

INFANT GAZE DURING MOTHER-INFANT
FACE-TO-FACE INTERACTION

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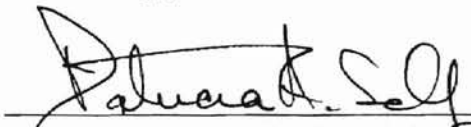
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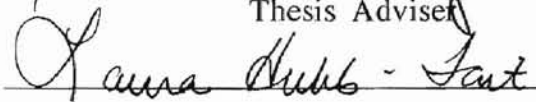
Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE
December, 1995

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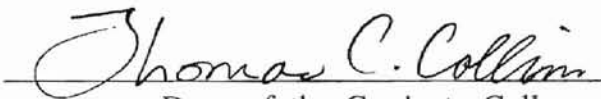
Thesis Approved:



Thesis Adviser







Dean of the Graduate College

ACKNOWLEDGMENTS

I wish to express my sincere appreciation to my major advisor, Dr. Patricia Self for her intelligent supervision, inspiration, endurance and friendship. My sincere appreciation extends to my other committee members Dr. Nancy Hurlbut and Dr. Laura Hubbs-Tait, whose guidance, assistance, encouragement, and friendship are also invaluable. I would also like to thank Dr. Hubbs-Tait for the opportunity to receive one of the John and Sue Taylor Scholarships for graduate student research which helped me complete this research.

I would also like to thank Susanne Morse for making all of the telephone calls to the mothers and for being a wonderful listener and friend. I would like to extend my very sincere appreciation and gratitude to my sister, Dr. Corinna Czekaj, for all of her support, advice and love. I would not have been able to complete this project without them. I also need to thank my husband, Brian Dengler, for his continuous support, encouragement, sense of humor and love. Without Brian's help and sleepless nights this research would never have been completed.

Finally, I would like to thank the Department of Family Relations and Child Development for supporting these three years of study.

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CHAPTER I

INTRODUCTION

Numerous research studies have examined mother-infant face-to-face interactions. A common goal of these studies has been to identify the characteristics of both the mother and the infant that affect social interaction. One area of theory and research has focused specifically on the communication patterns that develop in the mother-infant dyad; both the verbal and nonverbal aspects of this relationship have been investigated. Past research studies have also demonstrated that nearly one third of early parent-infant interactions can be considered play which is defined as social interactions that occur when the infant is alert and the caregiver's needs have been met (Stern, 1974; Field 1979). Based on this definition, play represents a unique set of social interactions that may vary among individuals and as a result contribute to individual differences in social development. Roggman and Peery (1989) suggest that patterns of parent-infant play may develop very early and are specific to the gender of both the infant and the parent. If this is true, then some gender differences which occur later in a child's development may begin in infancy during these early parent-infant interactions. As a result, gender-related variation in parent-infant interaction may contribute to the beginning of differential socialization for males and females (Roggman & Peery, 1989).

The main purpose of the current research was to improve understanding of early social interactions, specifically mother-infant play interactions during the first six months of life. Past research has suggested that gender affects infant completion of studies involving changes in a mother's pace of interaction, but has failed to examine the relationship of age in conjunction with gender (Burlie, 1992). In addition, infant gender has been shown to alter the gaze behaviors of mothers (Roggman & Peery, 1989). Stern (1974) stated that gaze behavior is important in maternal satisfaction with play interactions. Therefore, the specific purpose of this research is to analyze infant gaze behaviors during mother-infant

face-to-face interaction , looking specifically at the effects of infant gender, infant age, and change in maternal pacing on infant gaze behaviors.

Infant gaze differs for boys and girls. In normal play situations, three- and four-month-old girls gazed longer at their mothers than boys did (Fogel, Toda & Kawai, 1988; Roggman & Peery, 1989). This research indicates that females are more attentive during normal play than males. However, a study done by Tronick & Cohn (1989) found that sons are more likely than daughters to match behavior states with their mothers. They also reported that sons are more synchronized with their mothers than daughters at six and nine months. Although, the data also suggest that daughters are synchronized at three months (Tronick & Cohn, 1989). These results are supported by Burlie's 1992 study in which three-month-old females were unable to return to normal play behavior once the mother slowed down her play behavior and as a result broke the synchrony of the interaction. The present study investigated how gaze behaviors vary across gender, and how these differences vary with the age of the infant.

Research shows that the amount of time infants spend gazing at their mothers changes with age. Gaze behaviors usually increase from birth up until three or four months of age when the behavior begins to decrease. At six months the infant's focal environment increases to include objects which decreases the amount of time that the infant spends gazing at the mother (Cohn & Tronick, 1987; Stack & Muir, 1990). As a result, six-month-olds may not be as sensitive to changes in their mother's behavior. The present study will examine gaze behaviors in infants who are one to six months of age. Previous studies on infant gaze behaviors have not focused on the 1 to 2 month age range. As a result, this study will provide insight into some of the earliest gaze behaviors as well as the more complex gaze behaviors which develop along with the infant's visual-motor system.

Numerous research studies have concluded that changes in maternal behavior affect infant gaze. If mothers imitate their infant's behaviors or speed up the pace of their play, infant gaze will increase (Field, 1977; Arco & McCluskey, 1981). However, if play is

slowed down the amount of mutual gaze will decrease (Arco & McCluskey, 1981; Burlie, 1992). These studies also report a failure to return to the normal rate of play once the infant has been through the slow play phase. Burlie (1992) reported that subject loss for females compared to males was almost 2 to 1 during the slow play phase. Arco and McCluskey (1981) have suggested changing the sequence of the maternal pacing phases and testing different ages to try to determine the failure to return to normal levels of interacting once play is slowed down. Following this suggestion, the present study looked at the effects of five maternal pacing phases on infant gaze. The order of the phases in this study differed from previous studies because the slow paced phase was moved to the end of the sequence. This change may solve the problem of subject loss following a slow paced phase early in the sequence (Arco & McCluskey, 1981; Burlie, 1992). The order of the five phases in the current study was as follows: normal pacing, fast pacing, return-to-normal pacing, slow pacing, and return-to-normal pacing.

The present study briefly reviews the theoretical perspectives which have influenced gaze behavior research. This will be followed by a review of the research literature which examines infant gaze as a way to achieve mutual influence, as a way for infants to regulate external stimulation, and as a tool for mothers to alter their behavior. These sections will be followed by the statement of the problem, hypotheses, methodology, results and discussion of the current research.

CHAPTER II

LITERATURE AND RESEARCH REVIEW

Theoretical Summary

The current research on infant gaze behaviors originates from two inclusive theories on communicative development: Fogel and Thelen's (1987) Dynamic Systems Approach (DSA) to the development of expressive and communicative action during the first year of life and Papousek and Bornstein's (1992) theory of didactic caregiving as it is embedded in intuitive parenting. Both of these theories account for environmental as well as individual influences on development. In Fogel and Thelen's (1987) DSA, expressive and communicative actions are organized as part of a cooperative system with other elements of the infant's physiology, cognition, behavior and social environment. Their DSA presumes that the order of behaviors arises dynamically within the system as a result of the interaction between the cooperating elements that are changing asynchronously (Fogel & Thelen, 1987). To apply this theory to the current study, we infer that differences in infant gaze behaviors due to temporal changes in maternal pacing occur because of gender and age. In the current study, the context (laboratory setting) is the same, but because of the individual variables of age and gender the infants will perform differently.

In their theory of didactic caregiving, Papousek and Bornstein (1992) suggest that parents may provide much of their support for their infant's communicative development unknowingly in the form of intuitive, relatively universal behaviors which they have labeled "didactics". In their theory, infants are not only receptors of parental stimulation but they also elicit behaviors in their parents, and both the parent and the child function as highly complex, dynamic self-regulating systems. This idea of the parent-infant dyad being complex and dynamic is similar to Fogel and Thelen's (1987) concept of a dynamic system made up of complex elements. Papousek and Bornstein (1992) emphasize that caregiving alone does not determine the path or outcome of an individual's development;

"caregiving modes wax and wane in effectiveness, modulated by the developmental status of the child and by individual differences among children" (p. 221). The present study will explore differences in the developmental status of the child in infants who are one to six months old. Individual differences in children in terms of their gender and subsequent gaze behavior will also be examined.

Literature Review

Maternal Framing and Mutual Influence

One area of mother-infant interaction literature examines which participant, the mother or the infant, influences the interaction. Some research supports the concept of the mother having sole influence which has been referred to as maternal framing (Fogel, 1977). Other research supports the concept of a bi-directional or mutual influence where the mother and the infant both influence the interaction (Cohn and Tronick, 1988; Messer & Vietze, 1988; Tronick & Cohn, 1989). The concept of infant influence has been further examined by comparing female and male infants (Tronick & Cohn, 1989; Fogel, Toda & Kawai, 1988; Roggman & Peery, 1989).

An examination of this debate begins by reviewing Stern's (1974) research. In 1974 Stern observed 18 mother-infant dyads at play to examine their facial, vocal, and gaze behaviors. He reported that in all infants, the mother's gaze at them increases the probability of their initiating a gaze at her. Stern (1974) also reported that all infants are less likely to avert gaze and look away if their mother is looking at them. Raw data was provided in support of these conclusions, but statistical support was not provided.

In 1977, Fogel discussed this asymmetrical relationship that exists within the dyad as a result of the mother creating a "frame" for the activities of the infant. Fogel (1977), observing a dyad over seven weeks, reported that the mean mother gaze "at" duration was 207 seconds compared to a mean of 45 seconds for infant gaze "attention". These data

reflect earlier research (Stern, 1974) which shows that mothers are almost always looking at their infants whether the infant is looking at her or not.

Cohn and Tronick in their 1987 study tested the dyadic-states model with mother-infant pairs at three, six and nine months of age. They hypothesized that mother and infant do not change behavior states simultaneously. Although they reported strong support for this hypothesis, data were not provided. They also reported strong support that maternal positive expression precedes the onset of the infant's positive expression at three and six months, but not at nine months. Cohn and Tronick (1987) explained that when the infant does become positive, the mother will remain positive until the infant becomes neutral or disengaged. "The probability of the infant's leading out of joint positive ranged from .69 at three months to .81 at nine months. The corresponding probabilities for the mother ranged from .27 at three months to .16 at nine months" (Cohn & Tronick, 1987). Cohn and Tronick (1987) report a change in the framing behavior at six months when the time spent looking away from the mother is spent looking at objects. These results support Stern's 1974 findings.

Keller and Eibl-Eibesfeldt (1989) examined the role of eye-contact in early parent-child interactions in four different cultures. They reported that the amount of eye contact in the four cultures was largely determined by the amount of looking behavior. They also reported that parents usually initiate gaze and continue to look at their infants even when the infants have stopped looking. No data were given to support these findings.

Cohn and Tronick did another study in 1988 in an attempt to determine whether and how bi-directional influence occurs in mother-infant face-to-face interactions. They shifted their focus from examining only the mother's influence through framing to looking at the influence of both the mother and the infant on their interactions. They justified this shift by explaining that moment-to-moment changes in the infant's behavior are independent of changes in the mother's behavior. Their sample included 54 mother-infant pairs, 18 pairs each at three, six and nine months of age. Cohn and Tronick (1988) report that at three and

nine months the infant and the mother were equally influential in determining the direction of interaction. However, at six months, the mother was more likely to follow the infant's lead due to the infant's increased interest in objects at this age. No significant gender differences were found.

Similar to Cohn and Tronick's (1988) bi-directional influence study, Messer and Vietze (1988) also did a study to determine if mutual influence occurs during mother-infant social gaze. They observed 49 mother-infant pairs at 10, 26 and 54 weeks of age. They found that mothers spent three-fourths of their time gazing at their infant while infants spent only one-fourth to one-third of their time gazing at their mother. They reported a decline in mutual gaze with age and found that infants are more likely to initiate gaze at their mothers when their mothers were looking at them. However, data were not provided to support this statement. Messer and Vietze (1988) concluded that the pattern of mother-infant gaze may be a result of the way that each individual organizes his/her own behavior and not the result of interpersonal synchrony.

Tronick and Cohn continued to research mother-infant pairs in 1989, but they changed their focus from behavioral influence to coordination of behaviors within the dyad. Once again they looked at three, six, and nine month olds. They reported that the infants showed a decrease in averting after the first three months (mean averting time at three months = 36.4, six months = 21.5, nine months = 26.3). Tronick and Cohn (1989) also reported a peak interest in objects at six months ($M = 40.8$), but at nine months ($M = 24.6$) this approximated to the three month level ($M = 21$). These data support the results of their 1987 and 1988 studies. The mean percentage of time infants spent in matched states with their mother was dependent on their age and gender. Tronick and Cohn (1989) report that matching of visual states was less at three months than at six and nine months. When analyzing gender they found that mother-son dyads were more likely than mother-daughter dyads to be in matched visual states. They also reported that mother-son dyads had higher synchrony scores than mother-daughter dyads at six and nine months. They did not report

a significantly higher synchrony score for mother-daughter dyads at three months, even though the means were similar to the scores for six and nine months just mentioned. Tronick and Cohn (1989) offered an explanation that "normal interaction is not always well coordinated, and it is differently coordinated between mothers and sons and mothers and daughters."

Fogel, Toda and Kawai (1988) also looked at the effects of infant gender on mother-infant interaction, but their study examined gender cross-culturally. They compared 36 Japanese and 36 American three-month-old infants and their mothers during face-to-face interaction. They reported that American infant girls gazed at their mothers longer than American infant boys. Fogel, Toda and Kawai (1988) also reported that mothers in both cultures responded contingently to a change in infant gaze state; their behavior differed when the infants were gazing at them compared to when the infants were gazing away from them.

In 1989 Roggman and Peery hypothesized that patterns of parent-infant social play behavior would differ with both parent and infant gender. They observed 20 four-month-old infants and their parents. Roggman and Peery (1989) found that parents gazed at their infants 81% of the time with 5.9 gazes per minute and each gaze lasting approximately 10.4 seconds. Infants, on the other hand, gazed at their parents only 33% of the time with 3.8 gazes per minute and each gaze lasting approximately 5.1 seconds. The average length of gazes was calculated to be longer for girls ($M = 5.86$) than for boys ($M = 4.12$) (Roggman & Peery, 1989).

Past research in the area of maternal framing and mutual influence initially focused on the mother creating and controlling her interactions with her infant (Stern, 1974; Fogel, 1977; Cohn & Tronick, 1987; Keller & Eibl-Eibesfeldt, 1989). Then the focus shifted to the topic of mutual influence and the impact of both the mother and the infant on the interaction was explored (Cohn & Tronick, 1988; Messer & Vieyze, 1988). Research on mutual influence continued, but with more attention on specific infant variables such as

gender and age (Cohn & Tronick, 1988; Tronick & Cohn, 1989; Fogel, Toda & Kawai, 1988). Finally, researchers began to explore specific parent variables as well (Roggman & Peery, 1989). The present research follows this literature on mutual influence by examining both mother and infant behaviors during mother-infant interaction. Based on the previous literature infant age and gender differences will also be explored.

Behavior Regulation

Past research has also examined the role of the infant as an active participant who not only gazes at the mother, but has the ability to regulate maternal behaviors through gaze aversion (Termine & Izard, 1988; Cohn & Tronick, 1989; Stifter & Moyer, 1991). Additional research has explored maternal contributions to this ability of infants to self-regulate (Brazelton, Koslowski & Main, 1974; Gable & Isabella, 1992).

A review of the behavior regulation literature begins with research on mutual regulation by Stern (1977) and Brazelton, Koslowski and Main (1974). Stern (1977) states that social play at the developmental stage of three-to-four months of age is aimed mainly at the mutual regulation of stimulation in order to maintain a level of arousal that is affectively positive. "However, in an attempt to maintain the infant's interest, the mother often escalates the degree of exaggeration in timing of facial, and vocal behaviors up to some point of extraordinary exaggeration at which the infant rapidly averts gaze." (Stern, 1977) Along the same lines, Brazelton, Koslowski and Main (1974) did a study which examined the origins of reciprocity in five mother-infant pairs from 2 to 20 weeks in age. After observing the dyads, they reported that the most important rule for maintaining an interaction is that mothers develop a sensitivity for their infant's capacity for attention and their need for withdrawal/gaze aversion (Brazelton, Koslowski & Main, 1974). This finding has been replicated in subsequent studies which examine the impact of affective behaviors or maternal overstimulation on gaze aversion.

Termine and Izard (1988) examined infants' responses to their mothers' expressions of joy and sadness. Their participants were 36 nine-month-old infants and

their mothers. They found that infants looked longer at their mothers during the joy condition and that infants showed more gaze aversion during the sadness condition (Termine & Izard, 1988). These results are consistent with previous findings (Brazelton, Koslowski & Main, 1974) because they show that infants use gaze aversion to both reduce input of negative emotion and to self-regulate emotional arousal.

A 1989 study by Cohn and Tronick also looks at the impact of maternal affective behavior on infants. Their participants were 13 seven-month-old infants and their mothers from multiproblem families. Taken as a group, these mothers' behaviors during face-to-face interactions were different than the behaviors of mothers who were not from multiproblem families (Cohn & Tronick, 1989). These mothers disengaged more than 70% of the time, and their babies gaze averted 57% of the time. In contrast, Stern (1977) reported that most mothers spend approximately 70% of their time during play gazing at their infants. Cohn and Tronick (1989) also reported that infants of intrusive mothers had the highest percentage of gaze aversion at almost 70%. The high gaze aversion scores were not caused by a shift in attention to other objects. The proportion of time these infants spent attending to objects was also below normal. Cohn and Tronick (1989) observed that most of the mothers in this study either didn't express positive affect or combined it with negative behavior. As a result, the infants were forced to regulate their mother's negative affect as well as their own.

A 1991 study done by Stifter and Moyer also examined gaze aversion activity as a result of positive affect during mother-infant interaction. Their sample consisted of 60 five-month-old infants and their mothers. They found that infants averted their gaze for longer durations after a long smile than after a short smile. Similarly, they found that infants exhibiting high intensity smiles averted their gaze more often than infants with low intensity smiles (Stifter & Moyer, 1991). Stifter and Moyer (1991) concluded that high-positively aroused infants exhibit more frequent and longer gaze aversions than low-positively

aroused infants. Regardless of whether the affect is positive (Stifter & Moyer, 1991) or negative (Cohn & Tronick, 1989), the infants gaze avert in order to self-regulate.

Gable and Isabella (1992) longitudinally examined the maternal contributions to their infant's ability to regulate arousal at one and four months of age. They found that early maternal interactive behavior plays a meaningful role in the infants developing ability to regulate arousal through gaze behavior and affective expression. Gable and Isabella (1992) reported that affective maternal state at one month and physical activity at one month were both positively associated with infant regulation of arousal at four months. Either too much or too little physical stimulation resulted in the infant demonstrating less adequate abilities to regulate arousal (i.e., greater instances of gaze aversion and less positive affect).

Similar to maternal framing and mutual influence literature, past research on behavior regulation initially focuses on the mother regulating the interaction to ensure that the infant is in a positive state (Stern, 1977). Brazelton, Koslowski and Main (1974) also gave mothers the key role in the interaction. They reported that mothers needed to develop a sensitivity for their infant's capacity for attention and their need to gaze avert. The literature then examined the infant's ability to gaze avert based upon both maternal and infant variables such as maternal expressions of joy and sadness, mothers and infants from multiproblem families and moms displaying highly positive behavior (Termine & Izard, 1988; Cohn & Tronick, 1989; Stifter & Moyer, 1991). Finally, the literature explores the infant's ability to self-regulate through gaze aversion and it also recognizes maternal contributions to the infant's self-regulation such as affective maternal state and physical activity (Gable & Isabella, 1992). Building on this research, the present study examined behavior regulation further by controlling maternal behavior by instructing mothers how to play with their infants. This design allowed for closer examination of maternal correlates of infant gaze behaviors.

Temporal Organization

Numerous research studies have examined mother-infant interaction by manipulating the amount of maternal activity to modify the amount of infant behaviors (Field, 1977; Arco & McCluskey, 1981; Stack & Muir, 1990; Burlie, 1992). The manipulation in these studies involved dividing mother-infant interaction into phases with instructions on how the mother should interact with her infant during each phase.

For example, Field (1977) manipulated face-to-face interaction between mothers and their three-and-a-half month-old infants. She measured infant activity during three minute interaction situations: spontaneous, attention-getting, and imitation. Field (1977) found that infants gaze averted more during attention-getting situation (increased maternal activity) -79%, and less during the imitation situation (decreased maternal activity) - 40%. She concluded that during attention-getting, the mother is providing more information for the infant to process which results in the infant taking pause/gaze averting. Field (1977) also reported that during imitation, mothers were more responsive to their infants behavior and as a result they slowed down their imitations. This behavior matching by the mother resulted in less need for the infant to take pause/gaze avert.

Arco and McCluskey (1981) also manipulated mother-infant interaction. They hypothesized that infants would not only react to changes in maternal pacing, but they would also be able to discriminate between the changes. Their sample consisted of 32 mother-infant pairs, 16 each at three and five months. Arco and McCluskey (1981) looked at a variety of maternal and infant social interactive variables during four - two minute phases: natural pacing, slower-than-usual pacing, return-to-normal pacing, and faster-than-usual pacing. They found that natural pacing (phase 1) and faster-than-usual pacing (phase 4) had the highest levels of mother-infant synchrony. Arco and McCluskey (1981) also reported that infant visual regard of the mother was significantly affected by the play phases. They found that phase 1 and phase 4 had the highest levels of infant visual regard of the mother; these two phases were not significantly different from each other. Arco and

McCluskey (1981) reported that mutual visual regard also showed a main effect of phase. After experiencing slower-than-usual pacing, both infant visual regard of the mother and mutual visual regard did not return to normal levels in phase 3. "This failure to return to baseline indicates a possible sequencing effect and complicates the discussion of stable infant responding to temporal changes. It highlights the need for further methodological consideration and sequencing effects." (Arco & McCluskey, 1981) They also concluded that infants prefer fast-paced over slow-paced maternal play because infant positive facial expressiveness, positive facial coaction, and mother-infant synchrony were significantly higher during fast-paced play. Finally, Arco and McCluskey (1981) stated that there were no significant differences between infants of different ages or genders. These results did not support the data obtained by Field (1977) which showed that infants gazed more during imitation (decreased maternal activity) and less during attention-getting (increased maternal activity). This difference may occur because Arco and McCluskey (1981) just instructed the mothers to slow down their pace while Field (1977) instructed the mothers to imitate their infants' behaviors.

In 1990 Stack and Muir conducted a series of experiments in an attempt to isolate the effect of touch as a component of mother-infant interaction in the still-face paradigm. Their sample consisted of three, six and nine-month-old infants and their mothers. Stack and Muir (1990) found that six-month-olds gazed significantly less overall ($M = 56.2\%$) compared to three-month-olds ($M = 76\%$). Those data support previous findings (Cohn & Tronick, 1987 and 1988; Tronick & Cohn, 1989). They also observed a dramatic decrease in infant gaze from the normal period to the still-face period ($M = 34.8\%$), but not from the normal period to the still-face with touch period ($M = 64.7\%$). During the still-face with touch condition, the infants split their gaze between the face ($M = 20.3\%$) and the hands ($M = 44.4\%$), but the total gaze did not change relative to the normal period ($M = 64.7\%$). There was also less gaze in the still-face condition relative to the still-faced with touch condition. No significant gender differences were reported.

Burlie (1992) did a study similar to Arco and McCluskey's (1981) study on temporal organization. She examined mother and infant variables during 3 - three minute sessions: natural temporal patterning, slow temporal patterning, and return to normal patterning. Burlie (1992) reported 30 percent fewer utterances in the slow play phase. When maternal utterances decreased; mutual gaze between the infant and mother also decreased (Burlie, 1992). These results support Arco and McCluskey's (1981) results that infant behaviors decrease in the slow play phase. Burlie (1992) also reported that subject loss for females compared to males was almost 2 to 1. Most of the females were lost in the second phase when they became extremely fussy. Burlie (1992) suggests that females are more sensitive to interaction patterns than males. As illustrated in previous studies (Field, 1977; Arco & McCluskey, 1981; Stack & Muir, 1990), Burlie (1992) reported that experimental manipulations had a significant impact on the social interaction between the mother and the infant which merits further experimental attention.

The literature on temporal organization reports that if mothers imitate their infant's behaviors or speed up the pace of their play, infant gaze will increase (Field, 1977; Arco & McCluskey, 1981). However, if the mother is using a still face or play is slowed down the amount of mutual gaze will decrease (Arco & McCluskey, 1981; Stack & Muir, 1990; Burlie, 1992). Arco & McCluskey (1981) and Burlie (1992) also report a failure to return to the normal rate of play once the infant has been through the slow play phase. As a result, Arco and McCluskey (1981) have suggested changing the sequence of the maternal pacing phases and testing different ages to try to determine the failure to return to normal levels of interacting once play is slowed down. Following this suggestion, the present study looked at the effects of five maternal pacing phases on infant gaze. The order of the phases in this study differed from previous studies because the slow paced phase was moved to the end of the sequence.

Summary of Literature Review

In reviewing the theories of Fogel & Thelen and Papousek & Bornstein, both theories suggest that both maternal and infant variables act as cooperating elements in a dynamic, self-regulating system. The previous literature embodies these theories by investigating both the maternal and infant behaviors which have an impact on mother-infant interaction. This literature has reported differences in mother-infant interaction as a result of infant gender, infant age and maternal temporal pacing.

How do infant gender (male and female), infant age (1-2 month olds, 3-4 month olds, 5-6 month olds) and maternal pacing (normal, fast, return to normal, slow, return to normal) influence infant gaze behaviors? The past research is not clear on this issue. This uncertainty results from disagreement over a variable's influence in the past literature or simply that the variable has not yet been investigated as designated in the current research. In examining the variable of gender, Tronick and Cohn (1989) reported that sons were more synchronized with their mothers than daughters at 6 and 9 months of age and daughters were more synchronized at 3 months. On the other hand, Fogel, Toda and Kawai (1988) and Roggman and Perry (1989) reported that females gazed longer than males at 3 and 4 months of age suggesting that females were more attentive than males. Although the past research is conflicting, both agreed that at 3 months females were most attentive. However, this finding differs with Burlie's (1992) pacing research in which 3 month old females drop out of the study following a slow play phase.

Unlike past research on gender, previous research on age and maternal temporal pacing was consistent in its results. For age, Cohn and Tronick (1987) and Stack and Muir (1990) reported that at six months, the infant's focal environment increases to include objects which decreases the amount of time that the infant spends gazing at the mother. For maternal pacing, Arco and McCluskey (1981) and Burlie (1992) reported that when play is slowed down the amount of mutual gaze will decrease.

The present study builds on this past research by examining the variables of infant gender, infant age and maternal pacing, but the present research also fills a gap in the literature by following new directions. Arco and McCluskey (1981) have suggested changing the sequence of the maternal pacing phases and testing different ages to try to determine the failure to return to normal levels of interacting once play is slowed down. Following this suggestion, the present study looked at the effects of five maternal pacing phases on infant gaze. The order of the phases in the current study differed from previous studies because the slow paced phase was moved to the end of the sequence. The present study also examined 1-2 month olds which has not been done in temporal organization research. As a result of these new directions in age and pacing research and because of disagreements on the influence of gender in past research, directional hypotheses about the influence of infant age, infant gender and maternal pacing did not seem warranted.

Problem Statement

As indicated by the literature, mother-infant social interaction has been widely researched over the last two decades. Following the theoretical framework on communicative development, numerous studies have identified both maternal and infant variables which have an impact on social interaction. However, the impact of these variables needs to be examined in more detail. Building on past research, the present study was guided by the question: how are infant gaze behaviors affected by changes in maternal pacing, infant age and infant gender?

Hypotheses

To explore this question, the present research study examined videotaped mother-infant face-to-face interactions. The effects of changes in maternal pacing, infant age and infant gender (the independent variables) on infant gaze behaviors (the dependent variable) were analyzed. The primary hypotheses concerned whether infant gaze behaviors were related to temporal changes in maternal pacing as well as infant age and infant gender.

Since the literature does not foster directive hypotheses about these variables, two-tailed hypotheses were derived: first, the frequency and duration of infant gaze will vary as a function of gender; second, the frequency and duration of infant gaze will vary as a function of age; third, the frequency and duration of infant age will vary with changes in maternal pacing; fourth, there will be a significant interaction between gender and age on the frequency and duration of infant gaze; fifth, there will be a significant interaction between gender and maternal pacing on the frequency and duration of infant gaze; sixth, there will be a significant interaction between age and maternal pacing on the frequency and duration of infant gaze; and seventh, there will be a significant interaction between gender, age, and maternal pacing on the frequency and duration of infant gaze.

CHAPTER III

METHOD

Participants

The participants were 36 infants (18 males and 18 females) and their mothers. They represent a cross-sectional sample of 12 mother-infant pairs from each age group: 1-2 months, 3 -4 months, and 5-6 months. The sample was obtained from the birth announcements in the local paper, and the mothers were contacted by telephone (see Appendix B). The sample is representative of middle class families from a medium sized midwestern community.

An additional eight subjects were tested, but were excluded due to fussiness (2 females and 3 males), experimenter error (1 female and 1 male) and equipment failure (1 female). Of the infants who were excluded because of fussiness, two were 1-2 month olds, one was a 3-4 month old and one was a 5-6 month old. In addition, two 1-2 month old males were excluded before testing began because of fussiness. A break between sessions was needed for four females and four males. Five of the eight infants who needed breaks were the same five infants who were excluded due to fussiness. The other three infants who needed breaks were a 1-2 month old female, a 3-4 month old female and a 5-6 month old male. Finally, sessions for one male from each age group were restarted due to fussiness. Of the three males, only the 1-2 month old was later excluded because of fussiness.

Materials

The mother-infant pairs were videotaped in a university observation room. The observation room contained an infant seat placed on a table at a height that allowed face-to-face interaction when the mother is seated. Two color video cameras were used: one was set up in the observation room to videotape the infant, the other was behind a one-way mirror to record the mother's behavior. The images from the two cameras were mixed

using a split screen editor. A time-date generator and a video recorder were also used for data collection.

Procedure

The mothers and infants were videotaped together for one session lasting approximately 10 minutes. The videotaped sessions were divided into five phases each lasting 2 minutes: phase 1 - normal temporal pacing; phase 2 - fast temporal pacing; phase 3 - return-to-normal temporal pacing; phase 4 - slow temporal pacing; and phase 5 - return-to-normal temporal pacing.

The procedure was reviewed with the mother prior to the videotaping and consent for participation was obtained (see Appendix C). The researcher gave the following instructions to the mother: the mother was asked to keep the child in the infant seat unless she/he became upset and needed to take a break and she was also asked not to use any pacifiers or toys in her play; the mother was informed that she would be videotaped from behind a one-way mirror and that in order to observe her playing with her infant in different ways, the researcher would come into the room every two minutes and give her instructions on how to play with her infant (see Appendix D).

Phase 1 - Before beginning, the researcher instructed the mother to play with her infant as she normally does at home, but not to use toys or any other items to assist her in playing with the infant. The mother was also told that after approximately two minutes a short break will be taken and she will be given further instructions about changing her rate of play. The researcher left the room before each session began so the infant and the mother could play in privacy. At the end of phase 1, the researcher went back into the room and asked the mother if she and the infant were ready to go on to the next phase. When the participants were ready, the next phase was explained to the mother.

Phase 2 - When the dyad was ready to continue, the researcher asked the mother to speed up her play behavior. At the end of this two minute session, the researcher returned

to the room and asked the mother if she and the infant were ready to go on to the next phase. When the participants were ready to begin, phase 3 was explained.

Phase 3 - When the dyad was ready to begin phase 3, the researcher asked the mother to return to her normal rate of play. At the end of this two minute session, the researcher returned to the room and asked the mother if she and the infant were ready to go on to the next phase. When the participants were ready to begin, phase 4 was explained.

Phase 4 - When the dyad was ready to begin phase 4, the researcher asked the mother to slow down her play behavior. At the end of this two minute session, the researcher returned to the room and asked the mother if she and the infant were ready to go on to the final phase. When the participants were ready to begin, the final phase was explained.

Phase 5 - When the dyad was ready to begin the final phase, the researcher asked the mother to return to her normal rate of play. At the end of this two minute session, the researcher returned to the room and concluded the session by thanking the mother. The mother was asked if she has any questions about the study. She was told that the study is looking at how both the infants and the mothers react when the pace or rate of play was increased and decreased.

Design

In order to examine the effects of infant gender and age as well as maternal pacing upon infant visual behavior, two repeated measures analyses of variance were performed. The first repeated measures analysis of variance used the frequency of infant visual behaviors as the dependent measure; infant gender and age were the independent variables with the maternal pacing being the repeated variable. Similarly, for the second repeated measures analysis of variance used duration of infant visual behavior as the dependent measure; infant gender and age were the independent variables with maternal pacing being the repeated variable. In addition, follow-up Tukey's tests were used as a post hoc comparison to determine if the means were homogeneous. This test controls the

type I experiment-wise error rate. The probability level for all reported Tukey's tests = $p < .05$.

Data Coding - Infant gaze behaviors were coded using the frequency and duration of gaze. The behaviors were coded using the EVENTLOG software package (Hendersen, 1989) which was designed to be used as a tool for recording real-time events. The data were entered using a standard keyboard.

The videotapes were transcribed by two observers and both intrarater and interrater reliability were calculated for each of the variables mentioned above. The observers were both experienced with approximately 100 hours of coding experience using tapes of mother-infant interactions. The observers were trained on the coding definitions and procedures for this study. The reliability scores for both frequency and duration were computed by dividing the total number of observer agreements by the overall total of observer agreements plus disagreements and then multiplied by 100. This procedure for obtaining reliability was based on past research (Field, 1977; Arco & McCluskey, 1981; Burlie, 1992).

Intrarater reliability was determined by having the raters periodically rescore subjects that they scored earlier and ranged from 93 to 95 percent. Interrater reliability was initially calculated by having both raters code a training tape before coding the research tapes. An agreement level of 90 to 92 percent was reached before they proceeded. Interrater reliability was also calculated in the middle and at the end of the research coding to ensure consistency between the raters and ranged from 89 to 92 percent. Table I illustrates these reliability percentages. All tables are located at the end of the Results Chapter.

CHAPTER IV

RESULTS

The current study examined the impact on infant gender, infant age and maternal pacing upon infant visual behavior, both its frequency and duration. Analyses of the data included two repeated measures analyses of variance and post hoc Tukey's tests.

Since previous research reported that maternal activity increased during fast temporal pacing/attention getting and decreased during slow temporal pacing/imitation (Field, 1977; Arco & McCluskey, 1981; Burlie, 1992), it was assumed that the mothers in the current study followed directions and altered the pace of their play for each experimental manipulation.

The means and standard deviations for frequency and duration of infant gaze were calculated. The scores are illustrated in table form as a function of phase, age, and gender. Table II illustrates the *duration* means and standard deviations of infant visual behaviors and Table III illustrates the *frequency* means and standard deviations of infant visual behaviors. Tables II and III are at the end of this chapter.

Analyses of Specific Hypotheses

The primary analyses examined the effect of gender, age and phase on the frequency and duration of infant gazes. Seven hypotheses were examined using two repeated measures analysis of variance. The results of these analyses can be found in Table IV at the end of this chapter.

The first hypothesis analyzed the influence of *gender* on infant gaze behaviors. For frequency of infant gaze, gender was not significant, but it was significant for duration of infant gaze. ($F = 7.39, p < .0108$) Overall, females gazed longer than males: females gazed 33% of the time while males gazed 22% of the time. Figure 1 shows the duration of infant gaze by gender and Table V shows the overall means and standard deviations for gender. The figure and table are shown at the end of this chapter.

The second hypothesis examined the impact of *age* on infant gaze behaviors. For frequency of infant gaze, age was not significant, but it was significant for duration of infant gaze. ($F = 25.33, p < .0001$) Overall, 1-2 month olds looked significantly longer at their mothers, than the 3-4 and 5-6 month olds. 1-2 month olds gazed 46% of the time while 3-4 and 5-6 month olds gazed 13% and 23% respectively. Figure 2 shows the duration of infant gaze by age and Table V shows the overall means and standard deviations for age. These are located at the end of the chapter.

The third hypothesis assessed the effect of *maternal pacing* on infant gaze behaviors. Maternal pacing was significant for both frequency ($F = 8.37, p < .0001$) and duration ($F = 5.31, p < .0006$) of infant gaze. Infants gazed less during the slow paced phase and more during the fast paced phase. During Phase 1 the infants gazed an average of 9.78 times, 11.92 times for Phase 2, 9.20 times for Phase 3, 6.78 times for Phase 4, and 4.35 times for Phase 5. The length of their gazes also varied with phase: infants gazed 32% of the time during Phase 1, 37% for Phase 2, 28% for Phase 3, 18% for Phase 4, and 23% for Phase 5. Figure 3 shows the duration of infant gaze by phase and Figure 4 shows the frequency of infant gaze by phase. The overall means and standard deviations for phase are illustrated at the end of the chapter in Table VI for duration and Table VII for frequency.

The fourth hypothesis examined the impact of gender and age on the frequency and duration of infant gaze. The interaction between these two variables was not significant for frequency, but a significant interaction was found for duration of infant gaze. ($F = 3.33, p < .0495$) The females in each age group gazed significantly longer than the males in their age group. Figure 5 shows the duration of infant gaze by gender and age and Table V shows the overall means and standard deviations by gender and age. See the end of the chapter for the figure and table.

For the fifth hypothesis the influence of phase and gender was analyzed on the frequency and duration of infant gaze. However, no significant interaction was indicated for these variables as a function of frequency and duration of infant gaze.

For the sixth hypothesis the effect of maternal pacing and age was examined for the frequency and duration of infant gaze. The interaction between these two variables was significant for frequency ($F = 3.21, p < .0025$), but not significant for duration of infant gaze. Analysis revealed that the 3-4 month olds were significantly different from both the 1-2 and 5-6 month olds during Phase 2, the fast paced phase. Unlike the other two groups, 3-4 month olds statistically increase the number of times they look at their mother during the fast paced phase. The frequency of infant gaze for the three age groups was not significantly different in any of the other phases. Figure 6 shows the frequency of infant gaze by age and phase and Table VII shows the overall means and standard deviations by age and phase. All tables and figures are at the end of the chapter.

The 2 (gender) x 3 (age) x 5 (phase) repeated measures analyses of variance assessed the effects of gender, age and phase on the *frequency* ($F = 1.24$ with $p = .28$) and *duration* of infant gaze ($F = 1.02$ with $p = .42$). Although differences seemed apparent on Figures 7 and 8, significant differences were not obtained statistically. This may have resulted from the high variance of the research means. The figures are located at the end of the chapter with Figure 7 illustrating duration of infant gaze by gender, age, and phase and Figure 8 showing frequency of infant gaze by gender, age, and phase.

Tables I

Frequency and Duration of Infant Gaze: Interrater Reliability

	Beginning	Middle	End
Frequency	90%	89%	90%
Duration	92%	90%	92%

Table II

Duration: Means and Standard Deviations of Infant Gaze as a Function of Phase, Gender and Age

Duration	Phase One		Phase Two		Phase Three		Phase Four		Phase Five	
	M	SD	M	SD	M	SD	M	SD	M	SD
1-2 month females	67.45	32.20	75.35	23.12	79.22	26.42	65.35	33.28	65.88	41.20
1-2 month males	61.92	42.99	62.13	50.31	40.45	38.68	12.12	12.49	27.55	32.58
3-4 month females	23.58	2.91	29.48	6.26	17.48	5.40	8.02	8.92	9.35	12.73
3-4 month males	12.82	3.33	23.92	5.77	13.87	5.55	3.63	2.29	18.48	5.63
5-6 month females	29.55	15.47	41.03	32.11	25.57	24.91	24.98	27.75	29.10	31.63
5-6 month males	37.12	24.40	31.03	24.22	21.42	14.57	15.63	22.44	18.00	12.49

Table III

Frequency: Means and Standard Deviations of Infant Gaze as a Function of Phase, Gender and Age

Frequency	Phase One		Phase Two		Phase Three		Phase Four		Phase Five	
	M	SD	M	SD	M	SD	M	SD	M	SD
1-2 month females	10.67	4.59	11.33	4.03	10.33	1.75	11.17	5.19	10.17	4.40
1-2 month males	8.67	3.20	6.83	4.79	8.67	4.68	6.50	4.23	7.33	4.32
3-4 month females	9.67	2.73	15.50	4.04	9.50	3.73	4.33	3.98	4.67	4.63
3-4 month males	7.33	2.16	14.83	3.71	9.17	2.32	4.83	4.17	12.00	3.79
5-6 month females	10.50	4.32	12.67	5.47	9.67	6.62	8.17	5.27	9.67	4.41
5-6 month males	11.83	1.94	10.33	5.05	7.83	2.86	5.67	5.89	8.50	4.55

Table IV
Frequency and Duration of Infant Gaze: ANOVA

	Frequency of Infant Gaze			Duration of Infant Gaze		
	F	p	Sig.	F	p	Sig.
Gender	2.01	0.1661	NS	7.39	0.0108	*
Age	0.06	0.9405	NS	25.33	0.0001	***
Phase	8.37	0.0001	***	5.31	0.0006	***
Gender x Age	1.97	0.1565	NS	3.33	0.0495	*
Gender x Phase	1.23	0.3004	NS	0.90	0.4657	NS
Age x Phase	3.21	0.0025	**	0.41	0.9112	NS
Gender x Age x Phase	1.24	0.2800	NS	1.02	0.4248	NS

Levels of Significance:

* = .05

** = .01

*** = .001

Figure 1
Duration of Infant Gaze by Gender

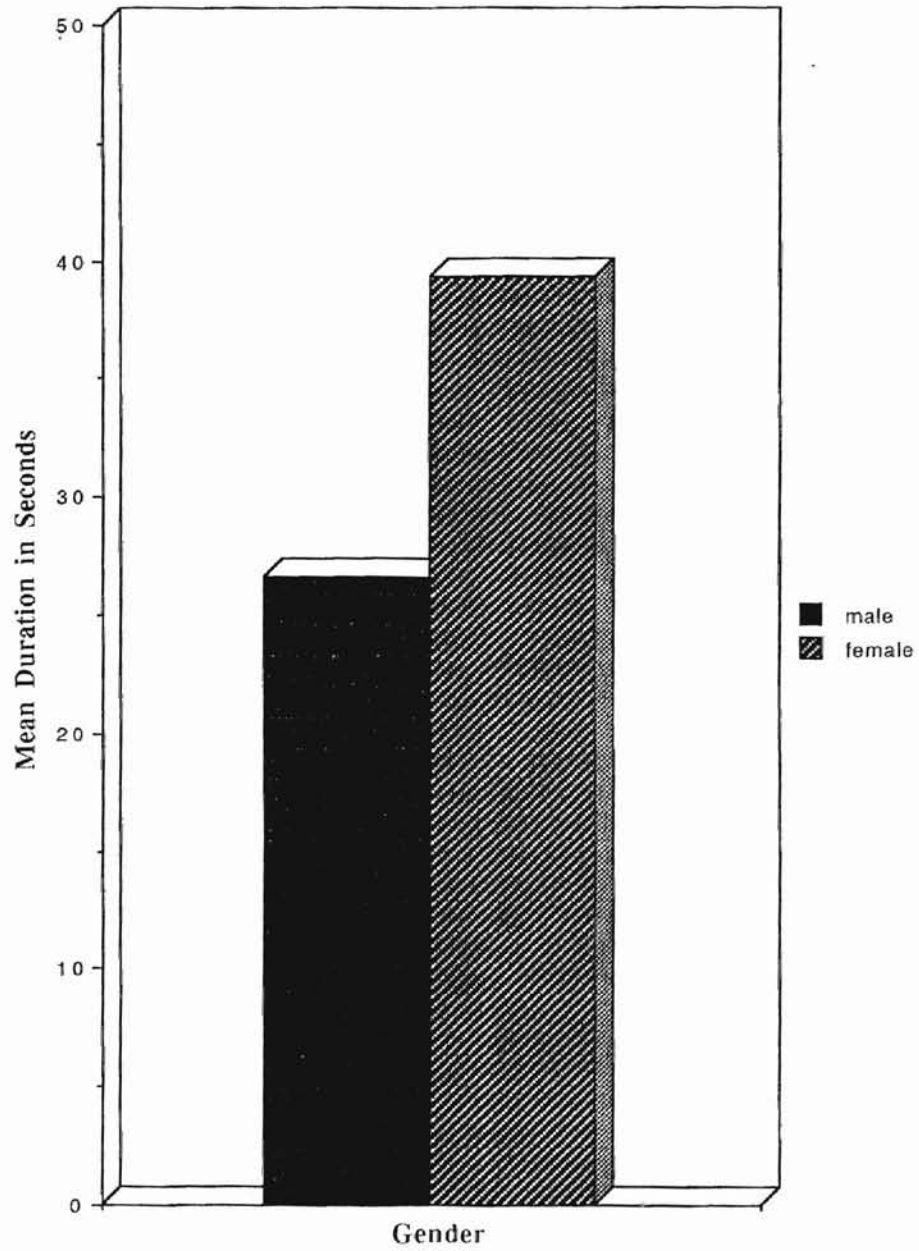


Table V

Duration: Overall Mean and Standard Deviation of Infant Gaze by Gender and Age

	1-2 months		3-4 months		5-6 months		Gender	Totals
	M	SD	M	SD	M	SD	M	SD
Females	70.65	31.24	17.58	7.24	30.05	26.37	39.43	21.62
Males	40.83	35.41	14.54	4.51	24.64	19.62	26.67	19.85
Age Totals	55.74	33.33	16.06	5.88	27.34	23.00		

Figure 2
Duration of Infant Gaze by Age

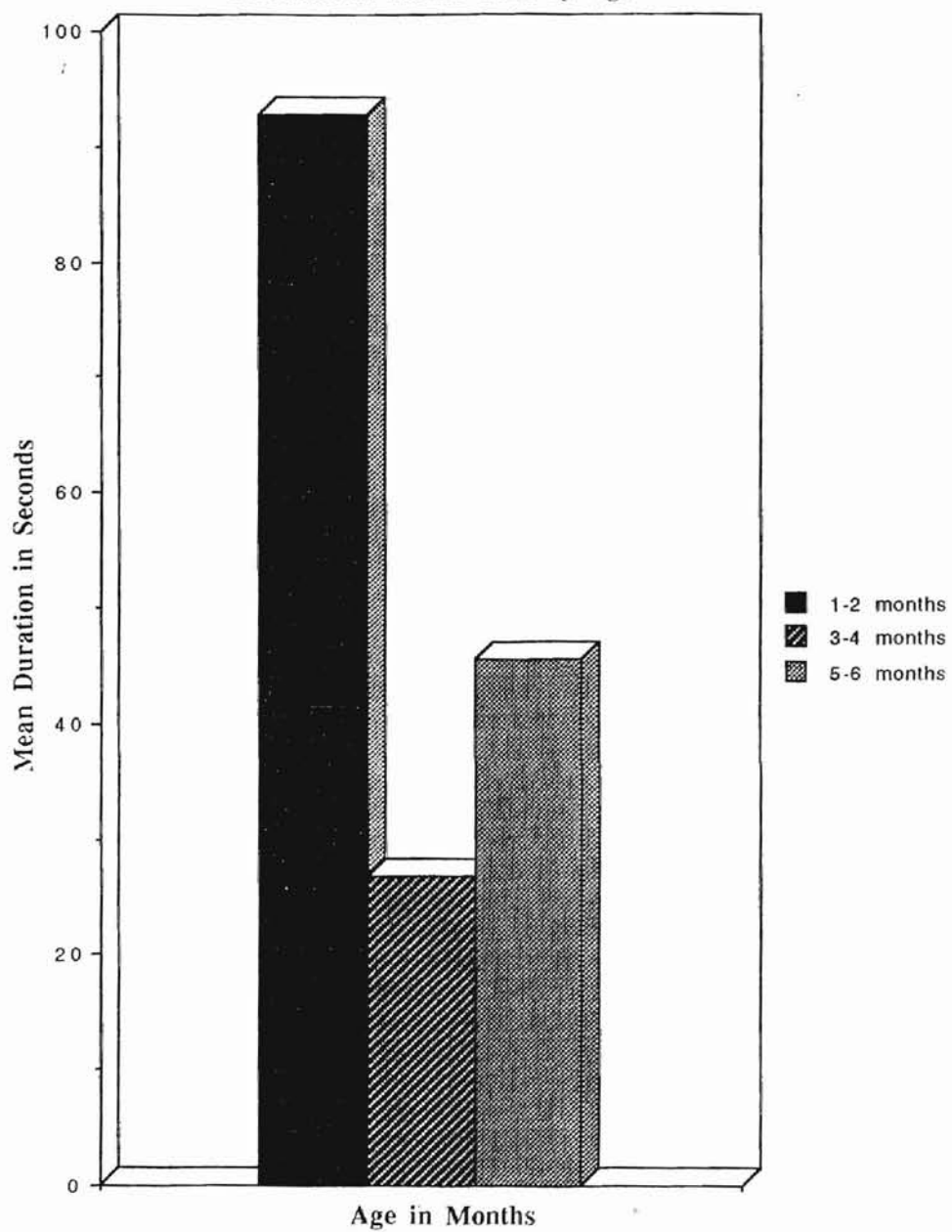


Figure 3
Duration of Infant Gaze by Phase

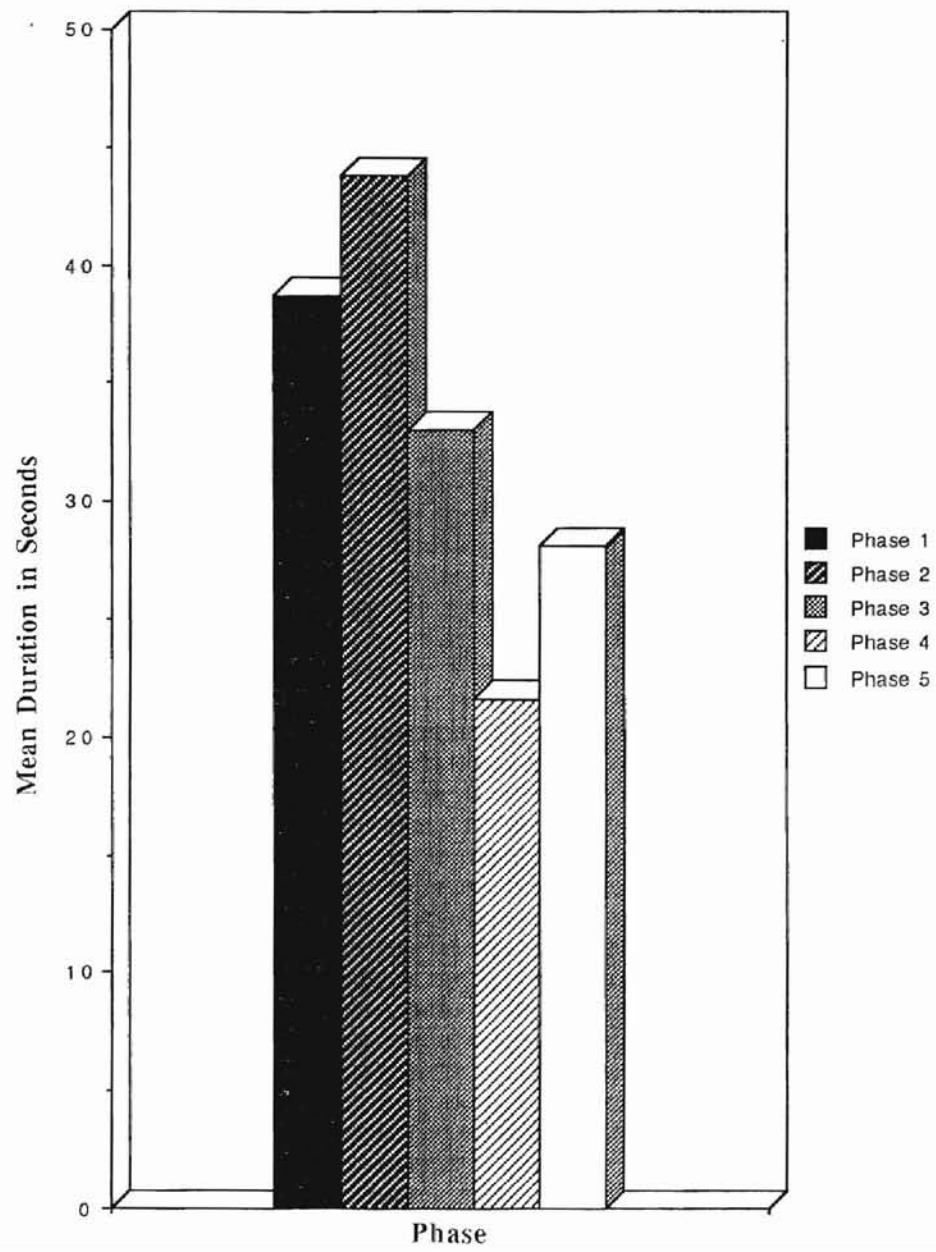


Table VI

Duration: Means and Standard Deviations of Infant Gaze by Gender and Phase

	Phase 1		Phase 2		Phase 3		Phase 4		Phase 5		Gender Totals	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Females	40.19	16.86	48.62	20.50	40.76	18.91	32.78	23.32	34.78	28.52	39.43	21.62
Males	37.29	23.57	39.03	26.77	25.25	19.60	10.46	12.41	21.34	16.90	26.67	19.85
Phase Totals	38.74	20.22	43.82	23.63	33.00	19.26	21.62	17.86	28.06	22.71		

Figure 4
Frequency of Infant Gaze by Phase

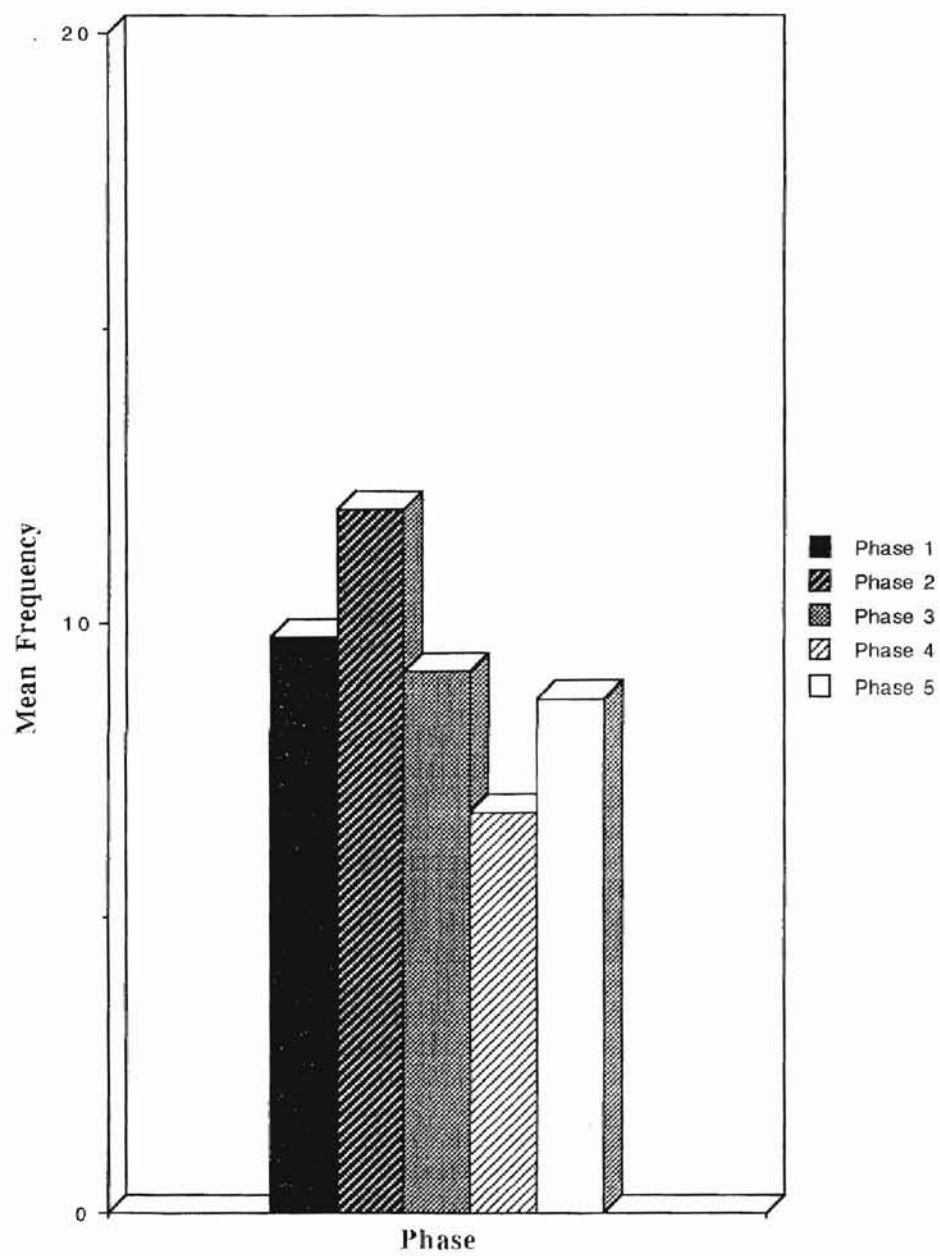


Table VII

Frequency: Overall Mean and Standard Deviation of Infant Gaze by Age and Phase

	Phase 1		Phase 2		Phase 3		Phase 4		Phase 5		Age Totals	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
1-2 months	9.67	3.90	9.08	4.41	9.50	3.22	8.84	4.71	8.75	4.36	9.17	4.12
3-4 months	8.50	2.45	15.17	3.88	9.34	3.03	4.58	4.08	8.34	4.21	9.19	3.53
5-6 months	11.17	3.13	11.50	5.26	8.75	4.74	6.92	5.58	9.09	4.48	9.49	4.64
Phase Total	9.78	3.16	11.92	4.52	9.20	3.66	6.78	4.79	8.73	4.35		

Figure 5

Duration of Infant Gaze by Gender and Age

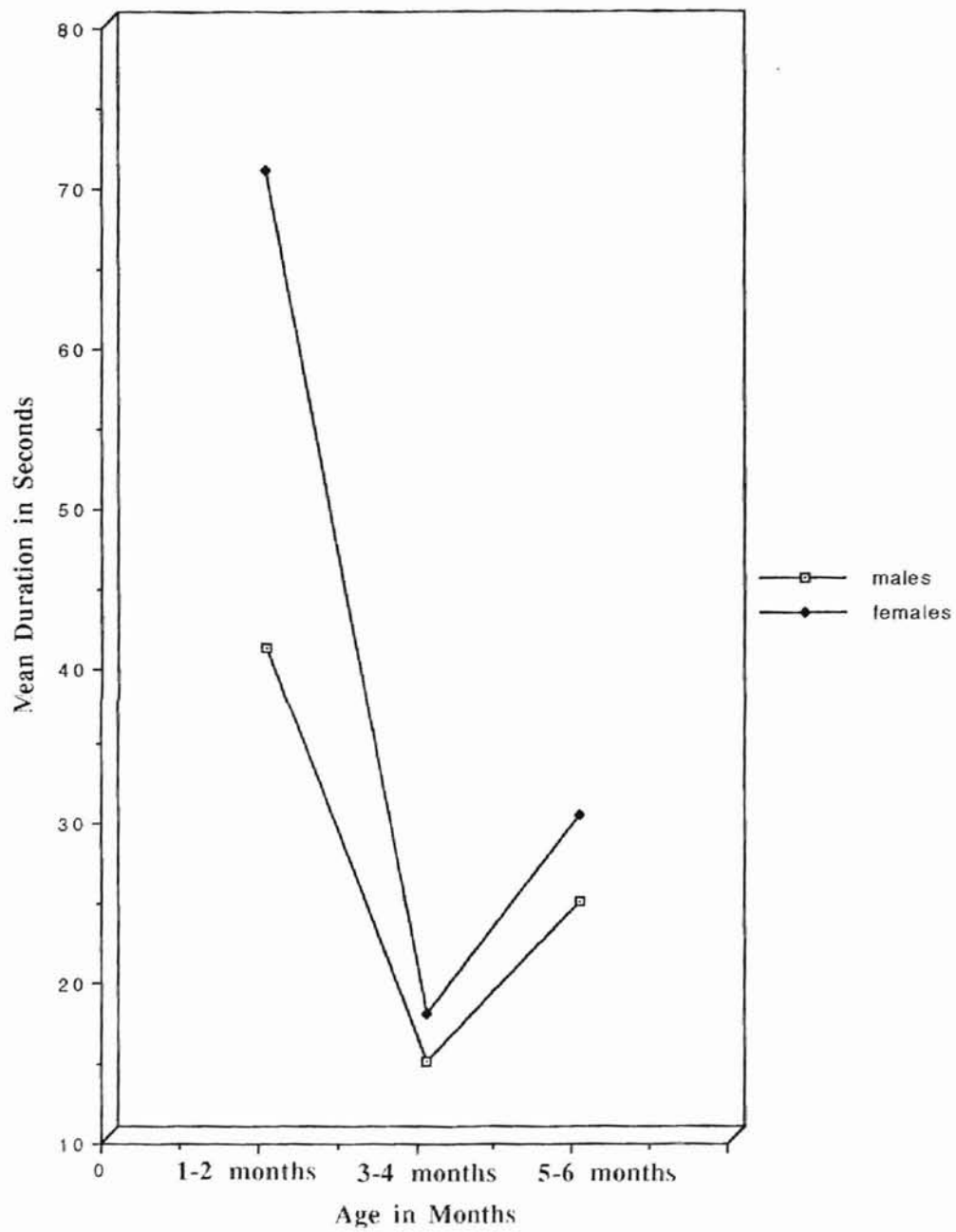


Figure 6
Frequency of Infant Gaze by Age and Phase

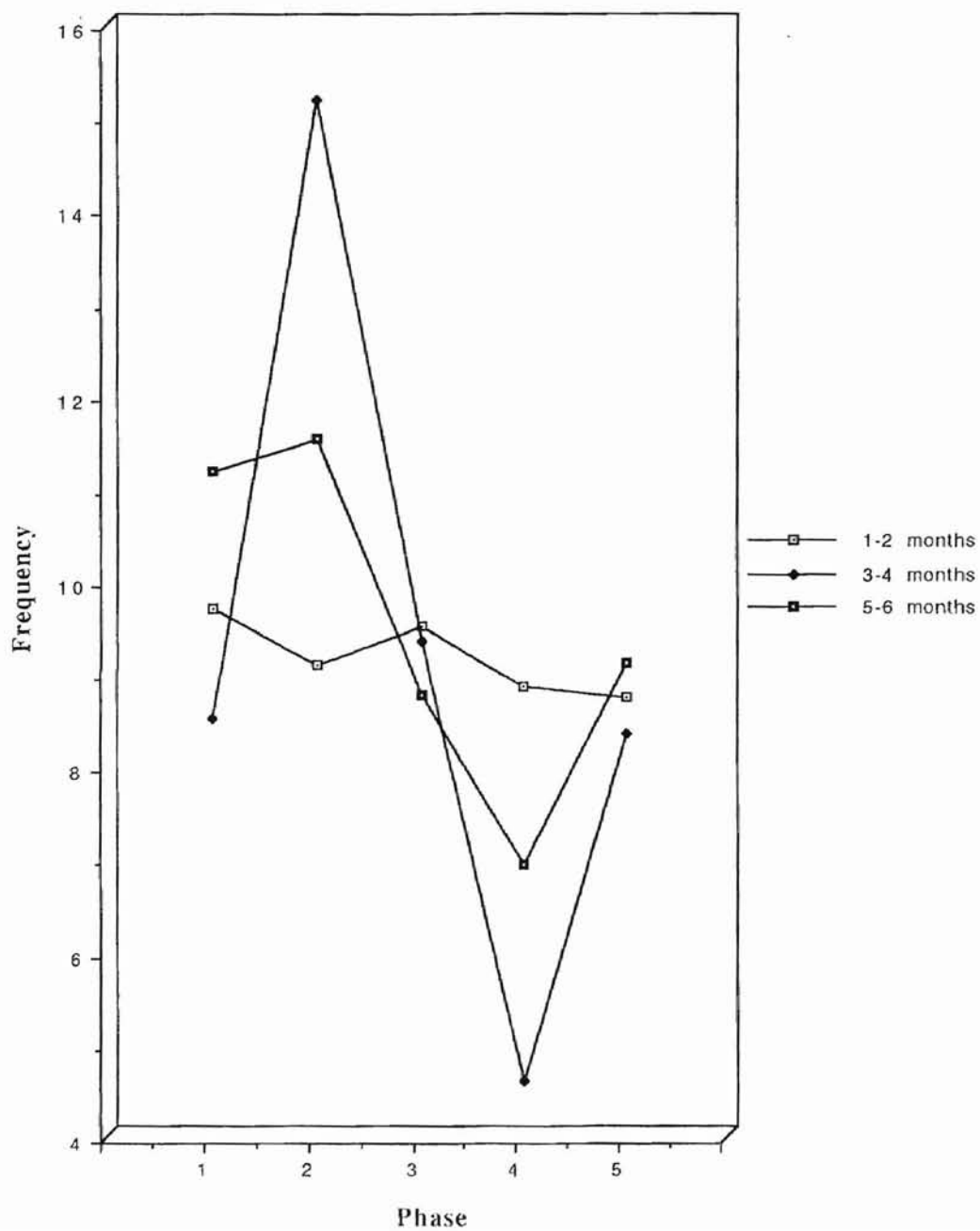


Figure 7
Duration of Infant Gaze by Gender, Age and Phase

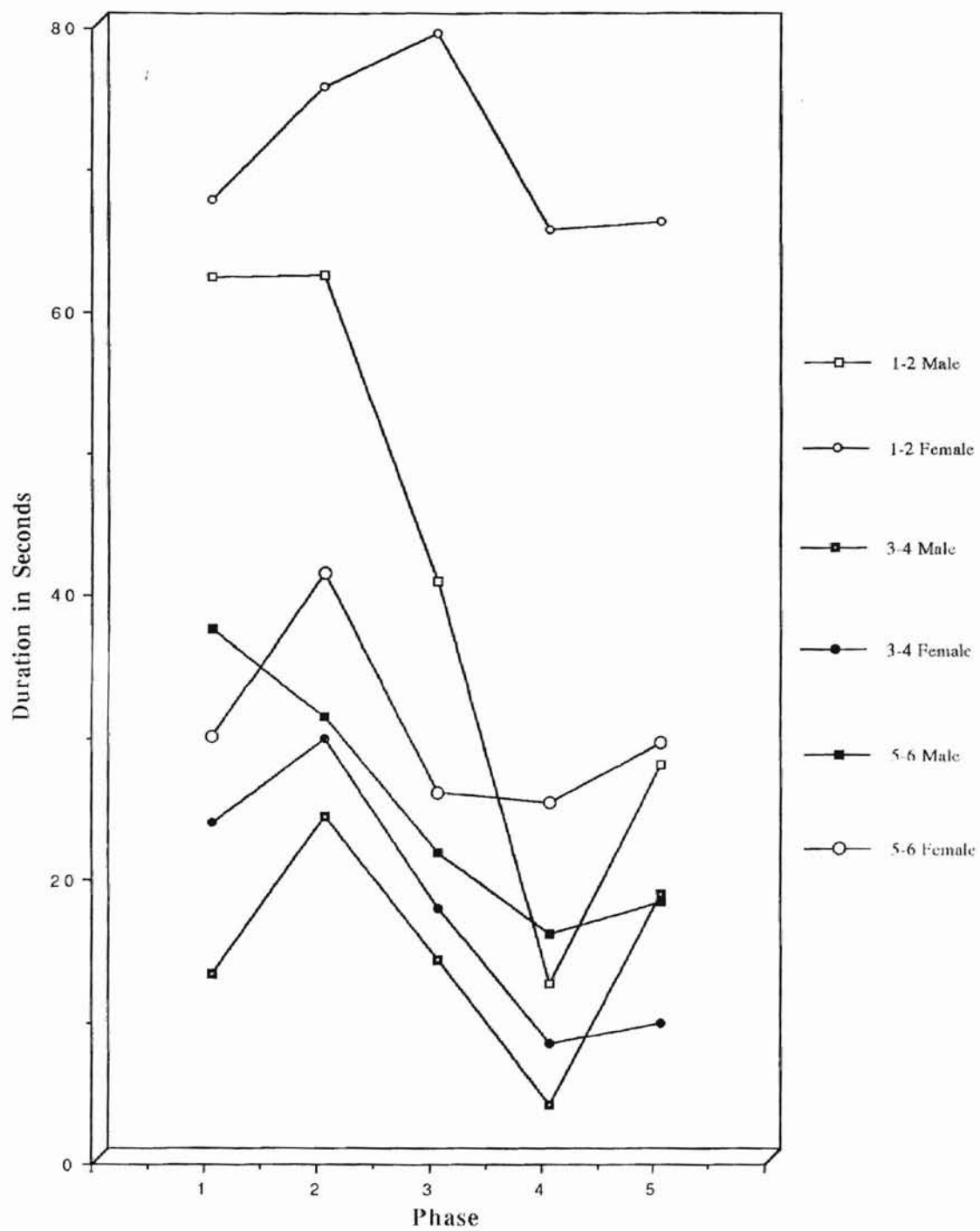
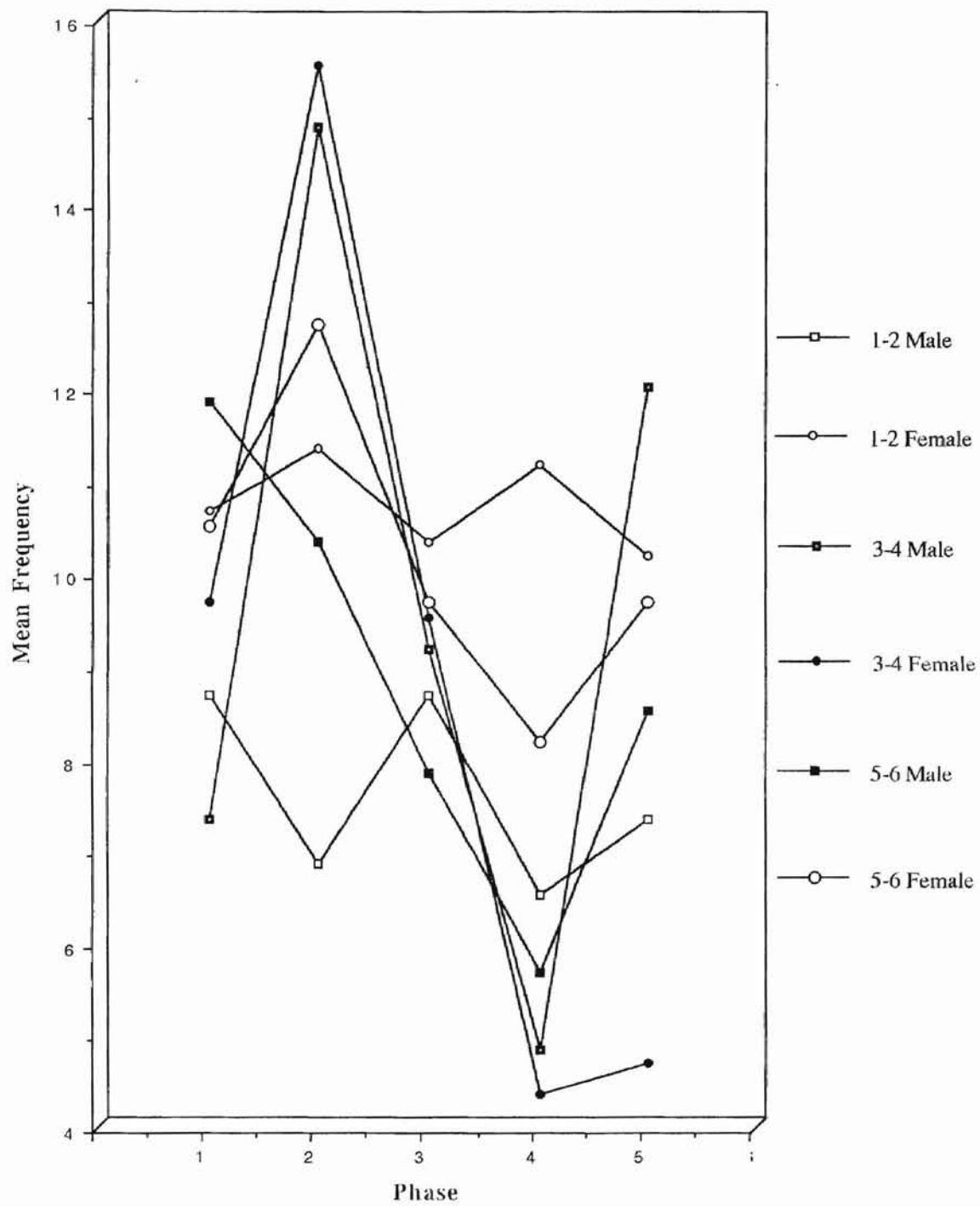


Figure 8

Frequency of Infant Gaze by Gender, Age and Phase



CHAPTER V

DISCUSSION

The current study examined the effects of infant gender, infant age and change in maternal pacing on infant gaze behaviors. The manipulated sequence of maternal pacing (normal pacing, slow pacing, return to normal pacing, fast pacing, return to normal pacing) along with infant gender and infant age were hypothesized to have an impact on the frequency and duration of infant gaze. For duration of infant gaze, significant main effects were found for gender, age and maternal pacing and maternal pacing was also significant for the frequency of infant gaze. There was significant interaction between gender and age for the duration of infant gaze and between age and phase for the frequency of infant gaze. Finally, the complex interaction between gender, age and maternal pacing was not significant for either the frequency or duration of infant visual behaviors.

One question of interest in the current research was whether infant gender influenced infant gaze behaviors. The results indicate that gender was found to significantly effect the duration of infant gaze with females gazing longer than males. There was also a significant interaction between infant gender and infant age on the duration of infant gaze. For all three ages, the females in each group gazed significantly longer than the males in their cohort. This research suggests that females are more attentive than males. These results support previous research which found the average length of gazes at their mothers was longer for infant girls than for infant boys (Fogel, Toda & Kawai, 1988; Roggman & Peery, 1989). However, a study done by Tronick and Cohn (1980) found that sons are more likely than daughters to match behavior states with their mothers. They also suggest that sons are more synchronized with their mothers than daughters at six and nine months, but daughters are more synchronized at three months.

The previous results on infant gender may differ based on the age of the participants and the goals that guided the studies. Fogel, Toda and Kawai (1988) and Roggman and

Peery (1989) studied infants who were 3 and 4 months old while Tronick and Cohn (1980) investigated 3, 6 and 9 month olds. Despite their opposing overall gender results, both studies reported more attentiveness for females at 3 months. Additional differences in the past research were evident in the goals of the studies. Tronick and Cohn (1980) investigated synchrony within the mother-infant dyad while Fogel, Toda and Kawai (1988) and Roggman and Peery (1989) looked specifically at individual gaze behaviors. Finally, the past results may differ from the current findings because the previous studies did not manipulate maternal pacing and because 1-2 month olds were not tested.

The current results also indicated that the interaction between infant gender and maternal pacing was not significant. Past research by Burlie (1992) found that female infants drop out of the session during the slow paced phase when they become fussy. However, Arco and McCluskey (1981) found no significant difference for gender by phase in their research, but they did report an overall failure to return to normal levels of responding following the slow play phase. In the current study, this phenomenon was true for only 3-4 month old female infants. Although the previous studies differed on their gender results, both made suggestions to further investigate the impact of the slow play phase on infant behaviors. The subject loss and decrease in infant gaze during the slow play phase mirrors the responses of infants to the low quality parenting behaviors of depressed moms (Sameroff, Seifer, Zax & Barocas, 1987; Goodman & Brumley, 1990). This suggests a very strong phase effect for the slow paced phase which only lasts from two to three minutes.

Another area of interest in the current research was whether infant age influenced infant gaze behaviors. The results indicated that infant age had a significant impact on the duration of infant gaze. Analysis across all three age groups revealed that 1-2 month olds gazed significantly longer than 3-4 or 5-6 month olds. These results differed from Stack and Muir's 1990 study which found that six month olds gazed significantly less than three month olds. Stack and Muir (1990) along with other researchers (Cohn & Tronick, 1987

and 1988; Tronick & Cohn, 1989) reported that at six months an infant's focal environment increases to include objects which decreases the amount of time the infant spends gazing at the mother.

The current results on infant age may differ from past research for various reasons. First, the results may differ because the previous studies were not manipulating maternal pacing and because 1-2 month olds were not tested. Second, the difference of 6 month olds being more attentive in the current research may have occurred since mothers are engaged in following pacing instructions they may work harder to involve their infant in the interaction and not follow the lead of the infant as they would in normal play situations. Third, Kaye and Fogel (1980) reported that although growing infants spend a declining proportion of time gazing at their mothers' faces, by six months those declining segments contain a more balanced and elaborate exchange between the partners during which the infant becomes less dependent on the mothers' initiations. This increased independence at six months compared to three months may explain why the 3-4 month olds were more influenced than the 5-6 month olds by the change in pacing and as a result gazed less.

The final question of interest in the current research was whether maternal pacing influenced infant gaze behaviors. The results indicate that maternal pacing had a significant impact on both the duration and frequency of infant gaze. Infants gazed more times during Phase 2, the fast paced phase and less times during Phase 4, the slow paced phase. In addition, infants gazed longer during the fast paced phase and shorter during the slow paced phase. These results supported Arco and McCluskey (1981) who reported that infant gaze was significantly affected by play phases. In their study with 3 and 5 month olds, they also found the longest durations during the fast paced phase and the shortest durations during the slow paced phase. Even though there are similar trends in the data, the sequences for the phases were different in each study. In the 1981 Arco and McCluskey study the slow paced phase was at the beginning of the sequence, but when the infants failed to return to normal levels following the slow paced phase they suggested that

it might be the result of a sequencing effect and recommended further methodological consideration of the phase order. Based on their recommendation, the current study placed the slow paced phase at the end of the sequence, but the same results were found. This suggests that the failure to return to normal levels following the slow paced phase was not just caused by sequencing, but was actually an effect of the manipulation regardless of when it was sequenced.

The present research pursued two unanswered questions in the literature by altering the sequence of the temporal phases and by including younger subjects. As mentioned earlier, the change in sequencing produced the same results as past research, less infant gaze during the slow play phase and more infant gaze during the fast paced phase. In addition to changing the order of these experimental phases, a final return to normal stage was also added in the current study. An interesting effect seemed to occur when the mothers were playing during this final phase. The pace of the play appeared faster and the mothers appeared more animated than they had been during the two previous normal phases. They had possibly "learned" during the fast paced phase that the infants responded positively to this increased rate of play. This idea of mothers "learning" as they go through the play phases was also reported by Field (1977) and merits further investigation.

The second area of new research involved including younger subjects to explore the parameters of communicative development and the effects of temporal patterning. As reported earlier, the 1-2 month olds gazed longer than both of the other age groups. Within this age group, females gazed longer than males which was also a trend in the other age groups. Finally, as participants, 1-2 month olds exhibited more fussy behavior, required more session restarts and dropped out more often than the other participants. Future research on this age group is encouraged to validate these results and to further explore the influence of temporal organization on infant communicative development.

In addition to attempting to fill gaps in the literature, the present study also raised

two interesting questions; one on gender effects in mothers and the other on the measurement of infant gaze by frequency and duration. The results of the current study indicate that females gaze longer than males regardless of age. Do females actually perform differently than males or are they parented differently? The question essentially asks if mothers treat their male infants differently than their female infants. Papousek and Bornstein's (1992) theory on intuitive parenting would suggest that mothers are unknowingly interacting differently with their infants. This question could be answered in future research by analyzing maternal activity such as vocalization, smiling, touch and eye contact during mother-infant interaction.

The second question examines the measurement of infant gaze by frequency and duration. The current research found more significance for duration of infant gaze than for frequency of infant gaze. Does this difference impact the current research? What are the implications for the measurement of mother-infant interaction? A review of the literature reveals that both frequency and duration are commonly used to compute infant gaze. However, the majority of the studies reviewed tend to report infant gaze, mutual gaze and/or visual regard as a measurement of duration. It is unclear if this is a preference of the researchers or if frequency was not reported because it was not significant. In addition, past research studies have not examined the relationship between these two measures. In the current study both frequency and duration were recorded for two minute segments. This limited time frame may have influenced the results. The usefulness of frequency as a measure may be enhanced by observing longer periods of interaction. Further investigation of these measures may lead to a better understanding of maternal and infant gaze behaviors.

The results of the current study fit best into Fogel and Thelen's (1987) Dynamic Systems Approach. In the DSA, expressive and communicative actions such as infant gaze are organized as part of a cooperative system with other elements of the infants physiology (age and gender) and social environment (changes in maternal pacing). The DSA presumes that the order of behaviors arises dynamically within the system and is sensitive to small

disturbances. Based on the results of the current study, manipulation of maternal pacing was shown to have a significant impact on the communicative system of the mother-infant dyad.

The results also appear to follow Papousek and Bornstein's (1992) theory of didactic caregiving. In their theory, they suggest that parents may provide much of the support for their infant's communicative development unknowingly in the form of intuitive, relatively universal behaviors. In this theory, the mother and infant function as part of a highly complex and dynamic self-regulating system where infants serve as receptors of maternal stimulation and at the same time they elicit behaviors from their mothers. However, literature on intuitive parenting theory is not exactly clear on how the infant's behavior directs intuitive parenting. The focus seems to be on the mother's role in guiding the interaction intuitively regardless of infant variables. However, the current data would suggest that infant visual behaviors in response to maternal changes in pacing do alter the mother's behavior in subsequent phases.

In conclusion, numerous studies (Papousek and Bornstein, 1992) have documented the importance of social interaction in providing a venue for parental teaching of infant communicative skills. Less attention has been given to the attributes that the infant brings to the didactic situation. Following Fogel and Thelen's (1987) Dynamic Systems Approach, the current study suggests that infant gender and infant age may shape the infant's responses to parental behaviors. Since infants may also differ in the amount of visual behavior they bring to the social situation, these infant characteristics may play an important role in didactic interactions. Additional studies may clarify how these characteristics alter the interactional patterns as well as how the increasing age of the infant may reconstruct these patterns.

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APPENDICES

APPENDIX A
EXTENDED SUMMARY OF THEORY

Theoretical Summary

The current research on infant gaze behaviors stems from the area of social development, specifically socialization theory and research and social learning theory. Socialization can be defined as a teaching process by which people influence other people, usually through interaction with them. Socialization is considered to be a lifelong process in which the family serves a primary role. Within this process, parents act as social models for their children to observe and imitate (Bandura, 1977). For example, Hartup (1979) found that the family system, particularly the mother-infant dyad, provides an affective base from which the infant can explore the social world without excessive anxiety or stress.

This phenomena is described through Bandura's (1977) social learning theory. He believed that behavior must be learned. In his view, infants are not born with a set repertoire of behavior; they learn through direct experience or observation (Bandura, 1977). He found that most human behavior is learned observationally through modeling. For infants, what they observe depends on what they attend to and what models are available (Bandura, 1977). According to Bandura (1977), most learning occurs merely through the proximity of the model and the observer in time and space. This idea of learning through proximity, is illustrated in the numerous studies dealing with mother-infant face-to-face interaction. Through these early social interactions, learning as well as communication occur. Keller and Eibl-Eibesfeldt (1989) believe that the differing communication patterns of the mother and the infant lead to infant learning about themselves, their partner and the relationship between them. The present literature and research study will examine the role of infant gaze behaviors in early social interaction within the mother-infant dyad.

APPENDIX B
OUTLINE OF ORAL SOLICITATION

Outline for Telephone Solicitation

I. Introduction

- A. Hello, my name is Becky Czekaj and I am a graduate student in Child Development at Oklahoma State University. I am currently doing research on the interactions between mothers and their infants. I am calling to ask if you would be willing to participate in a research study with your infant. My study involves videotaping mother and infant pairs during ten minutes of play. I am interested in observing different ways that mothers play with their infants.

II. Questions

A. Participation

- 1. Would you be willing to participate in the study?
 - a. No, I will thank them for their time.
 - b. Yes, I will thank them for their interest and inform them that they can decide not to participate at any time (Continue with #2).
- 2. Do you have any questions at this point about the study?
 - a. No, (Continue with section B).
 - b. Yes, answer questions.

B. Appointment

- 1. I will be doing the videotaping at Oklahoma State University in a child development testing room in the Human Environmental Science Building. I would like to set up an appointment with you to come in with your infant. The entire process should take about 30 minutes. When would be a good time for you?

C. Information

- 1. I would like to ask you a few questions before we meet:
 - a. What is your babies name?
 - b. When was she/he born?

III. Closing

A. Parking

- 1. Possible locations
- 2. Temporary parking permits

B. Reminders

- 1. Time, day, and place of the appointment.

- C. Thank them for their time and I look forward to meeting them and "their infants name".

APPENDIX C
INFORMED CONSENT FORM

Informed Consent Form

I, _____ (print name) hereby authorize and direct Dr. Patricia A. Self, or associates or assistants of her choosing, to include me and my child, _____, in their research project.

I understand that the research study will involve videotaping interactions between me and my child. I understand that this procedure is part of a study entitled, "Infant gaze during mother-infant face-to-face interaction". The purpose of this study is to investigate early social interaction. I also understand that this procedure will last approximately ten minutes.

I understand that all my responses and the videotaped interaction will be held in confidence. More specifically, I understand that this informed consent form will be kept separate from the videotape and that the videotape is coded with an identification number and will not have my name on it anywhere. I understand that the findings of this study will be reported for the group and not for the individual.

I understand that participation is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my consent and my participation in this project at any time without penalty. If I do not want to continue my participation, I understand that I need to notify the project director or her assistants.

I may contact the project director, Dr. Patricia A. Self for further information about this research at 405-744-8348. I may also contact University Research Services, 001 Life Sciences East, Oklahoma State University, Stillwater, OK, 74078; Telephone: 405-744-5700.

I have read and fully understand the consent form. I sign freely and voluntarily. I understand that I will be given a copy of this consent form.

Date: _____ Time: _____ (a.m./p.m.)

Signed: _____
Signature of Subject

Since it is sometimes useful to view the videotapes for future research and educational purposes, we would like your permission to use the videotape. As stated above, we will make every effort to keep your identity confidential.

In addition to consenting to participate in the research project outlined above, I consent to the use of the videotape for future research and educational purposes by the project director, and her assistants or associates. I understand that not consenting to this condition will not have an impact on my participation in this study.

Signed: _____
Signature of Subject

I certify that I have personally explained all elements of this form to the subjects before requesting the subject to sign it.

Signed: _____
Project Director or his/her authorized representative

APPENDIX D
OUTLINE OF ORAL INSTRUCTIONS

Oral Instructions and Debriefing for Parents and Children

- A. Introduction:
1. Hello, my name is Becky Czekaj.
 2. Thank you for coming in to meet with me.
 3. Before we begin the actual data collection, I would like you to read and sign the Informed Consent Form . If you have any questions, please feel free to ask me. (I will sign the consent form once all questions have been answered and I will give the parents a copy of the form for their files).
 4. Today I will be videotaping you playing with your infant for ten minutes.
 5. Do you have any questions before we begin?
- B. Instructions:
1. Before we begin the study I would like to go over a few instructions:
 - a. First, you may stop participating at any time if you or your infant needs a break.
 - b. Second, please leave the infant seated unless she/he becomes upset and you wish to take a break.
 - c. Third, please do not use any toys or pacifiers during the videotaping.
 - d. Do you have any questions about the instructions?
 2. Now I will explain the videotaping to you.
 - a. First, I will be videotaping you from behind this two way mirror.
 - b. Second, In order to observe you playing with your infant in different ways, I will come into the room every two minutes and give you instructions on how to play with your infant.
 - c. Do you have any questions on the videotaping?
 3. For the first two minutes, I would like you to play with your infant as you normally do.
 - a. After the two minutes are up, I will enter the room and explain the next phase.
 4. Now I would like you to speed up your play with your infant.
 - a. After the two minutes are up, I will enter the room and explain the next phase.
 5. Now I would like you to play with your infant as you normally do.
 - a. After the two minutes are up, I will enter the room and explain the next phase.
 6. Now I would like you to slow down your play with your infant.
 - a. After the two minutes are up, I will enter the room and explain the final phase.
 7. For the last two minutes, I would like you to play with your infant as you normally do.
 - a. After the two minutes are up, I will enter the room and debrief the mother.
- C. Debriefing:
1. Thank you for your time and cooperation.
 2. If you would like a summary report of my findings in the summer 1995 when I complete the study, please sign your name on the list and one will be mailed to you.
 3. I also want to remind you that the videotaped interaction of you and your child will be kept confidential.
 4. If you have any other questions, please feel free to contact me or Dr. Self.
 5. Do you have any questions before you go?

APPENDIX E
FREQUENCY AND DURATION DATA COLLECTED
FOR EACH SUBJECT

FREQUENCY AND DURATION DATA COLLECTED
FOR EACH SUBJECT

ID	Age	Gender	FREQUENCY					DURATION				
			Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
100	1-2 mos	male	13	10	10	11	12	55.6	67.9	73.7	35.2	41.3
101	1-2 mos	male	4	3	12	7	9	2.1	2.3	35.1	6.6	16.9
102	1-2 mos	male	10	6	4	0	3	111.6	116.3	4.3	0.0	3.2
103	1-2 mos	male	10	3	2	8	9	90.2	5.0	1.4	9.1	87.1
104	1-2 mos	male	6	4	14	10	1	89.8	115.3	98.7	16.3	0.3
105	1-2 mos	male	9	15	10	3	10	22.2	66.0	29.5	5.5	16.5
201	1-2 mos	female	13	8	9	16	16	56.4	68.8	92.0	84.0	78.7
202	1-2 mos	female	13	17	10	6	9	54.2	68.0	61.7	25.0	37.8
205	1-2 mos	female	10	15	9	5	3	72.4	68.9	76.5	25.7	7.8
206	1-2 mos	female	5	12	13	11	9	20.3	110.6	107.4	107.2	109.7
207	1-2 mos	female	17	7	12	18	13	86.1	43.6	37.2	70.2	110.7
208	1-2 mos	female	6	9	9	11	11	115.3	92.2	100.5	80.0	50.6
301	3-4 mos	male	8	15	6	2	16	12.4	18.1	4.9	1.3	27.5
302	3-4 mos	male	9	14	8	13	16	15.2	20.0	10.2	1.8	21.1
303	3-4 mos	male	10	18	10	4	12	17.8	32.0	16.4	3.7	18.5
304	3-4 mos	male	6	18	13	5	10	10.2	29.7	20.6	7.8	14.9
305	3-4 mos	male	4	8	9	2	6	8.6	19.6	16.7	3.6	10.9
306	3-4 mos	male	7	16	9	3	12	12.7	24.1	14.4	3.6	18.0
401	3-4 mos	female	10	19	13	3	3	27.4	35.1	18.7	5.8	5.9
402	3-4 mos	female	14	19	13	5	7	22.8	29.1	24.4	9.7	8.2
403	3-4 mos	female	8	16	7	2	1	22.6	28.7	21.1	1.9	1.2
404	3-4 mos	female	6	8	4	1	1	19.6	18.1	8.7	1.8	1.9
405	3-4 mos	female	9	15	12	3	3	22.5	30.7	17.0	3.7	4.1
406	3-4 mos	female	11	16	8	12	13	26.6	35.2	15.0	25.2	34.8
501	5-6 mos	male	13	3	7	0	6	18.1	2.8	37.8	0.0	13.4
502	5-6 mos	male	12	5	12	12	5	23.7	5.2	19.0	24.7	5.4
503	5-6 mos	male	13	14	4	4	9	50.5	55.7	2.1	5.5	18.0
505	5-6 mos	male	12	12	6	3	5	36.4	60.0	6.8	5.0	5.6
507	5-6 mos	male	8	13	10	14	9	14.9	28.0	32.3	57.6	30.7
508	5-6 mos	male	13	15	8	1	17	79.1	34.5	30.5	1.0	34.9
600	5-6 mos	female	9	17	10	2	4	24.4	30.7	16.4	3.0	4.0
601	5-6 mos	female	6	10	18	6	10	38.6	22.7	52.1	12.5	16.3
602	5-6 mos	female	15	16	11	15	16	50.1	92.5	21.0	77.1	86.6
603	5-6 mos	female	11	13	3	3	6	23.0	28.1	30.2	3.3	7.8
604	5-6 mos	female	6	3	1	12	13	5.4	5.7	0.8	30.0	44.9
605	5-6 mos	female	16	17	15	11	9	35.8	66.5	59.9	24.0	15.0

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
FOR HUMAN SUBJECTS RESEARCH

Date: 12-01-93

IRB#: HES-94-013

Proposal Title: INFANT GAZE DURING MOTHER-INFANT FACE-TO-FACE
INTERACTION

Principal Investigator(s): Patricia A. Self, Rebecca L. Czekaj

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

APPROVAL STATUS SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT
MEETING.

APPROVAL STATUS PERIOD VALID FOR ONE CALENDAR YEAR AFTER WHICH A CONTINUATION
OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL. ANY
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Comments, Modifications/Conditions for Approval or Reasons for
Deferral or Disapproval are as follows:

Signature:


Chair of Institutional Review Board

Date: December 10, 1993

VITA

Rebecca L. Czekaj

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Master of Science

Thesis: INFANT GAZE DURING MOTHER-INFANT FACE-TO-FACE
 INTERACTION

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