	10	54.4	9	18.7
18	142.1	15	35.1	0	0.0	10	3.4	13	32.6	7	23.4	0	0.0
20	41.0	25	122.4	0	0.0	15	5.4	18	40.7	0	0.0	6	34.0
21	63.1	24	122.7	0	0.0	13	7.6	15	25.2	0	0.0	7	20.6
23	104.0	41	100.9	2	0.8	15	4.9	18	30.6	0	0.0	4	6.1
26	99.1	14	49.1	0	0.0	22	7.0	22	34.8	6	40.9	2	10.8
29	103.5	1	0.6	0	0.0	29	9.3	30	67.2	8	35.4	6	25.3
40	23.9	10	125.2	1	1.8	12	4.3	12	37.3	6	21.3	7	27.6

APPENDIX C

RAW DATA
MATERNAL VISUAL, VOCAL, AND TACTILE BEHAVIORS

------------------------- COND=2 PHASE=3 -------------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF	VIOND	VOIF
4	2	2	0.6	6	228.6	0	0.0	5	3.1	2	0.8	0	0	5	9.7	60
5	2	6	21.0	22	197.9	0	0.0	1	0.3	1	1.9	0	0	15	20.4	27
15	2	0	0.0	13	223.9	0	0.0	0	0.0	0	0.0	0	0	12	18.0	65
18	2	0	0.0	4	235.5	0	0.0	0	0.0	0	0.0	0	0	3	4.5	58
20	2	1	0.4	2	237.2	0	0.0	1	0.3	1	4.5	0	0	0	0.0	19
21	1	9	3.7	10	201.3	1	3.4	11	10.1	2	2.9	0	0	8	20.7	60
23	1	0	0.0	5	237.1	0	0.0	0	0.0	0	0.0	0	0	4	5.2	43
26	1	2	16.2	11	206.4	0	0.0	3	1.0	3	7.3	0	0	6	10.3	66
29	1	1	0.5	24	135.1	0	0.0	0	0.0	0	0.0	0	0	23	55.5	78
40	1	0	0.0	6	219.4	0	0.0	5	1.9	0	0.0	0	0	5	20.7	0

SS	VOID	VOMF	VOMD	VOAF	VOAD	VOTF	VOTD	VOOFF	VOOFD	VOOTF	VOOTD	VOONF	VOOND	TIF
4	65.5	5	13.0	9	19.1	69	24.0	70	120.1	0	0.0	0	0	18
5	21.5	1	1.3	2	1.3	30	9.2	31	208.1	0	0.0	0	0	24
15	74.7	0	0.0	1	0.8	65	22.3	67	143.9	0	0.0	0	0	15
18	51.4	0	0.0	20	18.2	78	25.1	79	145.3	0	0.0	0	0	52
20	15.3	0	0.0	6	5.4	26	8.3	27	209.4	1	0.7	0	0	19
21	67.5	1	2.1	3	6.9	63	21.2	63	145.1	0	0.0	0	0	14
23	34.7	0	0.0	16	18.3	59	21.0	60	167.5	0	0.0	0	0	31
26	49.5	17	21.4	17	24.9	100	32.5	100	115.3	0	0.0	0	0	26
29	70.0	4	4.3	7	7.4	89	27.1	88	131.9	0	0.0	0	0	25
40	0.0	0	0.0	0	0.0	0	0.0	1	241.6	0	0.0	0	0	28

SS	TID	TMF	TMD	TA=	TAD	TTF	TTD	TOFF	TUFD	TUTF	TOTD	TONF	TOND
4	53.0	22	107.3	0	0.0	6	2.2	6	4.3	2	8.6	15	67.7
5	73.4	14	103.0	0	0.0	25	7.6	26	30.7	2	3.6	12	23.7
15	31.8	9	40.4	0	0.0	19	7.6	22	79.7	8	45.4	10	36.8
18	141.5	45	69.6	2	4.4	7	2.6	9	12.3	4	5.3	2	3.5
20	23.5	17	63.6	0	0.0	18	6.5	19	99.7	3	5.1	9	44.7
21	26.8	10	51.9	0	0.0	24	8.7	26	118.9	4	9.0	11	26.4
23	70.5	20	56.6	3	1.1	28	9.8	31	80.4	6	15.4	3	8.1
26	79.4	24	105.3	0	0.0	4	1.4	4	9.4	6	25.2	6	20.7
29	79.0	4	1.9	0	0.0	17	5.4	17	27.8	13	115.6	5	12.6
40	62.5	27	118.1	2	5.1	12	5.1	14	11.9	5	26.0	3	13.3

APPENDIX C

RAW DATA
MATERNAL VISUAL, VOCAL, AND TACTILE BEHAVIORS

---------------------- COND= 3 PHASE=1 ----------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF	VIOND	VOIF
1	2	0	0.0	9	228.8	0	0	2	0.7	2	3.0	0	0	6	9.4	54
7	2	0	0.0	10	220.0	0	0	7	2.5	11	11.1	0	0	5	8.4	83
9	2	11	39.0	23	193.2	0	0	4	1.4	4	3.5	0	0	7	5.9	79
11	2	7	110.3	9	107.0	0	0	5	1.7	5	2.1	0	0	2	20.2	83
16	2	0	0.0	7	207.9	0	0	5	1.6	5	18.7	0	0	7	13.4	31
25	1	8	2.5	10	217.6	0	0	16	5.8	16	5.3	0	0	8	10.8	77
31	1	0	0.0	5	235.7	0	0	1	0.4	1	1.0	0	0	3	4.5	37
32	1	0	0.0	5	236.2	0	0	3	1.1	3	2.4	0	0	1	1.9	86
36	1	0	0.0	7	232.7	0	0	0	0.0	0	0.0	0	0	6	8.6	81
39	1	1	0.4	2	229.3	0	0	1	0.3	1	0.3	0	0	1	10.6	35

SS	VOID	VOMF	VOMD	VOAF	VOAD	VOTF	VOTD	VOOFF	VOOFD	VOOTF	VOOTD	VOONF	VOOND	TIF
1	54.6	0	0.0	2	1.7	55	18.7	57	166.1	1	0.8	0	0	30
7	97.4	0	0.0	0	0.0	84	27.7	84	116.8	0	0.0	0	0	26
9	66.5	13	14.3	6	4.5	96	30.4	96	126.9	0	0.0	0	0	45
11	102.2	0	0.0	6	9.5	88	30.5	89	99.8	0	0.0	0	0	10
16	20.4	0	0.0	6	5.7	38	11.8	39	200.4	1	1.3	0	0	28
25	113.4	1	1.2	0	0.0	77	27.2	78	100.2	0	0.0	0	0	17
31	34.7	0	0.0	3	3.4	40	14.9	41	187.9	0	0.0	0	0	38
32	82.0	1	0.5	0	0.0	85	32.0	87	127.1	0	0.0	0	0	9
36	94.3	0	0.0	4	4.4	84	25.8	86	116.7	0	0.0	0	0	23
39	36.4	2	3.6	1	1.2	36	12.6	37	137.3	0	0.0	0	0	25

SS	TID	TMF	TMD	TAF	TAD	TTF	TTD	TGFF	TOFD	TOTF	TCTD	TDNF	TCND
1	42.9	10	15.4	3	1.3	36	12.1	38	158.6	7	5.9	42	164.1
7	55.4	32	64.4	0	0.0	32	11.2	33	23.8	3	5.1	33	142.4
9	119.7	42	106.0	0	0.0	2	0.6	2	4.5	1	1.9	5	9.8
11	24.8	24	116.9	0	0.0	30	9.7	30	16.1	3	15.9	17	57.0
16	102.5	16	47.7	1	1.8	18	5.5	18	3.9	6	62.9	3	10.6
25	46.3	12	18.4	0	0.0	20	7.2	20	141.0	3	7.5	9	21.1
31	102.8	32	115.3	0	0.0	13	4.9	13	14.0	2	5.1	0	0.0
32	204.6	1	5.9	0	0.0	11	3.3	12	7.2	1	5.3	7	15.5
36	67.9	12	112.5	0	0.0	21	6.7	23	37.7	4	13.6	2	3.3
39	57.8	21	98.9	0	0.0	11	4.2	10	22.0	14	49.3	3	9.1

APPENDIX C

RAW DATA
MATERNAL VISUAL, VOCAL, AND TACTILE BEHAVIORS

---------------------- COND=3 PHASE=2 ----------------------

SS	SX	VIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF	VIOND	VOIF
1	2	0	0.0	6	235.5	0	0	2	0.6	2	1.9	0	0	3	3.8	62
7	2	0	0.0	6	233.5	0	0	1	0.3	1	0.3	0	0	5	8.1	85
9	2	2	3.0	14	223.5	0	0	4	1.2	4	6.6	0	0	7	7.2	39
11	2	8	162.1	11	59.1	0	0	1	1.2	4	1.5	0	0	4	18.4	75
16	2	1	1.1	6	233.0	0	0	0	0.0	0	0.0	0	0	4	6.0	70
25	1	4	1.7	7	227.3	0	0	2	0.7	2	1.4	0	0	5	11.4	84
31	1	0	0.0	8	233.3	0	0	0	0.0	0	0.0	0	0	6	7.2	63
32	1	0	0.0	11	228.6	0	0	1	0.3	1	1.5	0	0	9	11.5	108
36	1	0	0.0	2	240.5	0	0	0	0.0	0	0.0	0	0	1	0.9	56
39	1	4	1.5	15	197.9	0	0	12	4.3	12	30.2	0	0	2	7.8	55

SS	VCID	VCMF	VOMD	VOAF	VOAD	VOTF	VOTD	VOOFF	VOOFD	VCOTF	VOOTD	VOONF	VCOND	TIF
1	78.6	0	0.0	12	12.4	74	35.4	74	115.3	0	0	0	0	8
7	88.8	0	0.0	0	0.0	85	26.6	85	130.8	0	0	0	0	30
9	27.1	41	34.3	22	19.2	102	32.5	102	130.8	0	0	0	0	35
11	115.9	0	0.0	7	5.4	81	26.9	82	90.4	0	0	0	0	0
16	82.2	0	0.0	2	2.0	71	22.5	73	134.3	0	0	0	0	27
25	123.3	4	7.0	1	1.7	86	29.5	86	80.7	0	0	0	0	34
31	64.8	0	0.0	5	5.9	66	23.7	66	146.2	0	0	0	0	30
32	114.6	0	0.0	0	0.0	109	34.3	109	92.7	0	0	0	0	32
36	103.0	0	0.0	5	7.0	90	28.1	91	103.4	0	0	0	0	15
39	58.6	0	0.0	8	10.4	63	23.5	65	148.9	0	0	0	0	16

SS	TID	TMF	TMD	TAF	TAD	TTF	TTD	TUFF	TUFD	TOTF	TOTD	TONF	TOND
1	16.5	0	0.00	0	0.0	40	14.4	40	151.8	5	10.5	28	47.3
7	50.9	7	5.80	0	0.0	49	16.9	49	51.4	0	0.0	46	116.6
9	80.1	32	136.50	0	0.0	2	0.5	2	5.8	2	4.9	5	14.0
11	0.0	27	151.39	2	8.6	27	9.2	27	10.5	5	18.2	20	44.8
16	108.6	8	31.30	0	0.0	22	7.1	22	58.0	1	23.5	2	11.7
25	84.9	26	40.60	0	0.0	24	8.4	24	92.5	1	7.0	4	8.1
31	112.0	29	125.90	0	0.0	5	2.0	4	3.0	0	0.0	0	0.0
32	173.6	1	0.80	0	0.0	12	4.3	11	23.9	10	33.5	2	6.3
36	55.7	15	105.20	0	0.0	9	2.8	10	17.2	0	0.0	6	60.8
39	29.5	19	129.40	0	0.0	13	8.7	9	17.4	4	26.5	5	30.7

APPENDIX C

RAW DATA
MATERNAL VISUAL, VOCAL, AND TACTILE BEHAVIORS

------------------------ COND=3 PHASE=3 ------------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIUFF	VIOFD	VIUTF	VIOTD	VICNF	VIOND	VOIF	VOID
1	2	0	0.0	3	238.2	0	0	0	0.0	0	0.0	0	0	2	4.0	27	24.3
7	2	0	0.0	17	212.0	0	0	4	1.3	4	2.2	0	0	16	26.2	94	88.2
9	2	10	14.7	25	204.4	0	0	1	0.3	1	0.5	0	0	14	21.7	54	41.9
11	2	10	83.7	14	117.8	0	0	8	2.5	8	2.4	0	0	4	29.7	96	111.4
16	2	3	3.3	17	204.6	0	0	2	0.9	3	4.2	0	0	15	28.9	70	64.5
25	1	17	6.1	17	201.8	0	0	0	0.0	0	0.0	0	0	16	34.3	77	121.5
31	1	0	0.0	7	230.1	0	0	2	3.0	1	2.5	0	0	4	6.5	28	27.7
32	1	0	0.0	12	194.8	0	0	4	1.3	4	9.6	0	0	10	35.8	96	94.2
36	1	1	4.4	3	233.6	0	0	0	0.0	0	0.0	0	0	1	3.5	81	123.6
39	1	3	2.9	5	204.8	0	0	3	3.1	0	0.0	0	0	4	31.2	23	30.2

SS	VCMF	VOMD	VUAF	VGAD	VOTF	VOTD	VOOFF	VOOFD	VOUTF	VOUTD	VOUNF	VOCND	TIF	TID
1	0	0.0	16	14.6	43	13.0	44	187.6	0	0.0	0	0.0	20	56.8
7	0	0.0	0	0.0	92	30.2	92	123.4	0	0.0	1	0.3	33	46.6
9	14	13.6	6	8.7	75	24.2	74	150.1	2	2.9	0	0.0	44	126.0
11	0	0.0	0	0.0	96	31.3	97	98.7	0	0.0	0	0.0	0	0.0
16	0	0.0	7	7.1	77	23.8	77	145.9	0	0.0	0	0.0	55	195.3
25	0	0.0	0	0.0	76	25.9	77	94.5	0	0.0	0	0.0	23	46.6
31	0	0.0	6	7.7	34	12.2	35	194.1	0	0.0	0	0.0	26	52.0
32	0	0.0	4	4.8	100	31.6	100	111.6	0	0.0	0	0.0	21	120.2
36	0	0.0	4	7.4	85	26.6	83	88.2	0	0.0	0	0.0	11	34.2
39	2	2.6	2	2.8	25	9.3	25	196.8	0	0.0	0	0.0	28	61.7

SS	TMF	TMD	TAF	TAD	TTF	TTD	TOFF	TOFD	TOTF	TOTD	TONF	TOND
1	15	33.2	0	0.0	16	5.9	22	51.3	3	13.7	14	30.5
7	10	12.3	0	0.0	61	20.4	60	54.2	0	0.0	45	103.7
9	38	106.5	0	0.0	1	0.3	1	2.1	2	7.2	0	0.0
11	21	156.5	0	0.0	21	7.0	21	7.7	1	22.5	20	48.0
16	17	24.1	1	3.2	3	3.8	2	1.4	4	13.3	1	2.2
25	8	14.7	0	0.0	20	6.9	20	147.7	3	19.7	4	6.5
31	29	116.0	0	0.0	5	2.0	5	3.7	2	4.0	9	64.0
32	4	4.2	0	0.0	10	3.1	10	16.2	5	82.6	2	15.3
36	10	149.2	0	0.0	6	1.9	7	6.7	3	41.0	3	8.5
39	20	130.1	0	0.0	11	4.0	12	30.6	6	10.9	2	4.6

APPENDIX C

RAW DATA
MATERNAL VISUAL, VOCAL, AND TACTILE BEHAVIORS

---------------------- COND=4 PHASE=1 ----------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF	VIOND	VOIF
2	2	0	0.0	15	206.0	0	0	0	0.0	0	0.0	0	0	14	31.1	35
10	2	0	0.0	8	238.2	0	0	1	0.4	1	1.0	0	0	6	3.1	98
12	2	0	0.0	12	223.5	0	0	1	0.4	1	0.8	0	0	10	14.2	38
17	2	0	0.0	23	191.2	0	0	0	0.0	0	0.0	0	0	22	48.8	44
19	2	0	0.0	15	208.0	0	0	2	0.6	5	5.7	0	0	15	25.7	35
22	1	0	0.0	13	227.3	0	0	4	1.2	4	4.0	0	0	9	8.6	48
24	1	11	12.4	31	200.2	0	0	2	0.6	2	2.4	0	0	17	24.9	30
27	1	0	0.0	23	158.1	0	0	9	3.3	9	13.2	0	0	17	60.9	30
28	1	1	0.4	2	237.2	0	0	1	0.3	1	0.9	0	0	0	0.0	29
35	1	0	0.0	15	223.0	0	0	3	1.0	3	5.4	0	0	11	12.7	41

SS	VOID	VOMF	VOMD	VOAF	VOAD	VOTF	VOTD	VOOFF	VOOFD	VOOTF	VOOTD	VOONF	VOOND	TIF
2	31.4	0	0.0	5	3.4	40	13.2	41	187.8	0	0.0	0	0	28
10	87.9	1	0.7	2	1.2	99	33.5	99	118.2	0	0.0	0	0	34
12	51.6	9	10.2	2	1.3	57	18.4	58	141.6	8	15.3	0	0	17
17	33.5	5	4.3	6	4.4	59	17.2	60	175.4	3	5.3	0	0	19
19	32.8	0	0.0	9	10.4	44	16.2	44	180.7	0	0.0	0	0	10
22	26.1	7	3.0	9	6.9	65	20.8	66	183.5	1	0.8	0	0	48
24	18.3	3	2.8	7	5.2	40	13.0	41	201.5	0	0.0	0	0	25
27	21.1	0	0.0	8	5.9	37	13.1	38	201.3	0	0.0	0	0	18
28	23.1	0	0.0	3	3.1	32	11.1	33	201.2	0	0.0	0	0	31
35	34.8	0	0.0	8	10.6	48	16.8	49	178.8	0	0.0	0	0	38

SS	TID	TMF	TMD	TAF	TAD	TTF	TTD	TOFF	TOFD	TOTF	TOTD	TONF	TOND
2	122.4	17	29.4	0	0.0	16	5.5	17	52.8	4	1.4	7	14.8
10	82.2	12	18.3	1	1.6	44	15.9	44	48.6	2	5.2	22	70.0
12	58.9	12	55.8	1	3.8	11	3.5	12	44.2	6	38.9	4	34.0
17	187.2	5	14.6	1	1.2	8	2.6	8	21.6	1	1.8	3	11.0
19	33.6	7	10.0	0	0.0	21	7.6	23	45.9	10	33.3	13	109.7
22	152.2	16	29.6	0	0.0	12	3.8	13	12.5	0	0.0	13	43.0
24	96.3	27	117.2	2	1.9	0	0.0	0	0.0	2	3.7	4	22.1
27	61.6	15	61.3	1	1.1	9	3.2	9	12.2	10	83.7	5	18.9
28	35.8	25	140.1	0	0.0	10	4.6	10	7.9	0	0.0	0	0.0
35	69.2	28	89.1	0	0.0	19	6.7	22	73.7	2	3.4	0	0.0

APPENDIX C

RAW DATA
MATERNAL VISUAL, VOCAL, AND TACTILE BEHAVIORS

---------------------- COND=4 PHASE=2 ----------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VICFF	VICFD	VIOTF	VIOTD	VIUNF	VICND	VOIF
2	2	0	0.0	5	234.7	0	0.0	0	0.0	0	0.0	0	0	4	7.0	48
10	2	1	0.9	5	237.6	0	0.0	3	1.2	3	1.9	0	0	0	0.0	110
12	2	1	4.2	4	234.4	0	0.0	1	0.3	1	1.9	0	0	1	3.7	72
17	2	0	0.0	8	227.1	0	0.0	2	0.7	2	1.1	0	0	6	12.8	64
19	2	0	0.0	19	213.9	0	0.0	5	1.8	5	9.2	0	0	13	17.0	43
22	1	1	1.7	9	233.7	0	0.0	3	0.9	3	1.2	0	0	3	5.9	82
24	1	7	11.5	30	204.9	1	0.9	0	0.0	0	0.0	0	0	21	24.0	46
27	1	0	0.0	25	153.8	0	0.0	3	0.9	3	2.6	0	0	22	82.0	44
28	1	0	0.0	1	242.4	0	0.0	0	0.0	0	0.0	0	0	0	0.0	67
35	1	0	0.0	7	231.2	0	0.0	3	1.1	3	3.9	0	0	4	7.5	56

SS	VOID	VOMF	VOMD	VOAF	VOAD	VOTF	VOTD	VOFF	VOFD	VOOTF	VOOTD	VOONF	VOOND	TIF
2	44.7	0	0.0	13	12.1	61	21.7	60	162.9	0	0	0	0	22
10	92.0	0	0.0	0	0.0	110	36.7	111	114.5	0	0	0	0	12
12	68.0	6	9.5	3	4.6	81	25.4	81	133.2	1	1	0	0	25
17	77.9	2	3.4	7	8.8	73	22.8	74	134.5	0	0	0	0	12
19	69.5	0	0.0	8	13.3	50	17.2	50	142.3	0	0	0	0	10
22	48.9	7	5.3	5	3.8	93	29.7	93	153.5	0	0	0	0	42
24	33.4	34	26.9	12	8.7	92	28.8	93	144.3	0	0	0	0	39
27	34.4	0	0.0	2	1.5	46	16.3	47	188.6	0	0	0	0	38
28	70.2	2	2.8	5	7.3	72	25.4	73	136.3	0	0	0	0	35
35	62.5	0	0.0	5	6.1	61	22.1	61	151.1	0	0	0	0	18

SS	TID	TMF	TMD	TAF	TAD	TTF	TTD	TOFF	TOFD	TOTF	TOTD	TONF	TOND
2	185.1	11	14.8	0	0.0	11	3.9	11	31.9	2	5.2	0	0.0
10	21.2	8	11.8	1	0.3	45	15.5	45	134.4	1	0.7	36	58.1
12	65.1	35	112.1	0	0.0	1	0.3	1	22.0	15	41.8	0	0.0
17	192.4	3	31.5	0	0.0	1	0.4	7	17.0	0	0.0	0	0.0
19	32.1	3	3.1	0	0.0	29	10.2	29	53.3	9	35.7	23	107.0
22	168.0	17	29.5	0	0.0	6	1.9	7	8.5	0	0.0	14	33.4
24	117.5	27	98.1	0	0.0	0	0.0	1	1.4	7	24.8	0	0.0
27	122.3	17	33.6	0	0.0	21	7.3	22	37.6	5	29.5	5	10.9
28	87.9	26	107.8	0	0.0	22	10.6	20	35.3	0	0.0	0	0.0
35	41.5	21	171.2	0	0.0	6	2.5	5	15.1	4	11.5	0	0.0

APPENDIX C

RAW DATA
MATERNAL VISUAL, VOCAL, AND TACTILE BEHAVIORS

---------------------- COND=4 PHASE=3 ----------------------

SS	SX	VIIF	VIID	VIMF	VIMD	VIAF	VIAD	VITF	VITD	VIOFF	VIOFD	VIOTF	VIOTD	VIONF	VIOND	VOIF	VOID
2	2	0	0.0	13	219.0	0	0	0	0.0	0	0.0	0	0	12	22.6	63	72.2
10	2	3	1.7	6	237.9	0	0	0	0.0	0	0.0	0	0	2	2.1	111	104.0
12	2	0	0.0	13	215.6	0	0	4	1.3	4	3.2	0	0	9	21.0	22	26.8
17	2	0	0.0	5	237.9	0	0	2	0.7	2	0.8	0	0	3	2.4	27	20.5
19	2	0	0.0	19	207.9	0	0	6	2.1	6	7.9	0	0	12	19.1	46	67.2
22	1	0	0.0	13	232.3	0	0	5	1.6	5	1.7	0	0	9	5.7	85	55.2
24	1	6	14.3	21	193.4	0	0	1	0.3	1	0.6	0	0	13	32.3	34	20.8
27	1	0	0.0	22	170.2	0	0	4	1.3	4	5.0	0	0	22	65.2	46	38.1
28	1	1	0.6	2	240.2	0	0	1	0.5	0	0.0	0	0	1	0.6	52	55.5
35	1	1	14.0	15	220.5	0	0	4	1.5	4	5.6	0	0	9	12.1	41	37.6

SS	VOMF	VOMD	VOAF	VOAD	VOTF	VOTD	VOOFF	VOOFD	VOOTF	VOOTD	VOONF	VOOND	TIF	TID
2	0	0.0	5	4.8	67	22.9	68	141.8	0	0.0	0	0	27	156.6
10	1	0.7	3	1.9	115	38.3	114	100.7	0	0.0	0	0	38	90.8
12	29	35.9	3	2.9	54	17.9	54	150.2	1	0.6	0	0	20	49.9
17	1	0.5	5	7.1	44	14.1	45	181.3	11	20.8	0	0	3	6.7
19	0	0.0	21	24.0	65	23.5	67	118.5	0	0.0	0	0	9	14.7
22	1	0.8	5	2.3	91	28.7	92	155.8	0	0.0	0	0	38	130.0
24	36	28.1	10	8.2	80	24.9	81	158.8	0	0.0	0	0	19	78.1
27	0	0.0	13	7.0	59	20.2	60	177.6	0	0.0	0	0	39	88.5
28	0	0.0	3	5.0	54	20.4	56	160.3	0	0.0	0	0	26	52.9
35	0	0.0	6	7.7	43	17.7	47	176.3	0	0.0	0	0	28	74.0

SS	TMF	TMD	TAF	TAD	TTF	TTD	TOFF	TLFD	TCTF	TOTD	TONF	TOND
2	18	30.1	2	5.0	18	6.5	18	39.6	3	4.0	0	0.0
10	23	36.9	1	0.4	33	11.5	34	67.4	1	2.8	14	29.8
12	17	24.9	0	0.0	10	3.3	10	27.0	8	118.9	2	17.6
17	0	0.0	0	0.0	12	3.8	12	15.0	2	6.5	11	215.6
19	9	37.7	1	2.4	13	4.6	15	52.1	4	14.1	14	106.8
22	13	29.4	0	0.0	6	2.1	7	9.6	2	23.9	12	45.7
24	25	132.5	0	0.0	0	0.0	0	0.0	5	14.9	5	15.3
27	14	61.0	2	3.0	26	9.7	29	47.7	7	22.4	6	10.6
28	26	173.3	0	0.0	4	1.6	4	4.3	0	0.0	0	0.0
35	25	129.9	0	0.0	10	4.0	10	24.1	5	9.1	0	0.0

Appendix D

Multivariate Analyses of Variance
Effect Due to Infant Sex
Frequency and Duration of Infant Visual Behaviors

	Source	Criterion	Value	Statistic	p
FREQUENCY	Overall Sex	Wilk's Lambda	Lambda = .895	$F(5, 114) = 4.01$	.002
DURATION	Overall Sex	Wilk's Lambda	Lambda = .926	$F(5, 114) = 1.81$	.115

Appendix D

Analyses of Variance
Effect Due to Infant Sex
Frequency of Infant Visual Behaviors

Measure	Source	df	MS	F	p
Initiate	Sex	1	38.53	3.13	.080
	Subj (Sex)	118	12.32		
Monitor	Sex	1	80.03	1.42	N.S.
	Subj (Sex)	118	56.51		
Terminate	Sex	1	407.01	5.78	.018
	Subj (Sex)	118	70.43		
Off	Sex	1	508.41	7.21	.008
	Subj (Sex)	118	70.54		
Onother	Sex	1	1056.13	14.75	.0002
	Subj (Sex)	118	71.59		

Appendix D

Analyses of Variance
Effect Due to Infant Sex
Duration of Infant Visual Behaviors

Measure	Source	df	MS	F	p
Initiate	Sex	1	10.86	2.68	.104
	Subj(Sex)	118	4.05		
Monitor	Sex	1	9955.41	3.43	.067
	Subj(Sex)	118	2905.99		
Terminate	Sex	1	21.42	2.48	N.S.
	Subj(Sex)	118	8.63		
Off	Sex	1	8.27	0.00	N.S.
	Subj(Sex)	118	3623.76		
Onother	Sex	1	8666.60		N.S.
	Subj(Sex)	118	3908.91		

Appendix D

Infant Visual Behaviors
Means by Infant Sex

	Initiate		Monitor		Terminate		Off		Onother	
	F	D	F	D	F	D	F	D	F	D
Male	1.6	0.9	10.6	86.4	11.1	4.2	10.9	76.9	10.2	72.4
Female	0.5	0.3	12.2	68.2	14.8	5.0	15.0	77.4	16.2	89.4

Appendix E

Multivariate Analyses of Variance
Condition by Phase by Sex
Frequency of Infant Visual Behaviors

Source	Criterion	Value	Statistic	*p*
Overall Condition	Wilk's Lambda	Lambda = .650	$F(15, 77) = 0.87$	.596
Overall Phase	Wilk's Lambda	Lambda = .733	$F(10, 120) = 2.02$	.037
Overall Sex	Wilk's Lambda	Lambda = .763	$F(5, 28) = 1.74$	.158
Overall Condition by Phase	Wilk's Lambda	Lambda = .667	$F(30, 242) = 0.86$	.680
Overall Condition by Sex	Wilk's Lambda	Lambda = .448	$F(15, 77) = 1.75$	.059
Overall Phase by Sex	Wilk's Lambda	Lambda = .844	$F(10, 120) = 1.06$	.396
Overall Condition by Phase by Sex	Wilk's Lambda	Lambda = .640	$F(30, 242) = 0.95$	.542

Appendix E

Analysis of Variance
Condition by Phase by Sex
Frequency of Infant Visual Behaviors

Visual Initiate

Source	df	MS	F	p
Between				
Condition	3	4.11	0.13	N.S.
Sex	1	38.53	1.25	N.S.
Cond by Sex	3	22.82	0.74	N.S.
Subj(Cond Sex)	32	30.93		
Within				
Phase	2	4.36	0.91	N.S.
Cond by Phase	6	4.47	0.93	N.S.
Sex by Phase	2	7.76	1.62	N.S.
Cond by Phase by Sex	6	4.25	0.89	N.S.
Phase by Subj(Cond Sex)	64	4.78		

Appendix E

Analyses of Variance
Condition by Phase by Sex
Frequency of Infant Visual Behaviors

Visual Monitor

Source	df	MS	F	p
Between				
Condition	3	91.60	0.68	N.S.
Sex	1	80.03	0.60	N.S.
Cond by Sex	3	13.99	0.10	N.S.
Subj(Cond Sex)	32	134.45		
Within				
Phase	2	122.91	5.30	.007
Cond by Phase	6	22.98	0.99	N.S.
Sex by Phase	2	15.41	0.66	N.S.
Cond by Phase by Sex	6	24.96	1.08	N.S.
Phase by Subj(Cond Sex)	64	23.19		

Visual Terminate

Source	df	MS	F	p
Between				
Condition	3	257.83	1.76	N.S.
Sex	1	407.01	2.79	N.S.
Cond by Sex	3	282.14	1.93	N.S.
Subj(Cond Sex)	32	146.12		
Within				
Phase	2	82.66	3.21	.047
Cond by Phase	6	5.78	0.22	N.S.
Sex by Phase	2	13.36	0.52	N.S.
Cond by Phase by Sex	6	23.73	0.92	N.S.
Phase by Subj(Cond)	64	25.72		

Appendix E

Analyses of Variance
Condition by Phase by Sex
Frequency of Infant Visual Behaviors

Visual Off

Source	df	MS	F	p
Between				
Condition	3	278.97	1.86	N.S.
Sex	1	508.41	3.39	.075
Cond by Sex	3	253.85	1.69	N.S.
Subj(Cond Sex)	32	150.18		
Within				
Phase	2	91.53	3.86	.026
Cond by Phase	6	5.38	0.23	N.S.
Sex by Phase	2	17.91	0.75	N.S.
Cond by Phase by Sex	6	25.05	1.06	N.S.
Phase by Subj(Cond Sex)	64	23.74		

Visual On Other

Source	df	MS	F	p
Between				
Condition	3	174.24	1.16	N.S.
Sex	1	1056.13	7.01	.013
Cond by Sex	3	332.02	2.20	N.S.
Subj(Cond Sex)	32	150.76		
Within				
Phase	2	79.83	3.04	.055
Cond by Phase	6	22.14	0.84	N.S.
Sex by Phase	2	11.61	0.44	N.S.
Cond by Phase by Sex	6	18.10	0.69	N.S.
Phase by Subj(Cond Sex)	64	26.25		

Appendix E

Individual Comparisons
Phase Effect
Frequency of Infant Visual Behaviors

Phase	Visual Monitor	Visual Terminate	Visual Off	Visual Onother
1	12.53A	14.50A	14.65A	14.63A
2	12.23A	12.30A	12.30A,B	13.18A,B
3	9.35B	11.88A	11.83B	11.80B

* Means with the same letter are not significantly different.

Appendix E

Multivariate Analyses of Variance
Condition by Phase by Sex
Duration of Infant Visual Behaviors

Source	Criterion	Value	Statistic	*p*
Overall Condition	Wilk's Lambda	Lambda = .550	F(15, 77) = 1.25	.252
Overall Phase	Wilk's Lambda	Lambda = .762	F(10, 120) = 1.75	.078
Overall Sex	Wilk's Lambda	Lambda = .842	F(5, 28) = 1.05	.409
Overall Condition by Phase	Wilk's Lambda	Lambda = .707	F(30, 242) = 0.73	.849
Overall Condition by Sex	Wilk's Lambda	Lambda = .502	F(15, 77) = 1.47	.139
Overall Phase by Sex	Wilk's Lambda	Lambda = .956	F(10, 120) = 0.27	.986
Overall Condition by Phase by Sex	Wilk's Lambda	Lambda = .679	F(30, 242) = 0.82	.735

Appendix E

Analyses of Variance
Condition by Phase by Sex
Duration of Infant Visual Behaviors

Visual Initiate

Source	df	MS	F	p
Between				
Condition	3	0.98	0.09	N.S.
Sex	1	10.86	1.03	N.S.
Cond by Sex	3	7.97	0.76	N.S.
Subj(Cond Sex)	32	10.53		
Within				
Phase	2	0.82	0.57	N.S.
Cond by Phase	6	1.70	1.19	N.S.
Sex by Phase	2	0.27	0.19	N.S.
Cond by Phase by Sex	6	1.73	1.22	N.S.
Phase by Subj(Cond Sex)	64	1.42		

Visual Monitor

Source	df	MS	F	p
Between				
Condition	3	12751.63	2.18	N.S.
Sex	1	9955.41	1.70	N.S.
Cond by Sex	3	9098.10	1.55	N.S.
Subj(Cond Sex)	32	5854.95		
Within				
Phase	2	4200.56	3.54	.035
Cond by Phase	6	736.87	0.62	N.S.
Sex by Phase	2	143.96	0.12	N.S.
Cond by Phase by Sex	6	172.50	0.15	N.S.

Appendix E

Analyses of Variance
Condition by Phase by Sex
Duration of Infant Visual Behaviors

Visual Terminate

Source	df	MS	F	p
Between				
Condition	3	27.87	1.55	N.S.
Sex	1	21.42	1.19	N.S.
Cond by Sex	3	31.50	1.75	N.S.
Subj(Cond Sex)	32	18.02		
Within				
Phase	2	7.97	2.34	N.S.
Cond by Phase	6	1.13	0.33	N.S.
Sex by Phase	2	1.37	0.40	N.S.
Cond by Phase by Sex	6	3.25	0.95	N.S.
Phase by Subj(Cond Sex)	64	3.41		

Visual Off

Source	df	MS	F	p
Between				
Condition	3	1296.02	0.16	N.S.
Sex	1	8.27	0.00	N.S.
Cond by Sex	3	5827.52	0.71	N.S.
Subj(Cond Sex)	32	8216.06		
Within				
Phase	2	3418.88	1.88	N.S.
Cond by Phase	6	1808.54	0.99	N.S.
Sex by Phase	2	464.45	0.26	N.S.
Cond by Phase by Sex	6	1365.94	0.75	N.S.
Phase by Subj(Cond Sex)	64	1820.40		

Appendix E

Analyses of Variance
Condition by Phase by Sex
Duration of Infant Visual Behaviors

Visual On Other

Source	df	MS	F	p
Between				
Condition	3	6748.40	0.70	N.S.
Sex	1	8666.60	0.89	N.S.
Cond by Sex	3	9290.13	0.96	N.S.
Subj(Cond Sex)	32	9694.70		
Within				
Phase	2	165.69	0.12	N.S.
Cond by Phase	6	923.56	0.68	N.S.
Sex by Phase	2	607.51	0.45	N.S.
Cond by Phase by Sex	6	1526.58	1.13	N.S.
Phase by Subj(Cond Sex)	64	1354.03		

Appendix E

Infant Visual Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Terminate		Off		Onoth	
	F	D	F	D	F	D	F	D	F	D
Phase										
1	0.7	0.7	12.5	83.7	14.6	5.1	14.7	71.8	14.6	78.6
2	1.3	0.7	12.2	82.8	12.3	4.5	12.3	71.9	13.2	81.5
3	1.1	0.5	9.4	65.5	11.9	4.3	11.8	87.8	11.8	82.6
Condition by Phase										
Increased Visual	1.1	0.7	11.8	100.8	10.2	3.8	11.2	75.9	12.5	60.3
1	1.1	0.7	12.7	109.8	12.2	4.6	12.5	70.2	10.5	55.9
2	1.4	1.2	11.7	97.3	10.0	3.7	9.9	76.8	11.7	62.9
3	0.7	0.3	11.0	95.2	8.5	3.1	8.5	80.7	9.5	62.1
Increased Vocal	1.5	0.5	13.2	56.2	16.9	5.8	17.2	85.7	16.4	91.1
1	0.1	0.1	14.0	53.3	18.5	6.5	18.9	82.7	20.1	95.1
2	2.3	0.9	16.0	71.0	16.6	5.7	16.7	68.3	15.6	95.4
3	2.1	0.7	9.6	44.3	15.5	5.4	15.9	106.3	13.4	82.8

Appendix E

Infant Visual Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Terminate		Off		Onoth	
	F	D	F	D	F	D	F	D	F	D
Condition by Phase (Cont.)										
Increased Vis + Voc	1.0	0.8	11.5	64.4	13.3	4.9	13.0	77.2	13.3	92.9
1	0.6	1.3	14.1	74.7	14.6	5.2	14.6	65.3	14.5	92.5
2	1.2	0.6	11.4	74.3	11.8	4.5	11.5	65.1	13.1	96.9
3	1.1	0.6	8.9	44.1	13.5	5.1	13.0	101.4	12.4	89.3
Control	0.6	0.4	9.0	87.9	11.2	3.9	11.2	69.8	12.5	79.4
1	0.9	0.7	9.3	96.8	12.9	4.3	12.6	68.8	13.4	71.1
2	0.4	0.2	9.8	88.4	10.8	4.0	11.1	77.5	12.3	70.9
3	0.5	0.3	7.9	78.4	10.0	3.5	9.9	63.1	11.9	96.2
Sex by Phase										
Male	1.6	0.9	10.6	86.4	11.1	4.2	10.9	76.9	10.2	72.4
1	0.8	1.0	11.4	94.9	12.1	4.5	11.9	70.8	11.1	69.3
2	2.3	1.1	11.1	90.2	11.0	4.2	10.8	68.7	10.3	77.3
3	1.8	0.7	9.3	74.3	10.1	3.9	10.0	91.3	9.4	70.7

Appendix E

Infant Visual Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Terminate		Off		Onoth	
	F	D	F	D	F	D	F	D	F	D
Sex by Phase (Cont.)										
Female	0.5	0.3	12.2	68.2	14.8	5.0	15.0	77.4	15.2	89.4
1	0.6	0.5	13.7	72.5	17.0	5.8	17.5	72.7	18.2	88.0
2	0.4	0.3	13.4	75.4	13.6	4.7	13.8	75.2	16.1	85.8
3	0.4	0.2	9.5	56.7	13.7	4.7	13.7	84.4	14.3	94.5
Sex by Condition										
Male										
Increased Visual	1.5	1.0	11.7	92.5	12.1	4.5	11.9	82.6	9.9	60.3
Increased Vocal	2.9	1.0	12.2	57.4	12.5	4.6	12.7	96.7	13.2	80.3
Increased Vis + Voc	1.9	1.6	9.8	75.5	12.7	5.0	11.9	56.9	12.9	101.7
Control	0.0	0.0	8.5	120.2	6.9	2.6	6.9	71.4	4.9	47.4

Appendix E

Infant Visual Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Terminate		Off		Onoth	
	F	D	F	D	F	D	F	D	F	D
Sex by Condition (Cont.)										
Female										
Increased Visual	0.6	0.4	11.9	109.1	8.3	3.0	8.7	69.2	11.2	60.3
Increased Vocal	0.1	0.1	14.2	54.9	21.3	7.1	21.7	74.7	19.5	101.8
Increased Vis + Voc	0.0	0.0	13.1	53.3	13.9	4.8	14.1	97.6	13.8	84.1
Control	1.2	0.9	9.5	55.5	15.5	5.3	15.5	68.2	20.1	111.4
Sex by Condition by Phase										
Male										
Increased Visual										
1	1.8	1.3	11.8	100.4	13.6	5.1	13.8	80.0	9.8	53.5
2	2.0	1.5	12.4	84.5	14.2	5.2	13.6	73.6	12.0	77.1
3	0.8	0.3	11.0	92.6	8.6	3.3	8.4	94.7	8.0	50.3

Appendix E

Infant Visual Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Terminate		Off		Onoth	
	F	D	F	D	F	D	F	D	F	D
Sex by Condition by Phase (Cont.)										
Male										
Increased Vocal										
1	0.0	0.0	14.0	57.7	12.4	4.7	12.4	79.2	17.2	98.2
2	4.6	1.7	13.0	73.4	12.4	4.6	12.4	77.4	12.6	84.8
3	4.2	1.4	9.6	41.2	12.6	4.6	13.2	133.5	9.8	58.1
Increased Vis + Voc										
1	1.2	2.5	10.2	87.3	13.6	5.0	13.0	50.5	12.0	94.3
2	2.4	1.2	11.0	82.8	12.0	4.8	11.4	51.0	12.8	101.3
3	2.2	1.1	8.2	56.4	12.6	5.3	11.4	69.1	13.8	109.4
Control										
1	0.0	0.0	9.4	133.9	8.8	3.3	8.2	73.8	5.4	31.3
2	0.0	0.0	7.8	120.0	5.4	2.1	5.8	72.5	3.6	45.9
3	0.0	0.0	8.2	106.9	6.6	2.4	6.8	67.8	5.8	54.9

Appendix E

Infant Visual Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Terminate		Off		Onoth	
	F	D	F	D	F	D	F	D	F	D
Sex by Condition by Phase (Cont.)										
Female										
Increased Visual										
1	0.4	0.2	13.6	119.2	10.8	4.0	11.2	60.9	11.2	58.3
2	0.8	0.8	11.0	110.2	5.8	2.1	6.2	80.0	11.4	48.7
3	0.6	0.2	11.0	97.7	8.4	3.0	8.6	56.7	11.0	73.8
Increased Vocal										
1	0.2	0.2	14.0	48.9	24.6	8.2	25.4	86.2	23.0	92.1
2	0.0	0.0	19.0	68.6	20.8	6.8	21.0	59.1	18.6	106.0
3	0.0	0.0	9.6	47.3	18.4	6.2	18.6	79.0	17.0	107.5
Increased Vis + Voc										
1	0.0	0.0	18.0	62.1	15.6	5.4	16.2	80.1	17.0	90.7
2	0.0	0.0	11.8	65.8	11.6	4.1	11.6	79.1	13.4	92.5
3	0.0	0.0	9.6	31.9	14.4	4.9	14.6	133.6	11.0	69.2

Appendix E

Infant Visual Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Terminate		Off		Onoth	
	F	D	F	D	F	D	F	D	F	D
Sex by Condition by Phase (Cont.)										
Female										
Control										
1	1.8	1.5	9.2	59.8	17.0	5.3	17.0	63.8	21.4	110.8
2	0.8	0.4	11.8	56.8	16.2	5.8	16.4	82.4	21.0	95.9
3	1.0	0.5	7.6	49.9	13.4	4.6	13.0	58.3	18.0	127.5

Appendix F

Multivariate Analyses of Variance
Effect Due to Infant Sex
Frequency and Duration of Infant Tactile Behaviors

	Source	Criterion	Value	Statistic	*p*
FREQUENCY	Overall Sex	Wilk's Lambda	Lambda = .955	F(5, 114) = 1.09	.373
DURATION	Overall Sex	Wilk's Lambda	Lambda = .866	F(5, 114) = 3.53	.005

Appendix F

Analyses of Variance
Effect Due to Infant Sex
Frequency of Infant Tactile Behaviors

Measure	Source	df	MS	F	p
Initiate	Sex	1	0.01	0.00	N.S.
	Subj(Sex)	118	9.34		
Monitor	Sex	1	90.13	3.95	.049
	Subj(Sex)	118	22.80		
Action	Sex	1	78.41	3.40	.068
	Subj(Sex)	118	23.07		
Terminate	Sex	1	20.01	1.49	N.S.
	Subj(Sex)	118	13.40		
Off	Sex	1	39.68	1.83	N.S.
	Subj(Sex)	118	21.64		

Appendix F

Analyses of Variance
Effect Due to Infant Sex
Duration of Infant Tactile Behaviors

Measure	Source	df	MS	F	p
Initiate	Sex	1	0.52	0.03	N.S.
	Subj(Sex)	118	14.95		
Monitor	Sex	1	26267.04	13.76	.0003
	Subj(Sex)	118	1909.02		
Action	Sex	1	124.85	0.93	N.S.
	Subj(Sex)	118	133.87		
Terminate	Sex	1	0.98	0.37	N.S.
	Subj(Sex)	118	2.65		
Off	Sex	1	29143.95	11.83	.0008
	Subj(Sex)	118	2464.10		

Appendix F

Infant Tactile Behaviors
Means by Infant Sex

	Initiate		Monitor		Action		Terminate		Off	
	F	D	F	D	F	D	F	D	F	D
Male	1.7	2.0	6.5	59.5	6.0	10.7	4.3	1.5	7.7	167.8
Female	1.7	2.1	4.8	29.9	4.4	8.6	3.5	1.4	6.5	199.0

Appendix G

Multivariate Analyses of Variance
Condition by Phase by Sex
Frequency of Infant Tactile Behaviors

Source	Criterion	Value	Statistic	*p*
Overall Condition	Wilk's Lambda	Lambda = .480	$F(15, 77) = 1.58$	.099
Overall Phase	Wilk's Lambda	Lambda = .811	$F(10, 120) = 1.33$	.224
Overall Sex	Wilk's Lambda	Lambda = .916	$F(5, 28) = 0.51$	.764
Overall Condition by Phase	Wilk's Lambda	Lambda = .629	$F(30, 242) = 0.99$	.483
Overall Condition by Sex	Wilk's Lambda	Lambda = .757	$F(15, 77) = 0.55$	.904
Overall Phase by Sex	Wilk's Lambda	Lambda = .761	$F(10, 120) = 1.76$	.076
Overall Condition by Phase by Sex	Wilk's Lambda	Lambda = .493	$F(30, 242) = 1.56$	.037

Appendix G

Analyses of Variance
Condition by Phase by Sex
Frequency of Infant Tactile Behaviors

Tactile Initiate

Source	df	MS	F	p
Between				
Condition	3	24.48	1.17	N.S.
Sex	1	0.008	0.00	N.S.
Cond by Sex	3	13.10	0.63	N.S.
Subj(Cond Sex)	32	20.86		
Within				
Phase	2	10.00	2.84	.066
Cond by Phase	6	2.67	0.76	N.S.
Sex by Phase	2	8.63	2.45	.094
Cond by Phase by Sex	6	7.19	1.04	.073
Phase by Subj(Cond Sex)	64	3.53		

Tactile Monitor

Source	df	MS	F	p
Between				
Condition	3	86.82	2.05	N.S.
Sex	1	90.13	2.13	N.S.
Cond by Sex	3	15.49	0.37	N.S.
Subj(Cond Sex)	32	42.26		
Within				
Phase	2	20.91	2.02	N.S.
Cond by Phase	6	24.90	2.41	.037
Sex by Phase	2	46.31	4.48	.015
Cond by Phase by Sex	6	14.43	1.40	N.S.
Phase by Subj(Cond Sex)	64	10.33		

Appendix G

Analyses of Variance
Condition by Phase by Sex
Frequency of Infant Tactile Behaviors

Tactile Action

Source	df	MS	F	p
Between				
Condition	3	51.63	1.27	N.S.
Sex	1	78.41	1.93	N.S.
Cond by Sex	3	5.74	0.14	N.S.
Subj(Cond Sex)	32	40.62		
Within				
Phase	2	7.73	0.51	N.S.
Cond by Phase	6	16.51	1.09	N.S.
Sex by Phase	2	26.16	1.73	N.S.
Cond by Phase by Sex	6	19.19	1.27	N.S.
Phase by Subj(Cond Sex)	64	15.14		

Tactile Terminate

Source	df	MS	F	p
Between				
Condition	3	16.28	0.65	N.S.
Sex	1	20.01	0.80	N.S.
Cond by Sex	3	0.41	0.02	N.S.
Subj(Cond Sex)	32	25.10		
Within				
Phase	2	8.58	0.94	N.S.
Cond by Phase	6	8.64	0.95	N.S.
Sex by Phase	2	10.51	1.16	N.S.
Cond by Phase by Sex	6	9.44	1.04	N.S.
Phase by Subj(Cond Sex)	64	9.08		

Appendix G

Analyses of Variance
Condition by Phase by Sex
Frequency of Infant Tactile Behaviors

Tactile Off

Source	df	MS	F	p
Between				
Condition	3	48.48	1.17	N.S.
Sex	1	39.68	0.96	N.S.
Cond by Sex	3	1.68	0.04	N.S.
Subj(Cond Sex)	32	41.40		
Within				
Phase	2	24.56	2.04	N.S.
Cond by Phase	6	20.89	1.74	N.S.
Sex by Phase	2	26.43	2.20	N.S.
Cond by Phase by Sex	6	13.56	1.13	N.S.
Phase by Subj(Cond Sex)	64	12.03		

Appendix G

Multivariate Analyses of Variance
Condition by Phase by Sex
Duration of Infant Tactile Behaviors

Source	Criterion	Value	Statistic	p
Overall Condition	Wilk's Lambda	Lambda = .601	F(15, 77) = 1.05	.419
Overall Phase	Wilk's Lambda	Lambda = .895	F(10, 120) = 0.68	.738
Overall Sex	Wilk's Lambda	Lambda = .739	F(5, 28) = 1.98	.113
Overall Condition by Phase	Wilk's Lambda	Lambda = .608	F(30, 242) = 1.07	.379
Overall Condition by Sex	Wilk's Lambda	Lambda = .634	F(15, 77) = 0.93	.536
Overall Phase by Sex	Wilk's Lambda	Lambda = .830	F(10, 120) = 1.17	.317
Overall Condition by Phase by Sex	Wilk's Lambda	Lambda = .642	F(30, 242) = 0.94	.555

Appendix G

Analyses of Variance
Condition by Phase by Sex
Duration of Infant Tactile Behaviors

Tactile Initiate

Source	df	MS	F	p
Between				
Condition	3	22.31	0.73	N.S.
Sex	1	0.52	0.02	N.S.
Cond by Sex	3	17.66	0.58	N.S.
Subj(Cond Sex)	32	30.66		
Within				
Phase	2	11.57	1.42	N.S.
Cond by Phase	6	3.24	0.40	N.S.
Sex by Phase	2	12.51	1.54	N.S.
Cond by Phase by Sex	6	12.63	1.56	N.S.
Phase by Subj(Cond Sex)	64	8.12		

Tactile Monitor

Source	df	MS	F	p
Between				
Condition	3	7124.06	1.67	N.S.
Sex	1	26267.04	6.17	.018
Cond by Sex	3	6000.71	1.41	N.S.
Subj(Cond Sex)	32	4253.98		
Within				
Phase	2	268.18	0.41	N.S.
Cond by Phase	6	671.31	1.03	N.S.
Sex by Phase	2	1003.70	1.54	N.S.
Cond by Phase by Sex	6	240.03	0.37	N.S.
Phase by Subj(Cond Sex)	64	652.36		

Appendix G

Analyses of Variance
Condition by Phase by Sex
Duration of Infant Tactile Behaviors

Tactile Action

Source	df	MS	F	p
Between				
Condition	3	136.81	0.62	N.S.
Sex	1	124.85	0.57	N.S.
Cond by Sex	3	17.09	0.08	N.S.
Subj(Cond Sex)	32	220.85		
Within				
Phase	2	15.50	0.15	N.S.
Cond by Phase	6	144.05	1.37	N.S.
Sex by Phase	2	2.38	0.02	N.S.
Cond by Phase by Sex	6	102.78	0.97	N.S.
Phase by Subj(Cond Sex)	64	105.48		

Tactile Terminate

Source	df	MS	F	p
Between				
Condition	3	1.71	0.39	N.S.
Sex	1	0.98	0.22	N.S.
Cond by Sex	3	1.04	0.23	N.S.
Subj(Cond Sex)	32	4.44		
Within				
Phase	2	0.44	0.22	N.S.
Cond by Phase	6	2.94	1.48	N.S.
Sex by Phase	2	0.42	0.21	N.S.
Cond by Phase by Sex	6	2.53	1.27	N.S.
Phase by Subj(Cond Sex)	64	1.99		

Appendix G

Analyses of Variance
Condition by Phase by Sex
Duration of Infant Tactile Behaviors

Tactile Off

Source	df	MS	F	p
Between				
Condition	3	8403.43	1.59	N.S.
Sex	1	29143.95	5.51	.025
Cond by Sex	3	6277.24	1.19	N.S.
Subj(Cond Sex)	32	5291.40		
Within				
Phase	2	546.45	0.56	N.S.
Cond by Phase	6	1208.60	1.24	N.S.
Sex by Phase	2	1328.69	1.37	N.S.
Cond by Phase by Sex	6	683.92	0.70	N.S.
Phase by Subj(Cond Sex)	64	973.31		

Appendix G

Infant Tactile Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Action		Terminate		Off	
	F	D	F	D	F	D	F	D	F	D
Phase										
1	1.7	2.2	5.0	44.0	4.7	9.1	3.9	1.4	6.9	184.2
2	2.2	2.5	6.5	47.5	5.4	10.3	4.4	1.6	8.0	179.4
3	1.2	1.5	5.5	42.5	5.6	9.5	3.4	1.4	6.5	186.6
Condition by Phase										
Increased Visual	1.5	2.5	4.9	35.6	5.6	12.3	4.4	1.3	7.7	189.5
1	1.7	3.0	5.0	44.2	5.8	14.6	5.2	1.9	8.3	178.2
2	2.2	3.3	6.3	35.2	6.7	14.7	5.5	2.3	9.3	186.2
3	0.6	1.3	3.3	27.4	4.3	14.7	2.6	1.0	5.4	204.2
Increased Vocal	1.1	1.4	4.4	28.3	3.8	7.2	3.0	1.3	5.7	203.3
1	1.5	2.0	4.2	25.2	2.7	6.0	2.7	0.9	5.9	207.0
2	1.0	1.2	3.3	24.7	2.8	4.8	2.7	0.9	4.9	209.6
3	0.8	1.0	5.7	23.8	6.0	10.7	3.6	1.9	6.2	193.2

Appendix G

Infant Tactile Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Action		Terminate		Off	
	F	D	F	D	F	D	F	D	F	D
Condition by Phase (Cont.)										
Increased Vis + Voc	3.0	3.0	8.2	61.5	6.9	9.9	4.5	1.5	8.6	164.4
1	2.3	2.9	5.7	52.9	5.9	8.2	4.2	1.4	6.8	173.8
2	4.0	3.4	10.0	69.8	7.5	14.0	5.4	1.8	10.7	152.7
3	2.7	2.9	8.8	62.0	7.2	7.5	4.0	1.4	8.2	166.8
Control	1.1	1.3	5.2	53.4	4.6	9.2	3.5	1.3	6.5	176.4
1	1.2	1.0	5.2	53.9	4.5	7.6	3.3	1.2	6.6	177.9
2	1.5	2.2	6.2	60.5	4.6	7.9	3.8	1.2	7.0	169.0
3	0.6	0.7	4.3	45.8	4.7	12.2	3.5	1.4	6.0	182.2
Sex by Phase										
Male	1.7	2.0	6.5	59.5	6.0	10.7	4.3	1.5	7.7	167.8
1	1.2	1.6	4.7	53.2	4.6	10.4	3.8	1.3	6.6	174.9
2	2.6	3.0	7.9	66.4	6.7	11.4	4.8	1.7	9.2	158.7
3	1.3	1.5	7.1	58.8	6.9	10.3	4.4	1.6	7.4	159.9

Appendix G

Infant Tactile Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Action		Terminate		Off	
	F	D	F	D	F	D	F	D	F	D
Sex by Phase (Cont.)										
Female	1.7	2.1	4.8	29.9	4.4	8.6	3.5	1.4	6.5	199.0
1	2.2	2.9	5.4	34.8	4.9	7.9	4.0	1.4	7.3	193.6
2	1.8	2.1	5.0	28.6	4.2	9.3	4.0	1.5	6.8	200.1
3	1.1	1.4	4.0	26.2	4.3	8.8	2.5	1.2	5.6	203.3
Sex by Condition										
Male										
Increased Visual	1.9	2.5	5.5	45.3	6.0	14.4	4.8	1.8	8.2	177.5
Increased Vocal	0.7	1.0	5.1	37.4	4.3	8.3	3.3	1.1	6.0	193.9
Increased Vis + Voc	3.7	4.0	10.1	97.3	7.9	10.5	5.0	1.7	9.5	127.7
Control	0.4	0.5	5.5	58.0	5.9	9.6	4.1	1.5	7.1	172.2

Appendix G

Infant Tactile Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Action		Terminate		Off	
	F	D	F	D	F	D	F	D	F	D
Sex by Condition (Cont.)										
Female										
Increased Visual	1.1	2.5	4.2	25.9	5.2	10.3	4.1	1.7	7.1	201.6
Increased Vocal	1.5	1.8	3.7	19.1	3.3	6.0	2.7	1.4	5.3	212.6
Increased Vis + Voc	2.3	2.1	6.3	25.8	5.9	9.4	4.1	1.4	7.7	201.2
Control	1.8	2.1	5.0	48.7	3.3	8.9	3.0	1.0	6.0	180.5
Sex by Condition by Phase										
Male										
Increased Visual										
1	2.0	2.2	4.0	49.0	4.8	15.6	5.2	1.7	7.4	173.2
2	3.6	5.1	8.4	53.9	8.4	18.4	6.6	2.7	11.4	161.2
3	0.2	0.3	4.2	32.9	4.8	9.1	2.6	0.0	5.8	198.0

Appendix G

Infant Tactile Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Action		Terminate		Off	
	F	D	F	D	F	D	F	D	F	D
Sex by Condition by Phase (Cont.)										
Male										
Increased Vocal										
1	0.8	1.4	2.8	26.5	1.6	6.6	1.6	0.5	4.2	206.3
2	1.2	1.6	5.2	37.4	5.0	7.6	4.0	1.4	6.8	193.2
3	0.0	0.0	7.2	48.2	6.4	10.7	4.2	1.4	7.0	182.1
Increased Vis + Voc										
1	1.6	2.6	5.8	82.9	5.4	8.2	4.4	1.6	7.0	145.4
2	4.8	4.4	12.6	104.1	8.0	10.9	5.0	1.6	11.8	120.5
3	4.6	5.0	11.8	104.8	10.2	12.3	5.6	2.0	9.6	117.3
Control										
1	0.2	0.1	6.0	54.6	5.5	11.1	3.8	1.5	7.6	174.7
2	0.6	0.7	5.4	70.4	5.2	8.5	3.4	0.9	6.6	159.7
3	0.4	0.6	5.0	49.1	6.0	9.1	5.0	2.2	7.0	182.2

Appendix G

Infant Tactile Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Action		Terminate		Off	
	F	D	F	D	F	D	F	D	F	D
Sex by Condition by Phase (Cont.)										
Female										
Increased Visual										
1	1.4	3.8	6.0	39.3	6.8	13.7	5.2	2.1	9.2	183.2
2	0.8	1.4	4.2	16.5	5.0	10.9	4.4	1.9	7.2	211.1
3	1.0	2.3	2.4	21.9	3.8	6.3	2.6	1.0	5.0	210.5
Increased Vocal										
1	2.2	2.6	5.6	23.9	3.8	5.4	3.8	1.2	7.6	207.7
2	0.8	0.8	1.4	12.1	0.6	1.9	1.4	0.5	3.0	226.0
3	1.6	2.0	4.2	21.4	5.6	10.7	3.0	2.5	5.4	204.2
Increased Vis + Voc										
1	3.0	3.2	5.6	22.8	6.4	8.3	4.0	1.3	6.6	202.2
2	3.2	2.3	7.4	35.4	7.0	17.1	5.8	2.0	9.6	184.9
3	0.8	0.7	5.8	19.1	4.2	2.8	2.4	0.8	6.8	216.4

Appendix G

Infant Tactile Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Action		Terminate		Off	
	F	D	F	D	F	D	F	D	F	D
Sex by Condition by Phase (Cont.)										
Female										
Control										
1	2.2	2.0	4.4	53.2	2.4	4.0	2.8	0.9	5.6	181.2
2	2.4	3.7	7.0	50.5	4.0	7.3	4.2	1.4	7.4	178.2
3	0.8	0.7	3.6	42.4	3.4	15.2	2.0	0.6	5.0	182.2

Appendix H

Analysis of Variance
Condition by Phase by Sex
Proportion Measure
Frequency of Infant Visual Behaviors

Source	df	MS	F	p
Between				
Condition	3	0.206	1.94	N.S.
Sex	1	0.279	2.63	N.S.
Cond by Sex	3	0.368	1.29	N.S.
Subj (Cond Sex)	32	0.106		
Within				
Phase	2	0.029	2.55	.086
Phase by Sex	2	0.004	0.36	N.S.
Cond by Phase	6	0.031	2.69	.022
Cond by Phase by Sex	6	0.003	0.25	N.S.
Phase by Subj (Cond Sex)	64	0.011		

Appendix H

Individual Comparisons
Condition by Phase Effect
Proportion Measure-Frequency of Infant Visual Behaviors

Condition	Phase 1	Phase 2	Phase 3
Increased Visual	.647	.590	.637
Increased Vocal	.381	.501	.438
Increased Visual and Vocal	.516	.502	.369
Control	.530	.552	.490

* Only those means connected by a line are significantly different.

Appendix H

Analysis of Variance
Condition by Phase by Sex
Proportion Measure
Duration of Infant Visual Behaviors

Source	df	MS	F	p
Between				
Condition	3	Ø.386	1.95	N.S.
Sex	1	Ø.334	1.69	N.S.
Cond by Sex	3	Ø.381	1.93	N.S.
Subj(Cond Sex)	32	Ø.198		
Within				
Phase	2	Ø.Ø83	3.58	.Ø34
Phase by Sex	2	Ø.Ø1Ø	Ø.43	N.S.
Cond by Phase	6	Ø.Ø32	1.36	N.S.
Cond by Phase by Sex	6	Ø.Ø13	Ø.58	N.S.
Phase by Subj(Cond Sex)	64	Ø.Ø23		

Appendix H

Individual Comparisons
Phase Effect
Proportion Measure-Duration of Infant Visual Behaviors

Phase	Proportion	*
1	.521	A,B
2	.541	A
3	.454	B

* Means with the same letter are not significantly different.

Appendix H

Derived Variable for Infant Visual Behaviors
Means by Condition, Phase and Sex

	Frequency	Duration
Phase		
1	.51	.52
2	.54	.54
3	.48	.45
Condition by Phase		
Increased Visual	.62	.64
1	.65	.66
2	.59	.63
3	.64	.64
Increased Vocal	.44	.40
1	.38	.35
2	.50	.47
3	.44	.38
Increased Visual and Vocal	.46	.43
1	.52	.48
2	.50	.49
3	.37	.31
Control	.52	.55
1	.53	.60
2	.55	.57
3	.49	.48

Appendix H

Derived Variable for Infant Visual Behaviors
Means by Condition, Phase and Sex

	Frequency	Duration
Sex by Phase		
Male	.56	.56
1	.56	.58
2	.58	.58
3	.54	.52
Female	.46	.45
1	.48	.47
2	.49	.50
3	.42	.39
Sex by Condition		
Male		
Increased Visual	.64	.62
Increased Vocal	.45	.41
Increased Visual and Vocal	.48	.43
Control	.67	.77
Female		
Increased Visual	.61	.67
Increased Vocal	.43	.39
Increased Visual and Vocal	.44	.42
Control	.37	.33

Appendix H

Derived Variable for Infant Visual Behaviors
Means by Condition, Phase and Sex

Sex by Condition by Phase	Frequency	Duration
Male		
Increased Visual		
1	.66	.64
2	.61	.56
3	.64	.65
Increased Vocal		
1	.37	.31
2	.51	.49
3	.48	.44
Increased Visual and Vocal		
1	.52	.50
2	.52	.48
3	.40	.32
Control		
1	.68	.85
2	.70	.79
3	.64	.68

Appendix H

Derived Variable for Infant Visual Behaviors
Means by Condition, Phase and Sex

	Frequency	Duration
Female		
Increased Visual		
1	.63	.68
2	.57	.71
3	.63	.63
Increased Vocal		
1	.39	.38
2	.59	.44
3	.39	.33
Increased Visual and Vocal		
1	.52	.46
2	.48	.51
3	.34	.30
Control		
1	.37	.35
2	.41	.36
3	.34	.29

Appendix I

Multivariate Analyses of Variance
Effect Due to Infant Sex
Frequency and Duration of Maternal Visual Behaviors

	Source	Criterion	Value	Statistic	p
FREQUENCY	Overall Sex	Wilk's Lambda	Lambda = .970	F(5, 114) = 0.70	.624
DURATION	Overall Sex	Wilk's Lambda	Lambda = .944	F(5, 114) = 1.35	.249

Appendix I

Analyses of Variance
Effect Due to Infant Sex
Frequency of Maternal Visual Behaviors

Measure	Source	df	MS	F	p
Initiate	Sex	1	26.13	1.86	N.S.
	Subj(Sex)	118	14.08		
Monitor	Sex	1	76.80	1.45	N.S.
	Subj(Sex)	118	53.00		
Terminate	Sex	1	0.53	0.05	N.S.
	Subj(Sex)	118	11.26		
Off	Sex	1	0.21	0.03	N.S.
	Subj(Sex)	118	7.59		
Onother	Sex	1	8.11	0.02	N.S.
	Subj(Sex)	118	356.60		

Appendix I

Analyses of Variance
Effect Due to Infant Sex
Duration of Maternal Visual Behaviors

Measure	Source	df	MS	F	p
Initiate	Sex	1	1916.80	4.93	.028
	Subj(Sex)	118	388.75		
Monitor	Sex	1	1885.75	2.29	N.S.
	Subj(Sex)	118	822.45		
Terminate	Sex	1	0.01	0.00	N.S.
	Subj(Sex)	118	446.07		
Off	Sex	1	27.17	1.37	N.S.
	Subj(Sex)	118	19.78		
Onother	Sex	1	8.11	0.02	N.S.
	Subj(Sex)	118	356.60		

Appendix I

Maternal Visual Behaviors
Frequency and Duration Means by Sex

	Male	Female
Initiate		
F	1.7	2.6
D	1.9	9.9
Monitor		
F	10.5	12.1
D	216.7	208.7
Action		
F	-	-
D	-	-
Terminate		
F	2.7	2.5
D	1.2	1.2
Off		
F	2.2	2.1
D	3.1	2.2
Onother		
F	7.2	8.5
D	18.3	18.9

* The category of action was not analyzed for maternal visual behaviors.

Appendix J

Multivariate Analyses of Variance
Condition by Phase
Frequency of Maternal Visual Behaviors

Source	Criterion	Value	Statistic	p
Overall Condition	Wilk's Lambda	Lambda = .442	F(15, 88) = 2.03	.022
Overall Phase	Wilk's Lambda	Lambda = .838	F(10, 136) = 1.26	.259
Overall Condition by Phase	Wilk's Lambda	Lambda = .760	F(30, 274) = 0.65	.923

Appendix J

Analyses of Variance
Condition by Phase
Frequency of Maternal Visual Behaviors

Visual Initiate

Source	df	MS	F	p
Between				
Condition	3	18.38	0.51	N.S.
Subj(Cond)	36	35.76		
Within				
Phase	2	3.86	0.91	N.S.
Cond by Phase	6	5.34	1.26	N.S.
Phase by Subj(Cond)	72	4.24		

Visual Monitor

Source	df	MS	F	p
Between				
Condition	3	71.80	0.66	N.S.
Subj(Cond)	36	108.24		
Within				
Phase	2	7.50	0.27	N.S.
Cond by Phase	6	30.83	1.10	N.S.
Phase by Subj(Cond)	72	28.05		

Appendix J

Analyses of Variance
Condition by Phase
Frequency of Maternal Visual Behaviors

Visual Action

Source	df	MS	F	p
Between				
Condition	3	1.61	1.99	N.S.
Subj(Cond)	36	Ø.81		
Within				
Phase	2	Ø.Ø1	Ø.Ø4	N.S.
Cond by Phase	6	Ø.Ø1	Ø.Ø4	N.S.
Phase by Subj(Cond)	72	Ø.22		

Visual Terminate

Source	df	MS	F	p
Between				
Condition	3	4.51	Ø.21	N.S.
Subj(Cond)	36	21.54		
Within				
Phase	2	19.6Ø	2.95	.Ø58
Cond by Phase	6	3.85	Ø.58	N.S.
Phase by Subj(Cond)	72	6.64		

Appendix J

Analyses of Variance
Condition by Phase
Frequency of Maternal Visual Behaviors

Visual Off

Source	df	MS	F	p
Between				
Condition	3	26.16	3.01	.043
Subj(Cond)	36	8.70		
Within				
Phase	2	22.94	3.81	.027
Cond by Phase	6	4.19	0.70	N.S.
Phase by Subj(Cond)	72	6.01		

Appendix J

Individual Comparisons
Condition Effect
Frequency of Maternal Visual Behaviors

Condition	Visual Off	*
Increased Visual	0.93	A
Increased Vocal	3.17	B
Increased Visual and Vocal	2.40	C
Control	1.93	D

* Means with the same letter are not significantly different.

Appendix J

Multivariate Analyses of Variance
Condition by Phase
Duration of Maternal Visual Behaviors

Source	Criterion	Value	Statistic	*p*
Overall Condition	Wilk's Lambda	Lambda = .563	F(15, 88) = 1.37	.180
Overall Phase	Wilk's Lambda	Lambda = .904	F(10, 136) = 0.70	.720
Overall Condition by Phase	Wilk's Lambda	Lambda = .754	F(30, 274) = 0.67	.907

Appendix J

Analyses of Variance
Condition by Phase
Duration of Maternal Visual Behaviors

Visual Initiate

Source	df	MS	F	p
Between				
Condition	3	1061.25	0.96	N.S.
Subj(Cond)	36	1109.30		
Within				
Phase	2	6.11	0.10	N.S.
Cond by Phase	6	37.55	0.61	N.S.
Phase by Subj(Cond)	72	61.58		

Visual Monitor

Source	df	MS	F	p
Between				
Condition	3	730.09	0.35	N.S.
Subj(Cond)	36	2074.60		
Within				
Phase	2	38.10	0.13	N.S.
Cond by Phase	6	229.62	0.80	N.S.
Phase by Subj(Cond)	72	286.18		

Visual Action

Source	df	MS	F	p
Between				
Condition	3	7.19	1.69	N.S.
Subj(Cond)	36	4.26		
Within				
Phase	2	0.05	0.01	N.S.
Cond by Phase	6	0.07	0.09	N.S.
Phase by Subj(Cond)	72	0.80		

Appendix J

Analyses of Variance
Condition by Phase
Duration of Maternal Visual Behaviors

Visual Terminate

Source	df	MS	F	p
Between				
Condition	3	2.37	0.34	N.S.
Subj(Cond)	36	6.91		
Within				
Phase	2	5.80	2.39	.098
Cond by Phase	6	0.64	0.26	N.S.
Phase by Subj(Cond)	72	2.43		

Visual Off

Source	df	MS	F	p
Between				
Condition	3	28.91	1.34	N.S.
Subj(Cond)	36	21.65		
Within				
Phase	2	15.40	0.78	N.S.
Cond by Phase	6	8.43	0.43	N.S.
Phase by Subj(Cond)	72	19.63		

Appendix J

Maternal Visual Behaviors
Means by Condition and Phase

	Initiate		Monitor		Action		Terminate		Off	
	F	D	F	D	F	D	F	D	F	D
Increased Visual	2.3	3.6	10.5	217.2	0.1	0.3	2.2	1.5	0.9	1.4
Phase 1	2.7	5.1	9.6	218.7	0.1	0.3	2.5	2.0	1.3	1.7
Phase 2	2.0	1.4	11.5	215.6	0.1	0.1	1.6	0.8	0.6	0.7
Phase 3	2.1	4.3	10.3	217.2	0.1	0.3	2.6	1.7	0.9	1.7
Increased Vocal	3.0	14.7	9.8	208.8	0.0	0.0	3.1	1.2	3.2	3.7
Phase 1	2.7	15.2	8.7	210.8	0.0	0.0	4.4	1.6	4.8	4.7
Phase 2	1.9	16.9	8.6	211.2	0.0	0.0	2.3	0.9	2.6	4.3
Phase 3	4.4	12.0	12.0	204.2	0.0	0.0	2.5	1.2	2.1	2.1
Increased Visual and Vocal	1.1	2.1	13.3	216.7	0.0	0.0	2.3	0.8	2.4	2.8
Phase 1	1.2	1.3	15.7	211.3	0.0	0.0	2.3	0.8	2.6	3.8
Phase 2	1.0	1.8	11.3	221.4	0.1	0.9	2.0	0.7	2.0	2.2
Phase 3	2.2	3.1	12.9	217.5	0.0	0.0	2.7	0.9	2.6	2.5

Appendix J

Maternal Visual Behaviors
Means by Condition and Phase

	Initiate		Monitor		Action		Terminate		Off	
	F	D	F	D	F	D	F	D	F	D
Control	2.2	3.0	11.7	208.1	0.5	1.0	2.8	1.2	1.9	2.7
Phase 1	2.6	2.6	12.2	213.6	0.5	1.1	4.0	1.7	3.2	3.2
Phase 2	2.2	4.2	11.8	202.9	0.5	1.1	1.7	0.8	1.1	1.6
Phase 3	1.7	2.3	11.0	207.8	0.5	0.9	2.6	1.2	1.5	3.4
Phase										
1	2.3	6.1	11.6	213.6	0.2	0.3	3.3	1.5	3.0	3.4
2	1.8	6.1	10.8	212.8	0.2	0.3	1.9	0.8	1.6	2.2
3	2.3	5.4	11.6	211.7	0.2	0.3	2.6	1.3	1.8	2.4

Appendix K

Multivariate Analyses of Variance
Effect Due to Infant Sex
Frequency and Duration of Maternal Vocal Behaviors

	Source	Criterion	Value	Statistic	p
FREQUENCY	Overall Sex	Wilk's Lambda	Lambda = .942	$F(5, 114) = 1.41$	.226
DURATION	Overall Sex	Wilk's Lambda	Lambda = .949	$F(5, 114) = 1.23$	.298

Appendix K

Analyses of Variance
Effect Due to Infant Sex
Frequency of Maternal Vocal Behaviors

Measure	Source	df	MS	F	p
Initiate	Sex	1	134.41	0.20	N.S.
	Subj(Sex)	118	669.00		
Monitor	Sex	1	190.01	3.35	.069
	Subj(Sex)	118	56.75		
Action	Sex	1	60.21	2.66	N.S.
	Subj(Sex)	118	22.65		
Terminate	Sex	1	1178.13	1.75	N.S.
	Subj(Sex)	118	674.54		
Off	Sex	1	1086.01	1.63	N.S.
	Subj(Sex)	118	667.80		

Appendix K

Analyses of Variance
Effect Due to Infant Sex
Duration of Maternal Vocal Behaviors

Measure	Source	df	MS	F	p
Initiate	Sex	1	165.44	0.17	N.S.
	Subj(Sex)	118	952.78		
Monitor	Sex	1	233.24	4.64	.033
	Subj(Sex)	118	50.23		
Action	Sex	1	23.50	0.68	N.S.
	Subj(Sex)	118	34.51		
Terminate	Sex	1	127.72	1.77	N.S.
	Subj(Sex)	118	71.99		
Off	Sex	1	5512.14	2.05	N.S.
	Subj(Sex)	118	2684.79		

Appendix K

Maternal Vocal Behaviors
Frequency and Duration Means by Sex

	Male	Female
Initiate		
F	49.1	51.2
D	49.9	52.3
Monitor		
F	2.3	4.8
D	2.1	4.9
Action		
F	5.2	6.6
D	6.3	7.2
Terminate		
F	56.2	62.5
D	18.9	21.Ø
Off		
F	57.Ø	63.Ø
D	169.8	156.3
Onother		
F	-	-
D	-	-

* The category of on other was not analyzed for maternal vocal behaviors.

Appendix L

Multivariate Analyses of Variance
Condition by Phase
Frequency of Maternal Vocal Behaviors

Source	Criterion	Value	Statistic	p
Overall Condition	Wilk's Lambda	Lambda = .580	F(15, 88) = 1.29	.226
Overall Phase	Wilk's Lambda	Lambda = .796	F(10, 136) = 1.65	.100
Overall Condition by Phase	Wilk's Lambda	Lambda = .599	F(30, 274) = 1.25	.180

Appendix L

Analyses of Variance
Condition by Phase
Frequency of Maternal Vocal Behaviors

Vocal Initiate

Source	df	MS	F	p
Between				
Condition	3	6409.14	4.85	.006
Subj(Cond)	36	1320.59		
Within				
Phase	2	632.51	4.68	.012
Cond by Phase	6	219.54	1.63	N.S.
Phase by Subj(Cond)	72	135.08		

Vocal Terminate

Source	df	MS	F	p
Between				
Condition	3	5206.73	3.54	.024
Subj(Cond)	36	1469.18		
Within				
Phase	2	858.96	7.30	.001
Cond by Phase	6	345.43	2.94	.013
Phase by Subj(Cond)	72	117.68		

Vocal Off

Source	df	MS	F	p
Between				
Condition	3	5199.21	3.61	.023
Subj(Cond)	36	1446.06		
Within				
Phase	2	862.01	7.27	.001
Cond by Phase	6	327.41	2.76	.018
Phase by Subj(Cond)	72	118.65		

Appendix L

Analyses of Variance
Condition by Phase
Frequency of Maternal Vocal Behaviors

Vocal Monitor

Source	df	MS	F	p
Between				
Condition	3	58.61	0.43	N.S.
Subj(Cond)	36	129.47		
Within				
Phase	2	18.51	0.71	N.S.
Cond by Phase	6	20.64	0.79	N.S.
Phase by Subj(Cond)	72	26.23		

Vocal Action

Source	df	MS	F	p
Between				
Condition	3	25.28	0.65	N.S.
Subj(Cond)	36	39.15		
Within				
Phase	2	13.51	0.87	N.S.
Cond by Phase	6	17.14	1.10	N.S.
Phase by Subj(Cond)	72	15.52		

Appendix L

Multivariate Analyses of Variance
Condition by Phase
Duration of Maternal Vocal Behaviors

Source	Criterion	Value	Statistic	p
Overall Condition	Wilk's Lambda	Lambda = .441	F(15, 88) = 2.04	.021
Overall Phase	Wilk's Lambda	Lambda = .713	F(10, 136) = 2.50	.009
Overall Condition by Phase	Wilk's Lambda	Lamdba = .601	F(30, 274) = 1.24	.190

Appendix L

Analyses of Variance
Condition by Phase
Duration of Maternal Vocal Behaviors

Vocal Initiate

Source	df	MS	F	p
Between				
Condition	3	10831.65	6.42	.001
Subj(Cond)	36	1688.48		
Within				
Phase	2	1334.24	6.58	.002
Cond by Phase	6	340.42	1.68	N.S.
Phase by Subj(Cond)	72	202.81		

Vocal Terminate

Source	df	MS	F	p
Between				
Condition	3	578.34	3.94	.016
Subj(Cond)	36	146.68		
Within				
Phase	2	93.40	6.00	.004
Cond by Phase	6	50.10	3.22	.007
Phase by Subj(Cond)	72	15.56		

Vocal Off

Source	df	MS	F	p
Between				
Condition	3	20730.38	5.59	.003
Subj(Cond)	36	3709.32		
Within				
Phase	2	3720.78	2.44	.09
Cond by Phase	6	1567.66	1.03	N.S.
Phase by Subj(Cond)	72	1524.21		

Appendix L

Analyses of Variance
Condition by Phase
Duration of Maternal Vocal Behaviors

Vocal Monitor

Source	*df*	*MS*	*F*	*p*
Between				
Condition	3	35.33	0.29	N.S.
Subj(Cond)	36	119.93		
Within				
Phase	2	23.12	1.07	N.S.
Cond by Phase	6	22.85	1.06	N.S.
Phase by Subj(Cond)	72	21.57		

Vocal Action

Source	*df*	*MS*	*F*	*p*
Between				
Condition	3	86.38	1.34	N.S.
Subj(Cond)	36	64.37		
Within				
Phase	2	24.08	1.23	N.S.
Cond by Phase	6	9.39	0.48	N.S.
Phase by Subj(Cond)	72	19.65		

Appendix L

Individual Comparisons
Phase Effect
Duration of Maternal Vocal Behaviors

Phase	Vocal Initiate	Vocal Terminate
Baseline	45.88A	18.49A
Manipulation	57.30B	21.54B
Return-to-Baseline	50.06C	19.81C

* Means with the same letter are not significantly different.

Appendix L

Individual Comparisons
Condition Effect
Duration of Maternal Vocal Behaviors

Condition	Vocal Initiate	Vocal Terminate	Vocal Off
Increased Visual	49.34A	18.75A	163.20A
Increased Vocal	76.21B	24.89B	133.12B
Increased Visual and Vocal	48.73C	21.60C	158.75C
Control	30.03D	14.54D	197.09D

* Means with the same letter are not significantly different.

Appendix L

Maternal Vocal Behaviors
Means by Condition and Phase

	Initiate		Monitor		Action		Terminate		Off	
	F	D	F	D	F	D	F	D	F	D
Increased Visual	48.6	49.3	2.0	2.6	6.4	9.0	56.3	18.8	57.0	163.2
Phase 1	48.5	49.8	2.1	1.7	5.8	8.5	55.7	18.8	56.3	166.6
Phase 2	49.6	52.9	1.2	1.8	5.3	8.3	55.2	18.4	56.1	160.2
Phase 3	47.6	45.3	2.8	4.2	8.1	10.2	58.0	19.1	58.6	162.8
Increased Vocal	67.3	76.2	2.6	2.6	4.5	4.9	73.8	24.9	74.4	133.1
Phase 1	64.6	70.2	1.7	2.0	2.8	3.0	68.4	23.2	69.4	142.9
Phase 2	72.7	85.7	4.5	4.1	6.2	6.4	82.7	28.5	83.3	117.4
Phase 3	64.6	72.8	1.6	1.6	4.5	5.3	70.3	23.0	70.6	139.1
Increased Visual and Vocal	52.9	48.7	4.8	4.5	6.4	6.3	64.6	21.6	65.2	158.8
Phase 1	42.8	36.1	2.5	2.1	5.9	5.2	52.1	17.3	52.9	177.0
Phase 2	63.2	60.2	5.1	4.8	6.0	6.6	73.9	24.7	74.3	146.1
Phase 3	52.7	50.0	6.8	6.6	7.4	7.1	67.8	22.9	68.4	153.1

Appendix L

Maternal Vocal Behaviors

Appendix L

Maternal Vocal Behaviors
Means by Condition and Phase

	Initiate		Monitor		Action		Terminate		Off	
	F	D	F	D	F	D	F	D	F	D
Control	31.8	30.0	4.6	4.4	6.1	6.6	42.8	14.5	43.4	197.1
Phase 1	30.2	27.5	4.6	4.9	6.3	6.5	42.1	14.7	42.4	187.8
Phase 2	32.1	30.4	4.6	4.2	6.8	7.2	43.5	14.6	44.4	184.0
Phase 3	33.1	32.2	4.6	4.1	5.2	6.2	42.7	14.3	43.4	219.5
Phase										
1	46.5	45.9	2.7	2.7	5.2	5.8	54.6	18.5	55.3	168.6
2	54.4	57.3	3.9	3.7	6.1	7.1	63.8	21.5	64.5	151.9
3	49.5	50.1	4.0	4.1	6.3	7.2	59.7	19.8	60.3	168.6

Appendix M

Multivariate Analyses of Variance
Effect Due to Infant Sex
Frequency and Duration of Maternal Tactile Behaviors

	Source	Criterion	Value	Statistic	p
FREQUENCY	Overall Sex	Wilk's Lambda	Lambda = .774	F(6, 113) = 5.50	.0001
DURATION	Overall Sex	Wilk's Lambda	Lambda = .810	F(6, 113) = 4.42	.0005

Appendix M

Analyses of Variance
Effect Due to Infant Sex
Frequency of Maternal Tactile Behaviors

Measure	Source	df	MS	F	p
Initiate	Sex	1	858.68	6.91	.010
	Subj(Sex)	118	124.20		
Monitor	Sex	1	396.03	3.73	.056
	Subj(Sex)	118	106.04		
Terminate	Sex	1	621.08	4.83	.030
	Subj(Sex)	118	128.58		
Off	Sex	1	811.20	6.30	.013
	Subj(Sex)	118	128.72		
Caretaking	Sex	1	19.20	1.51	N.S.
	Subj(Sex)	118	12.75		
Gross Body Stimulation	Sex	1	1300.21	17.40	.0001
	Subj(Sex)	118	74.74		

Appendix M

Analyses of Variance
Effect Due to Infant Sex
Duration of Maternal Tactile Behaviors

Measure	Source	df	MS	F	p
Initiate	Sex	1	13.67	0.01	N.S.
	Subj(Sex)	118	2127.20		
Monitor	Sex	1	37171.55	13.40	.0004
	Subj(Sex)	118	2774.78		
Terminate	Sex	1	41.65	2.61	N.S.
	Subj(Sex)	118	15.97		
Off	Sex	1	1659.12	1.32	N.S.
	Subj(Sex)	118	1254.76		
Caretaking	Sex	1	1362.15	2.03	N.S.
	Subj(Sex)	118	669.39		
Gross Body Stimulation	Sex	1	19694.09	17.07	.0001
	Subj(Sex)	118	1153.43		

Appendix M

Maternal Tactile Behaviors
Means by Infant Sex

	Male	Female
Initiate		
Freq.	28.3	22.9
Dur.	76.2	76.9
Monitor		
Freq.	20.1	16.4
Dur.	96.8	61.6
Terminate		
Freq.	12.3	16.9
Dur.	4.7	5.9
Off		
Freq.	12.6	17.8
Dur.	29.8	37.3
Other		
Freq.	4.1	4.9
Dur.	18.9	25.6
On Other		
Freq.	3.7	10.3
Dur.	13.0	38.6

Appendix N

Multivariate Analyses of Variance
Condition by Phase by Sex
Frequency of Maternal Tactile Behaviors

Source	Criterion	Value	Statistic	p
Overall Condition	Wilk's Lambda	Lambda = .489	F(18, 76) = 1.23	.262
Overall Phase	Wilk's Lambda	Lambda = .809	F(12, 118) = 1.10	.366
Overall Sex	Wilk's Lambda	Lambda = .691	F(6, 27) = 2.02	.098
Overall Condition by Phase	Wilk's Lambda	Lambda = .630	F(36, 261) = 0.81	.777
Overall Condition by Sex	Wilk's Lambda	Lambda = .564	F(18, 76) = 0.96	.514
Overall Phase by Sex	Wilk's Lambda	Lambda = .788	F(12, 118) = 1.25	.259
Overall Condition by Phase by Sex	Wilk's Lambda	Lambda = ..638	F(36, 261) = 0.78	.808

Appendix N

Analyses of Variance
Condition by Phase by Sex
Frequency of Maternal Tactile Behaviors

Tactile Initiate

Source	df	MS	F	p
Between				
Condition	3	118.90	0.45	N.S.
Sex	1	858.68	3.23	.082
Cond by Sex	3	328.19	1.23	N.S.
Subj(Cond Sex)	32	266.21		
Within				
Phase	2	34.76	0.56	N.S.
Cond by Phase	6	34.21	0.56	N.S.
Sex by Phase	2	137.58	2.24	N.S.
Cond by Phase by Sex	6	51.19	0.83	N.S.
Phase by Subj(Cond Sex)	64	61.55		

Tactile Monitor

Source	df	MS	F	p
Between				
Condition	3	48.83	0.21	N.S.
Sex	1	396.03	1.72	N.S.
Cond by Sex	3	457.01	1.99	N.S.
Subj(Cond Sex)	32	229.72		
Within				
Phase	2	86.80	1.85	N.S.
Cond by Phase	6	21.60	0.45	N.S.
Sex by Phase	2	64.13	1.37	N.S.
Cond by Phase by Sex	6	35.78	0.76	N.S.
Phase by Subj(Cond Sex)	64	46.84		

Appendix N

Analyses of Variance
Condition by Phase by Sex
Frequency of Maternal Tactile Behaviors

Tactile Terminate

Source	df	MS	F	p
Between				
Condition	3	442.10	1.50	N.S.
Sex	1	621.08	2.11	N.S.
Cond by Sex	3	322.50	1.10	N.S.
Subj(Cond Sex)	32	293.97		
Within				
Phase	2	19.73	0.42	N.S.
Cond by Phase	6	34.32	0.73	N.S.
Sex by Phase	2	15.60	0.33	N.S.
Cond by Phase by Sex	6	28.06	0.59	N.S.
Phase by Subj(Cond Sex)	64	47.30		

Tactile Off

Source	df	MS	F	p
Between				
Condition	3	504.92	1.72	N.S.
Sex	1	811.20	2.76	N.S.
Cond by Sex	3	306.36	1.04	N.S.
Subj(Cond Sex)	32	294.31		
Within				
Phase	2	7.31	0.16	N.S.
Cond by Phase	6	34.23	0.74	N.S.
Sex by Phase	2	19.83	0.43	N.S.
Cond by Phase by Sex	6	19.35	0.42	N.S.
Phase by Subj(Cond Sex)	64	46.28		

Appendix N

Analyses of Variance
Condition by Phase by Sex
Frequency of Maternal Tactile Behaviors

Tactile Caretaking

Source	df	MS	F	p
Between				
Condition	3	30.90	1.30	N.S.
Sex	1	19.20	0.81	N.S.
Cond by Sex	3	38.16	1.60	N.S.
Subj(Cond Sex)	32	23.83		
Within				
Phase	2	3.33	0.46	N.S.
Cond by Phase	6	4.76	0.66	N.S.
Sex by Phase	2	10.98	1.51	N.S.
Cond by Phase by Sex	6	2.16	0.30	N.S.
Phase by Subj(Cond Sex)	64	7.26		

Gross Body Stimulation

Source	df	MS	F	p
Between				
Condition	3	344.61	1.96	N.S.
Sex	1	1300.21	7.39	.011
Cond by Sex	3	267.61	1.52	N.S.
Subj(Cond Sex)	32	175.84		
Within				
Phase	2	3.23	0.18	N.S.
Cond by Phase	6	15.17	0.87	N.S.
Sex by Phase	2	21.23	1.21	N.S.
Cond by Phase by Sex	6	15.70	0.90	N.S.
Phase by Subj(Cond Sex)	64	17.52		

Appendix N

Multivariate Ananlyses of Variance
Condition by Phase by Sex
Duration of Maternal Tactile Behaviors

Source	Criterion	Value	Statistic	p
Overall Condition	Wilk's Lambda	Lambda = .532	F(18, 76) = 1.07	.400
Overall Phase	Wilk's Lambda	Lambda = .879	F(12, 118) = 0.65	.791
Overall Sex	Wilk's Lambda	Lambda = .677	F(6, 27) = 2.15	.081
Overall Condition by Phase	Wilk's Lambda	Lambda = .670	F(36, 261) = 0.69	.907
Overall Condition by Sex	Wilk's Lambda	Lambda = .519	F(18, 76) = 1.12	.355
Overall Phase by Sex	Wilk's Lambda	Lambda = .762	F(12, 118) = 1.43	.160
Overall Condition by Phase by Sex	Wilk's Lambda	Lambda = .647	F(36, 261) = 0.76	.842

Appendix N

Analyses of Variance
Condition by Phase by Sex
Duration of Maternal Tactile Behaviors

Tactile Initiate

Source	df	MS	F	p
Between				
Condition	3	3247.69	0.64	N.S.
Sex	1	13.67	0.00	N.S.
Cond by Sex	3	2774.05	0.55	N.S.
Subj(Cond Sex)	32	5050.15		
Within				
Phase	2	1190.09	1.28	N.S.
Cond by Phase	6	527.99	0.57	N.S.
Sex by Phase	2	582.53	0.63	N.S.
Cond by Phase by Sex	6	859.14	0.92	N.S.
Phase by Subj(Cond Sex)	64	929.24		

Tactile Monitor

Source	df	MS	F	p
Between				
Condition	3	11708.80	1.93	N.S.
Sex	1	37171.55	6.11	.019
Cond by Sex	3	15164.85	2.49	.078
Subj(Cond Sex)	32	6080.22		
Within				
Phase	2	73.33	0.10	N.S.
Cond by Phase	6	311.19	0.44	N.S.
Sex by Phase	2	894.45	1.26	N.S.
Cond by Phase by Sex	6	478.12	0.67	N.S.
Phase by Subj(Cond Sex)	64	711.94		

Appendix N

Analyses of Variance
Condition by Phase by Sex
Duration of Maternal Tactile Behaviors

Tactile Terminate

Source	df	MS	F	p
Between				
Condition	3	36.13	0.96	N.S.
Sex	1	41.65	1.11	N.S.
Cond by Sex	3	38.24	1.02	N.S.
Subj(Cond Sex)	32	37.61		
Within				
Phase	2	8.11	1.31	N.S.
Cond by Phase	6	3.50	0.56	N.S.
Sex by Phase	2	0.30	0.05	N.S.
Cond by Phase by Sex	6	3.89	0.63	N.S.
Phase by Subj(Cond Sex)	64	6.20		

Tactile Off

Source	df	MS	F	p
Between				
Condition	3	2485.49	0.87	N.S.
Sex	1	1659.12	0.58	N.S.
Cond by Sex	3	1304.11	0.46	N.S.
Subj(Cond Sex)	32	2849.84		
Within				
Phase	2	233.27	0.39	N.S.
Cond by Phase	6	507.76	0.85	N.S.
Sex by Phase	2	980.14	1.63	N.S.
Cond by Phase by Sex	6	274.66	0.46	N.S.
Phase by Subj(Cond Sex)	64	599.64		

Appendix N

Analyses of Variance
Condition by Phase by Sex
Duration of Maternal Tactile Behaviors

Tactile Caretaking

Source	df	MS	F	p
Between				
Condition	3	1238.09	1.11	N.S.
Sex	1	1362.15	1.22	N.S.
Cond by Sex	3	3087.46	2.77	.057
Subj(Cond Sex)	32	1112.62		
Within				
Phase	2	106.16	0.25	N.S.
Cond by Phase	6	169.47	0.40	N.S.
Sex by Phase	2	176.88	0.42	N.S.
Cond by Phase by Sex	6	335.43	0.80	N.S.
Phase by Subj(Cond Sex)	64	418.95		

Gross Body Stimulation

Source	df	MS	F	p
Between				
Condition	3	3454.36	1.69	N.S.
Sex	1	19694.09	9.64	.004
Cond by Sex	3	1875.29	0.92	N.S.
Subj(Cond Sex)	32	2042.17		
Within				
Phase	2	465.70	0.68	N.S.
Cond by Phase	6	594.47	0.87	N.S.
Sex by Phase	2	832.68	1.22	N.S.
Cond by Phase by Sex	6	814.70	1.19	N.S.
Phase by Subj(Cond Sex)	64	683.04		

Appendix U

Maternal Tactile Behaviors
Means by Condition, Phase, and Sex

	Initiate		Monitor		Terminate		Off		Other		Onoth	
	F	D	F	D	F	D	F	D	F	D	F	D
Phase												
1	26.7	79.7	19.9	80.5	14.5	5.1	15.4	30.8	4.8	22.1	7.2	27.5
2	25.0	79.7	17.0	77.8	15.3	5.8	15.5	35.2	4.4	20.7	7.1	21.8
3	25.2	70.3	18.0	79.1	13.9	5.1	14.7	34.7	4.2	23.9	6.7	28.0
Condition by Phase												
Increased Visual	28.4	71.3	18.5	75.7	16.3	5.8	17.9	41.3	4.8	22.7	6.0	19.8
1	30.8	72.8	19.6	79.4	14.7	5.1	16.9	32.7	5.0	22.2	4.9	14.9
2	29.1	77.1	16.8	76.0	18.1	6.6	19.4	43.7	4.1	19.9	7.5	18.7
3	25.2	64.0	19.2	71.8	16.0	5.7	17.4	47.5	5.3	26.0	7.6	25.8
Increased Vocal	24.7	75.9	17.9	72.5	18.4	6.5	18.6	39.6	3.4	17.1	11.5	36.9
1	25.4	82.4	20.2	70.1	19.4	6.5	19.9	43.4	4.4	17.5	12.6	43.3
2	22.7	71.3	16.4	72.7	20.3	7.4	19.8	43.2	2.8	12.4	11.8	34.0
3	26.1	74.0	17.2	74.7	15.4	5.5	16.0	32.2	3.0	21.5	10.1	33.3

Appendix N

Maternal Tactile Behaviors
Means by Condition, Phase, and Sex

	Initiate		Monitor		Terminate		Off		Other		Onoth	
	F	D	F	D	F	D	F	D	F	D	F	D
Condition by Phase (Cont.)												
Increased Vis + Voc	25.6	91.4	16.7	61.2	14.1	5.1	14.8	32.1	3.9	17.9	7.1	32.5
1	26.8	94.9	16.4	56.5	15.0	5.3	15.8	31.9	3.7	17.1	7.1	32.4
2	25.3	103.3	16.8	61.4	14.2	5.3	14.8	35.7	4.3	15.0	7.8	20.9
3	24.7	75.8	17.0	65.6	13.2	4.7	13.9	28.7	3.7	21.7	6.4	44.2
Control	23.7	67.7	19.8	107.3	9.4	3.9	9.6	21.3	5.7	31.1	3.4	13.9
1	23.7	68.6	23.2	116.1	8.8	3.3	9.1	15.2	6.0	31.7	4.3	19.3
2	22.7	67.4	17.8	101.2	8.5	4.1	8.0	18.5	6.2	35.3	3.2	13.8
3	24.8	67.2	18.4	104.6	10.9	4.3	11.6	30.3	4.9	16.4	2.6	8.7
Sex by Phase												
Male	28.3	76.2	20.1	96.8	12.3	4.7	12.6	29.8	4.1	18.9	3.7	13.0
1	29.5	79.5	20.7	92.7	12.7	4.6	13.4	30.1	4.3	18.5	3.4	10.2
2	29.4	83.2	20.2	98.1	12.3	5.2	12.1	25.8	3.5	15.3	3.6	13.7
3	26.0	66.1	19.3	99.5	11.8	4.4	12.4	33.7	4.4	22.7	4.2	15.0

Appendix N

Maternal Tactile Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Terminate		Off		Other		Onoth	
	F	D	F	D	F	D	F	D	F	D	F	D
Sex by Phase (Cont.)												
Female	22.9	76.9	16.4	61.6	16.8	5.9	17.8	37.3	4.9	25.6	10.3	38.6
1	23.9	79.9	19.0	68.4	16.3	5.6	17.5	31.5	5.3	25.7	11.1	44.7
2	20.5	76.3	13.7	57.5	18.3	6.5	18.9	44.7	5.2	26.0	10.6	30.0
3	24.5	74.5	16.6	58.8	16.0	5.7	17.1	35.6	4.1	25.1	9.2	41.0
Sex by Condition												
Male												
Increased Visual	31.0	72.3	17.5	68.1	18.1	6.4	19.3	43.9	5.2	26.6	4.9	15.4
Increased Vocal	23.2	83.5	15.9	77.8	12.7	4.7	12.7	38.7	3.9	20.4	3.9	16.9
Increased Vis + Voc	32.1	95.7	21.5	93.6	10.1	3.9	10.6	19.3	3.3	15.1	4.3	13.4
Control	26.9	53.5	25.4	147.5	8.2	4.0	7.9	17.4	3.8	13.2	1.7	6.1

Appendix N

Maternal Tactile Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Terminate		Off		Other		Onoth	
	F	D	F	D	F	D	F	D	F	D	F	D
Sex by Condition (Cont.)												
Female												
Increased Visual	22.9	76.9	16.4	61.6	16.8	5.9	17.8	37.3	4.9	15.6	10.3	38.6
Increased Vocal	26.3	68.4	19.9	67.2	24.0	8.3	24.5	40.4	2.9	13.8	19.1	56.8
Increased Vis + Voc	19.1	87.0	12.0	28.7	18.2	6.3	19.1	44.9	4.5	20.8	9.9	51.6
Control	20.6	82.0	14.2	67.0	10.6	3.9	11.3	25.2	7.6	49.0	5.0	21.7
Sex by Condition by Phase												
Male												
Increased Visual												
1	34.6	74.8	17.4	58.0	19.0	6.6	20.2	43.1	4.8	22.2	4.0	12.0
2	33.4	78.7	18.0	79.7	18.2	6.6	19.4	39.0	4.0	19.5	5.2	18.1
3	24.8	63.4	17.0	66.8	17.0	6.1	18.4	49.7	6.8	38.2	5.6	16.2

Appendix N

Maternal Tactile Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Terminate		Off		Other		Onoth	
	F	D	F	D	F	D	F	D	F	D	F	D
Sex by Condition by Phase (Cont.)												
Male												
Increased Vocal												
1	22.4	96.0	15.6	70.2	15.2	5.3	15.6	44.4	4.8	16.2	4.2	9.8
2	25.4	91.1	18.0	80.4	12.6	5.2	11.6	30.8	3.0	13.4	3.4	21.2
3	21.8	62.9	14.2	82.8	10.4	2.6	10.8	41.0	4.0	31.6	4.0	19.8
Increased Vis + Voc												
1	32.0	93.0	22.2	87.5	10.0	3.7	10.8	21.3	2.8	18.2	4.4	16.8
2	34.4	107.4	21.6	88.0	11.0	4.5	11.0	19.6	3.2	13.2	3.8	8.9
3	30.0	86.7	20.6	105.2	9.2	3.5	10.0	17.1	3.8	14.1	4.6	14.5
Control												
1	29.0	54.1	27.6	155.0	6.6	2.8	6.8	11.5	4.6	17.6	0.8	2.1
2	24.4	55.4	23.2	144.3	7.4	4.5	6.4	13.8	3.8	15.1	1.8	6.6
3	27.2	51.2	25.4	143.2	10.6	4.5	10.4	26.9	3.0	7.0	2.6	9.6

Appendix N

Maternal Tactile Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Terminate		Off		Other		Onoth	
	F	D	F	D	F	D	F	D	F	D	F	D
Sex by Condition by Phase (Cont.)												
Female												
Increased Visual												
1	27.0	70.8	21.8	100.7	10.4	3.6	13.6	22.3	5.2	22.2	5.8	17.8
2	24.8	75.4	15.6	72.2	18.0	6.5	19.4	48.4	4.2	20.3	5.8	19.2
3	25.6	64.6	21.4	76.8	15.0	5.3	16.4	45.3	3.8	13.8	9.6	35.3
Increased Vocal												
1	28.4	68.9	24.8	70.1	23.6	7.8	24.2	42.4	4.0	18.7	21.0	76.8
2	20.0	51.2	14.8	65.1	28.0	9.6	28.0	55.5	2.6	11.4	20.2	46.9
3	30.4	85.1	20.2	66.5	20.4	7.5	21.2	23.3	2.0	11.3	16.2	46.9
Increased Vis + Voc												
1	21.6	96.9	10.6	25.6	20.0	7.0	20.8	42.6	4.6	16.1	9.8	47.9
2	16.2	99.2	12.0	34.7	17.4	6.1	18.6	51.7	5.4	16.9	11.8	33.0
3	19.4	64.9	13.4	25.9	17.2	5.9	17.9	40.2	3.6	29.3	8.2	74.0

Appendix H

Maternal Tactile Behaviors
Means by Condition, Phase and Sex

	Initiate		Monitor		Terminate		Off		Other		Onoth	
	F	D	F	D	F	D	F	D	F	D	F	D
Sex by Condition by Phase (Cont.)												
Female												
Control												
1	18.4	83.2	18.8	77.1	11.0	3.8	11.4	18.8	7.4	45.7	7.8	36.4
2	21.0	79.5	12.4	58.1	9.6	3.7	9.6	23.1	8.6	55.4	4.6	20.9
3	22.4	83.2	11.4	65.9	11.2	4.1	12.8	33.7	6.8	45.9	2.6	7.9

Appendix O

Analysis of Variance
Condition by Phase
Proportion Measure
Frequency of Maternal Visual Behaviors

Source	df	MS	F	p
Between				
Condition	3	Ø.Ø1	Ø.5Ø	N.S.
Subj(Cond)	36	Ø.Ø2		
Within				
Phase	2	Ø.Ø2	1.5Ø	N.S.
Cond by Phase	6	Ø.Ø3	2.47	.Ø32
Phase by Subj(Cond)	72	Ø.Ø1		

Appendix O

Individual Comparisons
Condition by Phase Effect
Proportion Measure-Frequency of Maternal Visual Behaviors

	Phase		
Condition	1	2	3
Increased Visual	.634	.553	.517
Increased Vocal	.460	.546	.565
Increased Visual and Vocal	.500	.563	.519
Control	.524	.594	.515

* Only those means connected by a line are significantly different.

Appendix O

Analysis of Variance
Condition by Phase
Proportion Measure
Duration of Maternal Visual Behaviors

Source	df	MS	F	p
Between				
Condition	3	0.01	0.80	N.S.
Subj(Cond)	36	0.01		
Within				
Phase	2	0.002	0.60	N.S.
Cond by Phase	6	0.005	1.22	N.S.
Phase by Subj(Cond)	72	0.004		

Appendix O

Derived Variable of Maternal Visual Behaviors
Means by Condition and Phase

Condition	Main Effects F	Main Effects D	Phase 1 F	Phase 1 D	Phase 2 F	Phase 2 D	Phase 3 F	Phase 3 D
Main Effects			.529	.913	.564	.909	.529	.899
Increased Visual	.568	.917	.634	.931	.553	.901	.517	.918
Increased Vocal	.524	.925	.460	.935	.546	.944	.565	.894
Increased Visual and Vocal	.527	.906	.500	.885	.563	.922	.519	.910
Control	.543	.881	.524	.900	.594	.870	.515	.873

Appendix P

Analysis of Variance
Condition by Phase
Proportion Measure
Frequency of Maternal Vocal Behaviors

Source	df	MS	F	p
Between				
Condition	3	0.004	1.53	N.S.
Subj(Cond)	36	0.003		
Within				
Phase	2	0.002	3.12	.050
Cond by Phase	6	0.0004	0.66	N.S.
Phase by Subj(Cond)	72	0.0006		

Appendix P

Individual Comparisons
Phase Effect
Proportion Measure-Frequency of Maternal Vocal Behaviors

Phase	Proportion	*
Baseline	.323	A
Manipulation	.336	B
Return-to-Baseline	.332	C

* Means with the same letter are not significantly different.

Appendix P

Analysis of Variance
Condition by Phase
Proportion Measure
Duration of Maternal Vocal Behaviors

Source	df	MS	F	p
Between				
Condition	3	0.16	4.91	.006
Subj(Cond)	36	0.03		
Within				
Phase	2	0.02	10.59	.0001
Cond by Phase	6	0.008	2.39	.036
Phase by Subj(Cond)	72	0.003		

Appendix P

Individual Comparisons
Condition by Phase Effect
Proportion Measure-Duration of Maternal Vocal Behaviors

Condition	Phase 1	Phase 2	Phase 3
Increased Visual	.241	.260	.247
Increased Vocal	.311	.398	.329
Increased Visual and Vocal	.181	.295	.264
Control	.160	.174	.168

* Only those means connected by a line are significantly different.

Appendix P

Derived Variable of Maternal Vocal Behaviors
Means by Condition and Phase

Condition	Main Effects		Phase 1 F	Phase 1 D	Phase 2 F	Phase 2 D	Phase 3 F	Phase 3 D
			.323	.223	.336	.282	.332	.252
	F	D						
Increased Visual	.344	.250	.330	.241	.351	.260	.349	.247
Increased Vocal	.334	.346	.333	.311	.334	.398	.335	.329
Increased Visual and Vocal	.328	.246	.326	.181	.334	.295	.324	.264
Control	.316	.167	.303	.160	.324	.174	.321	.168

Appendix Q

Maternal Vocal Behaviors
Average Number of Vocalizations per Minute

Condition	Phase	Duration Initiate	Duration Off	Average # per Minute
Increased	1	1.Ø9	2.Ø6	19.Ø
	2	1.18	1.41	23.Ø
Vocal	3	1.13	1.97	19.Ø
Increased	1	Ø.84	3.34	14.Ø
Visual+	2	Ø.95	1.97	21.Ø
Vocal	3	Ø.95	2.24	19.Ø
	1	Ø.91	4.43	11.Ø
Control	2	Ø.95	4.14	12.Ø
	3	Ø.97	5.Ø6	1Ø.Ø