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FACTORS INFLUENCING THE REGULATION OF GAZING, SMILING, AND VOCALIZING BETWEEN PARENTS AND THEIR 3-MONTH-OLD INFANTS

By

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ABSTRACT

FACTORS INFLUENCING THE REGULATION OF GAZING SMILING, AND VOCALIZING BETWEEN PARENTS AND THEIR 3 MONTH-OLD INFANTS

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Visual behavior plays an important role in social interaction at all ages. It is a particularly informative behavior in early parent-infant interactions, since it is one of the few social behaviors which matures relatively quickly and is thus available to both parents and infants. Recent research has revealed a number of factors which may influence the amount and patterning of parent-infant social gaze. The purpose of the present study was to investigate some of these factors in a standardized laboratory play interaction.

Two groups of 12 3-month-old infants (half boys, half girls) were studied. Group 1 consisted of first-born infants tested with both parents. Group 2 consisted of pacifier-using infants tested with their mothers. Two 2-minute segments of face-to-face interaction followed by a 1-minute interval during which the parent silently and motionlessly gazed at the infant were recorded for each infant. Infants in Group 1 were observed once with their mothers and once with their fathers. Infants in Group 2 were tested once while sucking on their pacifiers and once without them. Behaviors recorded during the interactions were parent gaze, parent smile, parent vocalize, infant gaze, infant smile,

and infant vocalize. Following the interactions, parents completed a series of questionnaires and the infants' responses to several visual and auditory stimuli (Infant Test) were recorded.

Multivariate analyses of variance revealed that the mothers and fathers in Group 1 did not differ in their interactive behaviors. Neither were the parent behaviors measured influenced by infant sex or the order in which the parents interacted with their infants.

There was a sex difference in the amount of mutual gaze between parents and infants in Group 1. With male infants, more mutual gaze occurred during the first interaction than during the second, whereas with female infants, more mutual gaze occurred during the second interaction than during the first.

The interactive behaviors of the infants in Group 2 were influenced by the pacifier condition and by the parent behavior cessation condition. Infants smiled more and engaged in more frequent mutual gaze when they did not have their pacifiers than when they did. They gazed more and smiled longer when their mothers were interacting with them than when they weren't.

Groups 1 and 2 were combined for further analyses. A sec-by-sec analysis of interactive behaviors revealed that mothers and infants both tended to smile more during infant gaze than their base rates of smiling would have predicted.

Mothers' ratings of their infants' physical cuteness were higher than, but correlated with, the average cuteness ratings made by four college student observers. Cuter infants were rated by their mothers as being cute in behavior and dissimilar to their fathers in appearance.

Cuteness ratings were not related to any of the mothers' interactive behaviors.

Infants rated difficult in temperament vocalized more and smiled less during the Infant Test. Infants who smiled frequently during the face-to-face interaction also smiled frequently during the Infant Test. Although infant gaze during the interaction was not related to looking at visual stimuli during the Infant Test, the percent of mutual gaze during the interaction was positively correlated with the total time the infant spent looking at a photograph during the Infant Test.

Mothers who had positive attitudes toward caring for their infants looked longer at their infants during the interaction. More total mutual gaze was associated with positive maternal attitudes for mothers of male infants but not for mothers of female infants. More frequent mutual gaze was associated with negative maternal attitudes for both sexes.

Results are discussed in terms of cognitive and arousal effects on the regulation of behaviors during parent-infant face-to-face interaction.

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CHAPTER 1

INTRODUCTION

The important role that visual behavior plays in social interaction (Argyle & Cook, 1976) becomes particularly evident when one member of an interacting dyad either lacks vision or does not use visual signals appropriately (Adamson, Als, Tronick, & Brazelton, 1977; Fraiberg, 1974; Hutt & Ounsted, 1966; Thoman, 1975). Although many of the social behaviors of the adult are not present (or are present only in immature form) in the infant, visual behaviors are unique in that they tend to mature relatively early and thus are shared by parents and infants from an early point in their relationship (Robson, 1967). Within a few days after birth, most infants can fixate and follow a slowly moving object with their eyes, and, unlike many other newborn reflexive behaviors, visual fixation and pursuit do not drop out or become replaced by other behaviors (Greenman, 1963). Instead, they improve steadily with age, and by three months, most visual abilities reach adult levels (e.g., Haynes, White, & Held, 1965). Thus, the infant can use vision to contact, explore, and follow objects (including people) at a distance long before being capable of locomotion (Walters & Parke, 1965). Vision is also one of the first behaviors to come under voluntary control (Stern, 1974b). Not only can the infant choose where he looks, but he also can choose whether or not he looks, thereby using vision as an intentional on-off system (Robson, 1967). Although the degree of intentionality of infant visual behavior may vary widely

across situations, the fact that vision can be mediated by cognitive factors makes it a particularly informative infant behavior for both researchers (Cohen & Salapatek, 1975) and parents (Fraiberg, 1974; Robson, 1967; Wolff, 1963). Researchers have used selective infant visual behavior to study such processes as discrimination, preference, schema formation, and memory. Parents often infer meaning from their infants' visual behavior, such as attentiveness, arousal level, orientation to objects, discrimination, recognition, preference, and evaluation (Fraiberg, 1974; Robson, 1967). Particularly in early infancy, parents may attribute meaning and intention beyond the infant's capacity to behaviors which occur during social interaction (Anderson, 1977). Because of these inferences and because of the conversational patterning of many adult and infant behaviors (e.g., Jaffe, Stern, & Peery, 1973), social interactions take on the quality of being communicative (Bateson, 1975) and meaningful for the adult.

Although early social interaction generally has been considered an important precursor of parent-infant social attachment, until recently little stress was placed on the visual component of these interactions. Bowlby's theory of attachment (1969) considers crying, smiling, following, clinging, and sucking to be the infant behaviors which express attachment to an adult. Robson (1967) added eye-to-eye contact to the list of attachment behaviors because of its role in establishing and maintaining contact between a mother and infant even in the early months of life. Robson also pointed out that eye-to-eye contact contributes to the mother's attachment to the infant as well as the infant's attachment to the mother, as do Bowlby's five biobehavioral components of attachment. Being looked at by her baby is rewarding for

most mothers, and often serves to facilitate other interactive behaviors (Wolff, 1963).

Since Robson's (1967) paper, a number of studies have appeared which describe early social visual interaction. Moreover, looking behaviors have been included as variables in most studies of general caregiver-infant interaction. Many of these studies are reviewed below. On the basis of both direct and indirect evidence, a number of factors are believed to influence different aspects of social gaze between parents and young infants. The purpose of this dissertation was to summarize what is currently known about these factors, and to conduct a study to improve our understanding of the factors that regulate social gaze in face-to-face interactions between parents (both mothers and fathers) and young infants.

For the purposes of the following literature review, factors which influence parent-infant gaze interactions have been divided into infant characteristics, parent characteristics, and dyad characteristics. None of these factors can be assumed to have simple or unidirectional effects on behavior. Even if a factor has its most direct influence on one member of the interacting dyad, it will almost inevitably influence the other member as well. This secondary influence can be mediated cognitively or can be the direct influence of the affected behavior on the other member of the dyad.

Infant characteristics include sex, age, parity, birth condition, temperament, predisposition to gaze aversion, physical attractiveness, perceptual/cognitive capacities, and periodic changes in arousal level. Parent characteristics include sex, attitudes toward the infant and toward parenthood, and responsiveness to infant behaviors. Dyad charac-

teristics include the interaction between parent sex and infant sex, quantity and quality of previous contact between parent and infant, the context of the interaction, and the communicative nature of early adult-infant interaction.

According to Stern (1974a), the goal of mother-infant play is to assure the "mutual maintenance of a level of attention and arousal within some optimal range." He argues that infant gaze alternation serves to control the infant's level of attention and arousal. If Stern is correct, gaze aversions should be more frequent when the infant becomes excited or overloaded with information, and less frequent when the infant is at a very low level of arousal or is provided with very little visual information. This hypothesized regulator of infant gaze patterns was indirectly tested in the present study. Rather than try to directly measure the infant's level of arousal, arousal level was manipulated by placing a pacifier in the infant's mouth. The literature reviewed below indicates that the availability of a pacifier (here defined as the presence of a pacifier in the infant's mouth, whether or not nonnutritive sucking is actually occurring) serves to maintain the infant at a moderate level of arousal. Thus, less gaze aversion was expected during pacifier availability than during interactions when the infant was not supplied with a pacifier.

In addition to gaze, smiling and vocalizing by both infant and parent were recorded on a second-by-second basis. These behaviors may elicit or maintain gaze. They also may have arousing properties. Thus, the temporal relationships among these behaviors are important to consider in any attempt to explain gaze patterns. Nevertheless, since the emphasis of the study was on gaze, other behaviors were not recorded

in so much detail as has been done in some previous studies of face-to-face interaction.

In summary, the present study tested the effects of infant sex, parent sex, and pacifier use on parent-infant gaze interaction. Further analyses were conducted to describe the second-by-second regulation of parent-infant gaze. The literature review below summarizes what is currently known about factors influencing gaze interactions. Hypotheses related to this study are presented in the context of the appropriate literature and are summarized at the end of the review. The literature review is organized in three major sections: infant characteristics, parent characteristics, and dyad characteristics.

CHAPTER 2

FACTORS WHICH INFLUENCE GAZE INTERACTIONS: LITERATURE REVIEW AND HYPOTHESES

Infant Characteristics

SEX

Studies of infant visual behavior in response to different types of photographs have variously reported no sex differences or sex differences favoring either girls or boys (cf. Maccoby & Jacklin, 1974). Maturational differences between the sexes are often cited as explanations for sex differences when they do occur, although it is unclear at this point which visual behaviors are more "mature." Therefore, general statements about sex differences in infant visual behavior are unwarranted given the present state of the literature.

Studies of parent-infant face-to-face interaction by Brazelton and colleagues (Als, 1977; Brazelton, Koslowski, & Main, 1974; Brazelton, Tronick, Adamson, Als, & Wise, 1975; Tronick, Als, & Brazelton, 1977; Yogman, 1977) and Stern and colleagues (Jaffe et al, 1973; Peery & Stern, 1975, 1976; Stern, 1974b) do not consider or report information on the effects of infant sex. Some of these studies used very small samples, making sex comparisons unfeasible. Three other studies which used similar procedures and larger sample sizes included infant sex as a factor in their analyses, but found no significant main effects on infant, parent, or dyadic behaviors (Blehar, Lieberman, & Ainsworth,

1977; Field, 1977; Friedman, Thompson, Crawley, Criticos, Drake, Iacobbo, Rogers, & Richardson, 1976).

In contrast to studies of gaze behavior in face-to-face interactions, effects related to infant sex have been reported in a study of gaze behavior in the home which included, but was not restricted to, face-to-face interactions (Moss & Robson, 1968). These differences were in the correlates of mutual gaze between mothers and their 3-month-old infants rather than in the gaze behaviors themselves. No sex differences were reported by Moss (1967) in the amount of time infants spent looking at their mothers or in the amount of time their mothers spent looking at them, and Moss and Robson (1968) found no sex differences in the amount of mutual visual regard between mothers and infants. However, the amount of mutual visual regard was significantly correlated with ratings of the mothers' attitudes toward infants assessed during a pregnancy interview for mothers of girls but not for mothers of boys. More mutual visual regard between mothers and daughters (maternal looking and infant looking were not recorded separately in this study) was related to higher ratings for the mother on the "Degree to Which the Baby is Seen in a Positive Sense" and "Interest in Affectionate Contact with Infants." More mutual visual regard between mothers and sons was related only to the mother's concurrent concern over the baby's well-being. Moss and Robson (1968) suggest that factors such as the mother's uncertainty about how to interact with a boy and the greater irritability of male infants (Moss, 1967) may attenuate the relationship between attitudes during pregnancy and later behavior for mothers of boys.

In sum, the literature suggests that there are no direct effects of

the infant's sex on gaze interactions between mothers and infants. However, the infant's sex, or behaviors associated with the infant's sex, may interact with parental attitudes to influence the determinants of gaze behaviors. Thus, the factors influencing individual differences in gaze behavior may differ for the sexes, even though there are no group sex differences in such measures as absolute amount of looking.

In light of these findings and speculations, no overall sex differences in infant gaze behaviors were expected. However, it was hypothesized that there would be more mutual gaze between mothers and daughters when the mothers had positive attitudes toward their infants, whereas no such relationship was expected to hold for mothers and sons. The possibility remained that infant sex would influence father-infant gaze differently from mother-infant gaze. The interaction between parent and infant sex is discussed below.

AGE

Newborn infants spend very little time in eye-to-eye contact with their mothers (Als, 1977). Although the newborn may appear to be engaging in eye-to-eye contact at times, when the mother moves her head the infant often continues staring off in the original direction (Brazelton et al., 1974). Wolff (1963) observed a change in the quality of face gazing around 3 1/2 weeks which he interpreted as the beginning of true eye-to-eye contact. Several of the mothers in his study also noticed this transition in their infant's behavior and began taking more interest in playing with them. Infant looking at mothers has been found to continue to increase from 3 weeks to 3 months whereas mother looking at infants remains the same (Moss, 1967). Thus, mutual visual regard

also increases across this age span (Moss & Robson, 1968). At older ages (4-8 months), the amount of mutual visual regard with the mother declines (Friedman et al., 1976). Stern (1974a) suggests that older infants, when given a choice, shift interest from their mother to objects that can be manipulated.

Interest in visual interaction seems to be highest around 3 to 4 months, when infants' visual skills are relatively mature but locomotion and detailed manipulation of objects are not yet possible. Observations of visual interactions between parents and infants at this age are likely to be informative, but their developmental significance may be limited if, as Stern (1974a) suggests, the function of gaze at the mother changes with the age of the infant. Eventually, longitudinal studies extending beyond 3 or 4 months of age will be needed.

Since all the infants in the study to be reported here were as close as possible to the same age (3 months), no age differences in infant interactive behaviors were expected.

BIRTH CONDITION AND TEMPERAMENT

Most studies of parent-infant gaze have not considered the birth condition of the infant other than attempting to select infants who had experienced relatively "normal" births. A few studies, however, indicate that gaze interactions differ according to the infant's birth condition. For example, Osofsky (1976) found a positive correlation between 5 minute Apgar scores and the amount of time newborns looked at their mothers during feeding. A similar finding occurs with older infants, with asphyxiated infants at both 3 and 8 months looking less than control infants (Campbell, 1977). Infants labeled at risk due to

prematurity or postmaturity also have been found to gaze at their mothers less than normal gestation infants at 3 months of age (Field, 1977).

Interpretation of these findings requires consideration of maternal behavior and perceptions as well as temperamental differences among infants of varying birth conditions. For example, Osofsky (1976) found that the more alert newborns in her sample received more visual stimulation from their mothers. It may be that these infants looked more at their mothers because their mothers elicited more looking from them. In the Field (1977) and Campbell (1977) studies, the mother's behavior also differed according to the infant's birth condition. Campbell (1977) found that mothers of asphyxiated infants played with their infants less than mothers of control infants. In contrast, Field (1977) found that mothers of premature and postmature infants were more active in face-to-face interactions with their babies. These differences in findings may be due to the different contexts in which interactions were observed in these two studies. Perhaps risk infants are played with less in the natural home environment because of their lower responsiveness (e.g., Campbell, 1977). However, in a structured laboratory situation where mothers are told to interact with their infants (e.g., Field, 1977), mothers of risk infants may feel they need to try harder to get their infants' attention because of their infants' general lower level of responsiveness. However, when mothers increase their activity levels in an attempt to elicit and maintain infant attention, infant gaze decreases (Field, 1977). Thus, higher maternal activity level may be caused by perception of their risk infant as unresponsive. In turn, higher activity levels may then produce less infant looking, thereby

confirming the mother's initial perception that her infant is unresponsive. The generally lower social responsiveness of newborns at risk suggests that infant characteristics are initially responsible for this cycle of low gaze interaction. The mother's perceptions and behaviors may then maintain the cycle.

The infant's temperament is another factor often confounded with birth condition. In Field's study, more of the risk than control infants were rated as "difficult" by their mothers using the Carey Infant Temperament Survey (1972). Thus the "difficult" temperaments of the risk infants could have been the critical influence on their gaze interactions, rather than, or in combination with, their risk status. Campbell's study (1977) included a comparison of non-risk difficult infants with control infants and found a tendency for the mothers of difficult infants to look less at their infants than mothers of controls. She also found no difference in temperament ratings of the asphyxiated and control infants. These results indicate that both birth condition and temperament (at least Carey's "difficulty" dimension) can affect gaze interactions. The separate influences of these two factors cannot be discerned in the Field (1977) study.

The present study was limited to infants of "normal" birth condition. However, infant temperament (and parents' perceptions of infant temperament) was expected to vary within this population and potentially to affect parent-infant gaze interaction. Thus, some questions related to infant temperament (taken from Carey's Survey) were asked of the parents. Based on the literature reviewed, it was predicted that there would be less mutual gaze when the parent perceived the infant as temperamentally difficult. Infants perceived as difficult

should also show more negative responses during gaze interactions, such as fussing and gaze aversion.

PREDISPOSITION TOWARD GAZE AVERSION

Some infants seem to show a predisposition for gaze aversion (Robson, 1967; Thoman, 1975), and extreme gaze aversion is frequently considered to be a sign of early infantile autism (Hutt & Ounsted, 1966). However, adequate social relationships between parents and infants can be established with very little or no social gaze (Adamson et al., 1977; Fraiberg, 1974; Thoman, 1975), so gaze aversion cannot necessarily be considered a cause or indicator of psychopathology.

Parental response to low levels of social gaze in their infant is an important determinant of the extent of influence of such infant behavior on social attachment. For example, although it is often difficult and awkward for adults to interact with blind infants, teaching parents to use other sensory modalities can result in a relatively normal social relationship (Fraiberg, 1974). On the other hand, Stern (1971) describes a disruptive social interaction between a mother and one of her three-month-old fraternal twin sons, who averted gaze frequently, and a smoothly running interaction between the same mother and her other twin, who tended to gaze for longer periods. Although Stern (1971) suggests a number of influences on these two interactions, the mother's different behavior may have been partly the result of differences in the twins' predispositions toward gaze aversion.

A measure of infants' general degree of interest in social gaze was obtained in the present study through parental report. Although many

factors influence infant gaze, it was hypothesized that those infants whose parents have noticed their lack of interest enough to report it would show low levels of looking during the structured observations.

PHYSICAL ATTRACTIVENESS

Much is known about the effects of physical attractiveness on adult-adult, adult-child, and child-child social interactions (Berscheid & Walster, 1974). In general, physically attractive individuals receive more positive evaluations and are treated more positively than less physically attractive individuals.

Although there has been little research on the topic, there is increasing evidence that physical attractiveness can affect adults' attitudes and behaviors toward infants. For example, Corter, Trehub, Boukydis, Ford, Celhoffer, & Minde (1976) asked nurses to rank order photographs of premature infants on the basis of physical attractiveness and intellectual prognosis and found the orderings to be highly correlated. In addition, Hildebrandt and Fitzgerald (1978) found that college students spent more time looking at photographs of infants whom they ranked higher in cuteness. The same effect held for mothers looking at infant photographs (Hildebrandt & Fitzgerald, Note 1). As might be expected, however, the mothers' perceptions of the cuteness of their own infants' photographs were higher than the cuteness ratings given the photographs by college students. Even though most of the mothers in this study gave their infant's photograph the highest possible cuteness score, others did not. Although all the mothers looked longest at their own infant when photographs were presented in pairs, the difference in looking at own and other tended to be larger

for mothers who gave their infants the highest cuteness score.

The present study tested the hypothesis that parents who perceive their infants as cuter will look longer at their infants during social interaction than parents who perceive their infants as less cute. Several different questions about infant cuteness were asked in an attempt to elicit a range of cuteness ratings. Parents were asked to rate their infants' physical and behavioral cuteness, to predict how college students would rate their infants' cuteness, and to compare their infants' cuteness with that of a preselected group of infant photographs.

AROUSAL AND INFORMATION PROCESSING

The infant characteristics discussed so far are expected to be related primarily to the amount of social gaze occuring during face-to-face interactions. Other factors must be taken into account to explain the patterning of social gaze.

A common observation in mother-infant interaction studies is that mothers look at their infant most of the time during a face-to-face interaction, whereas infants look substantially less. Thus, mutual gaze patterns are determined in large part by the infant's gaze alternation. For example, Stern (1974b) found that infants initiate and terminate 94% of the mutual gazes during play. This does not mean, however, that the mother's looking behavior is irrelevant to the infant's looking behavior. Stern (1974b) also noted that the infant was more likely to initiate a gaze and less likely to terminate a gaze when the mother was looking than when she was not. In addition, the actual initiation and termination of face-to-face interaction in the home is generally deter-

mined by the mother (Blehar et al., 1977), although most infant initiations are responded to.

Parent-infant face-to-face interactions are cyclical in character, with infant cycles of attention and nonattention occurring at an average rate of 4.4 per minute (Brazelton et al., 1974). In a smoothly flowing interaction, the infant's excitement builds to a peak which is followed by a period of gaze aversion, and the mother's behaviors are synchronized with the infant's in that she increases her behaviors as the baby's excitement increases and then decreases her activity during the infant's nonattention. Infants look longer, look away for shorter periods and become less upset when their mother's behavioral cycles are synchronized with their own (Brazelton et al., 1974; Field, 1977).

Both Stern (1974a) and Brazelton et al. (1974) have proposed that infant gaze alternations serve a homeostatic function in regulating arousal and information intake during social interaction. It is assumed that face-to-face interaction with an adult is both arousing and informative. This assumption is supported by studies of adult gaze (reviewed by Argyle & Cook, 1976): direct social gaze produces increased arousal, there is less looking at highly arousing stimuli, and there is less looking when information load is high.

The assumption that face-to-face interaction with an adult provides the infant with a relatively high amount of information can easily be accepted. An interacting adult is likely to be one of the most complex, novel and continuously changing stimuli in an infant's perceptual world. The assumption that face-to-face interaction is arousing seems intuitively correct from the descriptions of infant behavior during these interactions (e.g., Brazelton et al., 1975). However, the reasons for

the arousing properties of face-to-face interaction have not been clearly established.

The hypothesis that infants alternate their gaze to modulate arousal level seems to be based largely on observations of changes in motor activity during social interaction. None of the studies of parent-infant face-to-face interactions have measured physiological responses, although both Brazelton et al. (1975) and Stern (1974b) have suggested this approach. The present study attempted to test the gaze/arousal hypothesis in a more indirect fashion, by manipulating arousal level and observing the effects on gaze behavior. The manipulation used was to provide the infant with a pacifier (a blind nipple). Nonnutritive sucking is one method of lowering the arousal level of an excited or upset infant. It also has been suggested as a buffering system, or means of protecting the infant from overwhelming stimulation (Bruner, 1973). Sleep, crying, and gaze aversion are also buffering systems. These systems may be hierarchically ordered, with the functioning of one system precluding the functioning of another. It can be hypothesized that the availability of the nonnutritive sucking buffering system will reduce the activity of the gaze aversion buffering system. Some support for this hypothesis is provided by Bruner's (1973) study of infant visual behavior with and without a pacifier. Saccadic movements were reduced by sucking, and they were reduced more for an unconventional film (achromatic animation of varied geometric shapes, stripes and textures) than for a more conventional film (a mother playing with her young child). Although not statistically significant, there was also more looking at the conventional film during pacifier use than without the pacifier.

Other studies of nonnutritive sucking also support the hypothesis that sucking can serve a buffering function. Brazelton (1967) interviewed mothers about their infants' use of thumb and finger sucking and found that one of the times it was most likely to occur was during mild frustration. Likewise, Lester, Bierbrauser, Selfridge and Gomeringer (1976) reported that children who seem to have difficulty averting their attention from environmental stimulation engage in more nonnutritive sucking in the natural environment than more easily distractible children, presumably as a means of escaping information overload.

Most studies of nonnutritive sucking have taken place in laboratories or hospitals, and have involved newborns or (less frequently) young infants. Again, a number of these studies support the notion of sucking as a buffering device. The most general finding is that sucking reduces arousal (Kaye, 1967; Kessen & Leutzendorff, 1963; Kessen, Leutzendorff, & Stoutsenberger, 1967). However, additional studies have shown that the direction and size of change in arousal produced by sucking is related to presucking arousal level. Both Kent (reported by Levin & Kaye, 1966) and Rovee and Levin (1966) found that sucking lowered the activity level of highly active infants, raised the activity level of quiescent infants, and did not change the activity level of moderately active infants. Thus, all infants were at approximately the same arousal level while sucking, regardless of their pre-sucking level. The arousal level of a sucking infant also seems to be more difficult to change than the arousal level of a nonsucking infant. Birns (reported by Bridger, 1962) observed the responses of infants with and without a pacifier to cold water applied to the foot. The sucking infants showed a slight increase in arousal and an increase in sucking. The nonsucking

infants showed a much larger increase in arousal. Bridger concluded that sucking served to protect the infants from, or make them less sensitive to, a stressful stimulus.

In contrast to Birns' study, infants also have been observed to decrease their sucking in response to an external stimulus (e.g., Bronshtein & Petrova, 1967). Crook, Burke, and Kittner (1977) suggest that the sucking response depends on the intensity of the stimulus, with moderate stimulation eliciting an orienting response which includes sucking suppression, and with more intense stimulation eliciting a defensive reaction which includes sucking potentiation. Again, this hypothesis is consistent with the notion that sucking acts as a buffering system.

Little direct information is available on the influence of sucking on looking behavior. Only Bruner's (1973) study has compared visual behavior during pacifier use and non-use. Mendelson and Haith (1976) compared newborn looking during bursts and pauses in sucking with a continually available pacifier and found no evidence for coordination of the two systems. Older infants (9 weeks) seem to alternate sucking and looking (Bruner & Bruner, 1968), and infants as young as 5 weeks can learn to suck as a means of focusing a moving picture (Kalnins & Bruner, 1973).

It appears that the relevant variable may be pacifier availability rather than the actual sucking response. In Bruner's (1973) study, differences in saccadic movements were reported for pacifier availability vs. pacifier nonavailability rather than sucking vs. nonsucking. Similarly, infants in Rovee and Levin's (1966) study showed shifts in arousal level when given a pacifier regardless of their actual sucking

responses.

In the present study, infant gaze behavior was observed both with and without a pacifier. If the suggestion that infants avert gaze to modulate arousal is correct, then mean gaze length ought to be longer and mean gaze aversion shorter during pacifier availability.

Including pacifier availability as a manipulation in the present study required consideration of several other factors. Since hungry infants are more aroused and suck more than satiated infants (Bridger, 1962; Kaye, 1967), initial hunger was kept as equivalent across infants as possible, by asking the parents to feed the infant within one hour preceding arrival at the laboratory. Other potential influences on infant nonnutritive sucking behavior were assessed through parental report. For example, whether the infant is breast or bottle fed has been shown to affect nonnutritive sucking (Dubignon & Campbell, 1968). Also, the amount of infants' experience with pacifiers can be expected to influence the ease with which a pacifier is accepted and retained.

Another consideration in this study was the effect of infant pacifier use on parental interactive behaviors and infant nongaze behaviors. For example, infant smiling and vocalizing were expected to occur less frequently during pacifier use. Also, infant activity level was expected to be generally lower during pacifier use. These changes in infant behavior may have produced concomitant changes in parental behavior.

If infant gaze alternations are related to information processing as well as, or instead of, changes in arousal level, individual differences in infant social gaze should be related to individual differences in performance on cognitively-based tasks. Several studies have found

such relationships, although the measures of social gaze have been related to quantity rather than patterning, and thus do not directly address the question of the role of information processing in the regulation of infant gaze.

Moss and Robson (1968) tested their sample of 3-month-old infants in the laboratory one week after observing their mutual gaze with their mothers at home. The tests involved the measurement of total fixation time to photographs of social (faces) and geometric (checkerboards) stimuli. Mutual gaze was significantly correlated with total fixation of the social stimuli for females only. Mutual gaze and total fixation of the geometric stimuli were not correlated for either sex. The authors suggest that the males were functioning at an earlier developmental level than the females as far as facial schema development was concerned, and this prevented their fixation times from being related to mutual gaze.

Noll (1971) also tested the relationship between maternal looking and laboratory visual behavior. The number of times a mother looked at her infant during a 2-minute waiting period was used to divide the infants into high and low maternal visual contact groups. The infants in the high group were found to look longer at a series of pictures than the infants in the low group. No sex differences were reported.

Along this same line, Beckwith, Cohen, Kopp, Parmalee, and Marcy (1976) found that more mutual gazing between mothers and 8-month-old preterm infants was associated with higher infant performance on a developmental test and a sensorimotor test at 9 months. Moreover, better cognitive performance at 9 months was associated with more positive social interactions at 1 and 3 months. One correlation,

however, did not fit this pattern. Higher scores on the developmental test were associated with less mutual gaze during feeding at 3 months. No explanation of this finding was offered by the authors, and insufficient information is available in their report to speculate on the factors underlying this correlation.

Relationships between parent and infant interactive behaviors and infant responses to nonsocial (and one social) stimuli were investigated in the present study.

Parent Characteristics

SEX

Over the years, most studies of parent-infant interaction have been concerned only with the mother. However, during the past five years considerable research interest has been directed toward the father's role during infancy (Parke, in press). Not only are fathers and infants interested in one another, but they become attached to one another in much the same way that mothers and infants become attached. In addition, fathers are competent caregivers, even as early as the newborn period. Qualitative characteristics of father-infant and mother-infant interactions seem to differ, with fathers engaging more in play and mothers engaging more in caregiving. This finding implies that fathers and mothers play different roles in the infant's social world (Lamb, 1975).

Thus far, three studies have compared mothers and fathers in face-to-face interactions with their young infants. Parke and Sawin (1977) observed mothers and fathers separately during toy play with their 3-month-old infants. Although in many ways the behavior of

mothers and fathers in this context was similar, there were some slight differences. Fathers imitated their infants more and were slightly less stimulating (visually and auditorily) than mothers. Based on the results of Field's (1977) study, which found that infants gazed more when their mothers imitated them than when their mothers tried actively to get their attention, it might be expected that these fathers were more effective than the mothers in maintaining their infant's visual attention. However, no data on the infants' visual behavior were presented. In addition, the work of Brazelton et al. (1974) suggests that the synchrony between parent and infant behaviors is also an important influence on infant attention. Since most fathers spend less time with their infants than mothers do, they may be less responsive to infant cues and less experienced at synchronizing their behaviors with the infants' attentional cycles. This could attentuate the positive effects of the fathers' level of stimulation.

In addition, although fathers engage in slightly less auditory and visual stimulation of their infants than mothers do, they seem to be more inclined than mothers to engage their infants in rhythmic physical "games" (Field, 1978; Yogman, 1977). Mothers were observed to be more inclined than fathers to use soft, repetitive, burst-pause vocalizing (Yogman, 1977) and to hold their infant's limbs (Field, in press). These results suggest that parents differ in the types of stimualation they use with their infants.

Because of procedural variations in these three studies, it would be presumptuous to use them as a basis for specific hypotheses about differences in maternal and paternal behavior in face-to-face interaction with their infants. Parke & Sawin (1977) reported parent-infant

play with a toy, Yogman (1977) studied only five families longitudinally, and Field's (1978) study included fathers who were primary caregivers as well as fathers who were secondary caregivers. It does seem reasonable to hypothesize that father-infant and mother-infant interaction will differ. How or how much they will differ cannot be predicted, although differences in modality of stimulation may be more likely than other differences. Since Field (1978) found differences between fathers who were primary caregivers and those who were secondary caregivers, it also seems reasonable to hypothesize that the amount of experience a father has had with his infant will influence their interaction. In Field's study, fathers and mothers who were primary caregivers were more similar to one another in their behavior than to fathers who were secondary caregivers. More experienced fathers thus should have been more similar to mothers than less experienced fathers in the present study.

PARENT ATTITUDES

Many studies of parent-infant interaction have considered only the directly observable behaviors of parents and infants. Parke (in press) suggests that more attention needs to be paid to "parental cognitions, perceptions, attitudes and knowledge" as mediators of observable behaviors. Research on gaze interactions between adults provides support for this approach, since the amount of interpersonal gaze has been found to be related to personality dimensions and attitudes toward interactive partners. Argyle and Cook (1976) conclude that "liking" is the most important determinant of the amount of social gaze by adult. Very likely, parents differ in how much they like their infant, for any

of a number of reasons. The possible influences of such infant characteristics as temperament and physical attractiveness on gaze interactions (discussed earlier) are probably due to their effects on the parents' liking of their infants. In general, more gaze should be associated with more positive parental attitudes toward their infant. However, it was suggested (in the section on infant sex) that this relationship will hold for mothers of girls but not for mothers of boys. A similar effect may exist for fathers, although there is no evidence. Parents' attitudes toward their infants were assessed in the present study by questionnaire.

Individual differences in parental looking may be related to general personality characteristics as well. Robson (1967) suggested that some mothers are predisposed to gaze aversion which results in less mutual gaze between them and their infants. Mothers also differ in their responsiveness to infant cues (Blehar et al., 1977) and in their interpretations of infant behaviors (Lewis & Rosenblum, 1974). Assessment of parental personality dimensions is beyond the scope of the proposed study.

Dyad Characteristics

INTERACTION BETWEEN PARENT SEX AND INFANT SEX

So far, the effects of parent sex and infant sex have been discussed separately. There is evidence, however, that mothers and fathers differ in their responses to male and female infants, and that male and female infants differ in their responses to mothers and fathers. In particular, same-sex relationships seem to differ from different-sex relationships. Even in the newborn period, mothers and

fathers differ in their ratings of sons and daughters. Rubin, Provenzano, and Luria (1974) found that fathers rated daughters as cuddlier than sons whereas mothers rated sons as cuddlier than daughters. This cross-sex physical contact preference is maintained during the infant's first 3 months, with Parke and Sawin (1977) reporting that during play interactions, fathers held daughters close more than sons, and mothers held sons close more than daughters. Other types of stimulation, however, seem to be directed more to the same-sex infant. Fathers and mothers in the Parke and Sawin (1977) study looked at the same-sex infant more, touched them more, and stimulated their feeding more. Rebelsky and Hanks (1971) also found that fathers talked more to 3-month-old sons than daughters. This study was based on a very small sample which showed very low levels of talking, and so this result must be interpreted cautiously. Observations of older infants in interaction with their parents confirms this trend; fathers tend to be more involved with sons and mothers more with daughters (cf. Parke, in press).

Differences between male and female infants in how they respond to their parents is evident in some studies of attachment and social behavior in older infants (Parke, in press). For example, Spelke, Zelazo, Kagan, and Kotelchuck (1973) found that one-year-old girls spent more time near and vocalized more to their mothers while boys behaved similarly toward their fathers. Whether or not young (pre-attachment) male and female infants also differ in their responses to mothers and fathers is not known. It is known that young infants can discriminate their mother from their father (Yogman, 1977), and that mothers and fathers behave differently toward male and female infants. These

differences in parental behavior may produce differences in infant behavior. However, it is unlikely that young infants have sufficient knowledge of their own sex to recognize which parent is the same sex and which is the different sex from themselves (see Lewis & Brooks, 1975, for a discussion of the development of gender identity).

It was hypothesized that parental behavior, but not infant behavior, would be influenced by the interaction between parent sex and infant sex. Specifically, it was expected that fathers would look more at and be more active with sons, and mothers would look more at and be more active with daughters.

CONTEXT

Contextual factors that affect parent-infant gaze interactions include the familiarity of the environment, the purpose of the interaction, and other stimuli present in the environment. Because of contextual differences, gaze interactions in a structured laboratory setting are likely to differ from gaze interactions in the natural environment of the home (Belsky, 1977). In the home, mothers have been found to look at their infants 27% of the time overall (Lewis & Lee-Painter, 1974) and 70% of the time during play, spoon feeding, and bottle feeding (Peery & Stern, 1975). Although the laboratory studies of parent-infant face-to-face interaction reviewed thus far do not report exact values for parental looking, the impression from their descriptions is that parents look at their infants most of the time in this setting. Brazelton et al. (1974) report that mothers tended to perceive the laboratory interaction as a period for heightened attention-getting activity. Likewise, the infants' behavior differed in

some ways from that commonly observed in the home, indicating that they too were aware of the unfamiliarity of the situation.

The reason for face-to-face interaction also influences the gaze interaction. Peery and Stern (1975) found subtle differences in mother and infant gaze behaviors during play, bottle feeding, and spoon feeding. For example, infants looked away for longer periods during feeding than during play, and mothers' looks were much shorter during spoon feeding than during bottle feeding or play. These differences probably were the result of the different purposes of these interactions. Presumably mothers provide different types of attention-getting stimulation during feeding, and they must look away more frequently during spoon feeding in order to get the food.

The interactions in the present study were limited to face-to-face play in an unfamiliar laboratory setting. Although such behavior is unlikely to be strictly representative of naturally occurring parent-infant interactions, it may be an example of parental behavior in certain types of stressful situations to which the infant must learn to respond (Brazelton et al., 1974). Ideally, laboratory observations should be compared with home observations to discover commonalities and differences between the two contexts. Conclusions from the present research can not be automatically generalized to other contexts until such commonalities are demonstrated (Belsky, 1977).

PREVIOUS EXPERIENCES OF THE DYAD

Both the quantity and quality of the previous interactions of a dyad may be related to their interaction in a laboratory setting. For example, some of the differences between mother-infant and father-infant

dyads may be a function of different experience rather than the parents' sex (recall the comparison of primary and secondary caregiver fathers by Field, 1978). Although effects of the father's availability and amount of contact are evident in attachment relations (reviewed by Parke, in press), little information is available on how previous experience affects interactions between fathers (or mothers) and young (pre-attachment) infants.

Many observers of early adult-infant interactions have noted the conversational quality of these interactions. The adult and infant seem to be communicating with one another. Describing the nature of these communicative exchanges requires at the least a fairly broad definition of communication. Within an ethological framework (Smith, 1965), the presence of a communicator, a signal, and a recipient are essential to communication and communicative events occur when two individuals establish a social relationship by use of a signal. This is true of adult-infant interchanges, since young infants can produce a number of signals that have meaning for adults. The young infant's communication skills are limited, however, in that signals are fairly gross (e.g., cries are only moderately specific) and there is little evidence that the young infant's signal production is intentional (Bates, Camaioni, & Volterra, 1975). However, the infant's behaviors do affect the adult, and as such are labeled communicative by some investigators (Als, 1977; Bakeman & Brown, 1977; Costello, 1976; Meier, 1975; Trevarthan, 1974). Likewise, adult behaviors which (potentially) affect the infant's behavior are considered communicative. The communicative exchanges between adults and infants are necessarily nonverbal, which suggests the problem of determining the meaning of communicative acts. Smith (1965)

points out that the message of a communicative signal (a behavior which encodes some aspect of the CNS of the communicator) may not be the same as its meaning (the recipient's choice of interpretations of the signal). This mismatch may be particularly common in adult-infant exchanges. Although the code for some signals may be held in common through genetic mechanisms (cry=distress, for example), many other signals may have different meanings for the adult and infant. In fact, parents seem to infer meaning and intentionality from many infant behaviors during social interaction (Anderson, 1970; Bates et al., 1975). The inferred meaning may determine the adult's response, and this consistency of response to what may actually be random behaviors in the infant may contribute to the infant's learning of the meaning of nonverbal (and eventually verbal) communicative acts (Anderson, 1970).

The looking behavior of young infants serves as a communicative signal in adult-infant interaction. Mothers normally become less active when their infants look away from them (Field, 1977), which implies that mothers perceive and respond appropriately to this signal. If, as Stern has suggested (1974a), the infant looks away to reduce his level of arousal, then the message and the meaning match. There may be cases, however, where the message and meaning do not match. Stern (1971) described a mother who responded to her infant's gaze aversions by increasing her attempts to elicit attention. The interaction tended to be unsatisfying and upsetting to both individuals. Also, infants who do not alternate gaze appropriately (e.g., blind infants, Fraiberg, 1974; autistic children, Hutt & Ounsted, 1966; a gaze-avoiding infant, Thoman, 1975) but instead look away most of the time, are generally perceived as rejecting and uncommunicative. Mothers may differ as well in their

interpretation of gaze away behavior (Lewis and Rosenblum, 1974). An "optimistic" mother may interpret her infant's gaze aversion as a temporary interest in something else whereas a more "pessimistic" mother may interpret it as a personal rejection. It seems pertinent within the framework of the proposed study to ask parents why they think their infants look at and away from them during play. The meaning given to these behaviors should be considered in the interpretation of their message value.

One reason why adult-infant interaction is so frequently labeled "communicative" is that it follows a conversational, turn-taking pattern. Body movements in response to speech (Condon & Sander, 1974), mutual gaze patterns (Jaffe et al., 1973) and mutual vocalization patterns (Bateson, 1975; Stern, Jaffe, Beebe, & Bennett, 1975) are very similar to those observed in adults during conversation. It has been proposed that these rhythms and tendencies toward alternation are innate and form the basis for communicative interchange (Trevarthan, 1974). If nothing else, such behavior may contribute to the adult's impression that the infant is responding to him. Considering the importance generally attributed to these early interactions (e.g., Meier, 1975), establishing them as a pleasant experience can be considered an important goal in itself (Bates et al., 1975).

Brazelton et al. (1974) describe mother-infant interaction as a time of "rule-learning" for both individuals. Each must learn what behavior patterns to expect from the other. They suggest that the most important rule the mother must learn is to be "sensitive" to her infant's capacity for attention and nonattention. Mothers who are more "sensitive" (who synchronize their interactive behaviors with their

infant's attention and nonattention) receive more attention from their infant and participate in a more smoothly running, positive interaction.

Evidence that infants also learn what kind of behavior to expect from their mothers comes from two observations of infant responses to mothers who were behaving "abnormally." Trevarthan (1974) observed infants' responses to an image of their mother interacting with an adult. The infants appeared puzzled, some seemed to try to elicit her attention, and then became dejected and withdrawn. Similar patterns of behavior were observed when mothers were asked to simply sit in front of their infants without responding or changing their facial expression (Brazelton et al., 1975).

It was not feasible to directly assess the nature of previous interactions between the parents and infants in the present study. However, a measure of the amount of previous interactive experience was obtained through parental report.

In addition, the existence of infants' expectations for interactive behavior from their parents was tested by observing their responses to the cessation of their parents' behavior. Parents were asked to stop interacting for approximately one minute during the laboratory observation. Based on Brazelton et al.'s (1975) description, infants were expected to first increase and then decrease their interactive behaviors. The amount of change in their behavior from when the parent was interacting to when the parent was not should have reflected how much the infant's cognitive expectancies related to the interaction were violated. It was hypothesized that low interactive dyads would differ from high interactive dyads, with the infant's expectancies being less well established in the low interactive dyads.

Summary Of Purpose And Hypotheses

The purpose of the present study was to investigate some of the processes believed to underlie variations in the quantity and patterning of social gaze between parents and young infants. Specifically, the influences on gaze interactions of the infant's sex, temperament, physical attractiveness, changes in arousal, and cognitive expectancies, the parent's sex and attitudes, and such dyadic factors as the interaction between parent sex and infant sex, the context of the interaction, and previous experience of the members of the dyad with one another were assessed. Hypotheses about these factors are listed below:

Infant characteristics

Sex

1. There will be no sex differences in infant gaze behaviors.
2. There will be more mutual gaze between mothers and daughters when the mothers have positive attitudes toward their infants. This relationship will not hold for mothers of boys.

Birth condition and temperament

3. There will be less mutual gaze when the parent perceives the infant as temperamentally difficult.
4. Infants perceived by their parents as difficult will engage in less gazing and smiling and more fussing.

Predisposition toward gaze aversion

5. There will be less looking by infants whose parents report they have a low level of interest in social gaze.

Physical attractiveness

6. Parents who perceive their infants as cuter will look longer at their infants.

Arousal and information processing

7. Mean gaze length will be longer during pacifier availability.
8. Mean gaze aversion will be shorter during pacifier availability.
9. Less infant smiling and vocalizing will occur during pacifier availability.

Parent characteristics

Sex

10. Father-infant and mother-infant interactions will differ.
11. More experienced fathers will be more similar to mothers than less experienced fathers.

Attitudes

12. More parent gaze will be associated with more positive attitudes toward their infants.

Dyad characteristics

Interaction between parent sex and infant sex

13. Fathers will look more at and be more active with sons, and mothers will look more at and be more active with daughters.

14. There will be no effect of this interaction on infant behaviors.

Previous experience

15. Infants will respond to the cessation of their parents' behavior by first increasing and then decreasing their behaviors.

16. Infants in dyads with low interactive experience will change their behavior less in response to parent behavior cessation than infants in dyads with high interactive experience.

CHAPTER 3

METHOD

SUBJECTS

The Ingham County (Michigan) birth records were used to obtain the names of parents of 3-month-old infants in the Lansing metropolitan area. Parents whose addresses were available (either in the birth records or in the telephone book) were sent a letter describing the study and a map to the research building (see Appendix A, A-1). Interested parents telephoned the experimenter to make an appointment for testing. In addition, many of the parents were contacted by telephone after first receiving the letter. At this time the parents were asked about their willingness to participate in the study, and their questions about it were answered.

A total of 41 infants were tested. Of these, 17 did not complete the study due to fussiness. Of the remaining 24, 12 were first-born infants tested with both parents (Group 1) and 12 were pacifier-using infants tested with their mothers (Group 2). Half the infants in each group were girls and half were boys.

Characteristics of the 24 families who completed the study are summarized in Tables 1 and 2, divided by group and by sex. All of the fathers and 12 of 23 mothers were employed in jobs ranging from skilled labor to professional. Over half the mothers had attended college and over half the fathers had completed college.

Table 1
Background Information
(Means and SDs)

	Male Infants	Female Infants	Group 1	Group 2	Total Group
Infant's age (days)	90.25 (6.77)	94.08 (5.35)	92.25 (6.48)	92.08 (6.36)	92.17 (6.28)
Infant's birth wt. (oz.)	117.50 (12.97)	122.67 (12.43)	120.92 (8.62)	119.25 (16.18)	120.08 (12.70)
Mother's age (yrs)	26.36 (4.06)	26.00 (2.09)	26.00 (3.52)	26.36 (2.77)	26.17 (3.11)
Father's age (yrs)	28.55 (4.11)	28.50 (3.73)	28.17 (4.15)	28.91 (3.59)	28.52 (3.82)
Years married	5.46 (3.70)	4.67 (2.39)	4.67 (2.93)	5.46 (3.24)	5.04 (3.04)

Table 2
Background Information
(Frequencies)

	Male Infants	Female Infants	Group 1	Group 2	Total Group
Pregnancy complications					
yes	2	4	2	4	6
no	10	8	10	8	18
Labor complications					
yes	0	2	2	0	2
no	12	9	9	12	21
Delivery complications					
yes	2	4	3	3	6
no	10	8	9	9	18
Labor medication					
yes	3	8	6	5	11
no	9	3	5	7	12
Delivery medication					
yes	7	8	8	7	15
no	5	4	4	5	9
Infant illnesses since birth					
yes	2	2	1	3	4
no	10	10	11	9	20
Pacifier use					
yes	9	6	4	11	15
no	3	6	8	1	9

Type of feeding					
breast	6	4	5	5	10
bottle	3	7	5	5	10
combination	3	1	2	2	4
Birth order					
first	7	8	12	3	15
second	3	3	0	6	6
third	1	1	0	1	1
fourth	1	0	0	2	2
Mother's education					
less than HS completion	0	1	0	1	1
HS completion	4	3	3	4	7
some college	3	6	6	3	9
college completion	2	1	1	2	3
some grad school	1	1	1	1	2
master's degree	1	0	1	0	1
doctorate	0	0	0	0	0
Father's education					
less than HS completion	0	1	0	1	1
HS completion	2	1	2	1	3
some college	3	2	1	4	5
college completion	3	3	2	4	6
some grad schmol	2	3	4	1	5
master's degree	1	2	2	0	2
doctorate	0	0	1	0	1

PROCEDURE

In Group 1, the parents, infant, and experimenter first were seated in the experimental room. The testing procedure was explained, and signed consent obtained from both parents (see Appendix A, A-2). For half the infants of each sex (Order 1) the mother remained in the experimental room and the father left the room with the experimenter. The mother was seated facing the infant, who was seated in an infant seat placed on a table top. The experimental room had one-way mirrors around three sides; the mother and infant were placed so that each of their faces could be seen clearly by two of the observers.

The mother was asked to interact with the infant as naturally as possible, without removing the infant from the infant seat or blocking the observers' views of the infant. She had been told that both her own

and her infant's behavior would be recorded, but that the major concern of the study was the infant's behavior. This unstructured interaction continued for approximately 4 minutes, with the first 2 minutes allowed for adaptation to the situation, and the second 2 minutes for recording. After two complete minutes of interaction were recorded, the mother was signalled by the experimenter (a light onset behind the infant's head) to stop interacting and to simply sit and gaze at the infant's face. This is labeled the "Stop" condition. The infant's behaviors during this condition were recorded for 1 minute.

If the infant started to cry during the interaction segment of the test, the mother was instructed to do whatever she felt was necessary to calm her infant, including removing the infant from the infant seat, feeding or changing the infant, or calling in the father. Testing resumed at the discretion of the mother and continued until 2 minutes of interaction were recorded. If the infant started to cry during the final minute when the mother was not interacting, that part of the experiment was terminated and further testing resumed only after the infant was calm. Only one such termination occurred.

After the interaction with the mother (Part A) was completed, the experimenter and father reentered the experimental room. The testing procedure was reviewed for the father, and the experimenter and mother then left the room. The interaction between the infant and father (Part B) then proceeded. Infants assigned to Order 2 interacted first with their father and then with their mother.

The procedure for Group 2 was the same as for Group 1, except that the infant interacted only with the mother. Part A was the same as Part A for Group 1, whereas in Part B the infant's pacifier was provided by

the mother. Again, the order of Parts A and B were counterbalanced across sex of infant.

Following the two interaction segments, parents were asked to complete a series of questionnaires (see Appendix A, A-3 to A-6). The first questionnaire (A-3, Today's Schedule and Trip to the Laboratory) was designed to determine the infant's schedule on the day of testing. The second questionnaire (A-4, Background Information) solicited background information about the infant and parents. The third questionnaire (A-5, Parent Questionnaire) was concerned with the parents' attitudes toward their infant and parenthood. Only responses to questions 1-17 and 31 and 32 were analyzed. For items with scale check-offs, the distance from the left scale end-point to the parent's check was converted to a percentage of the distance between the two end-points. The final questionnaire (A-6, Survey of Temperamental Characteristics) consisted of the 46 items from the Carey scale (1972) which are used to assess "difficulty" of infants' temperament. Temperament ratings were calculated by first assigning a value of 1 (low difficulty), 2 (medium difficulty), or 3 (high difficulty) to the response to each item according to Carey's scoring scheme (Carey, 1972). The average score for each of the scales of Rhythmicity (questions 1, 2, 5, 6, and 18), Adaptability (questions 4, 7, 15, 16, 22, 27, 28, 30, 32, 36, 42, and 44), Approach (questions 3, 12, 26, 29, 37, 41, and 43), Intensity (questions 9, 11, 14, 17, 21, 23, 25, 33, 35, 38, 40, and 46), and Mood (questions 3, 8, 10, 13, 17, 19, 20, 22, 24, 31, 32, 34, 37, 39, 41, and 45) was calculated. Unanswered questions were not included in these averages. Finally, the temperament (difficulty) rating was determined by averaging these scale scores.

While the parent(s) completed the questionnaires, the infants' responses to several visual and auditory stimuli were recorded (Infant Test). First, the infant was shown a color photograph (containing an array of patterned pottery) for 30 sec. Total amount and frequency of looking, smiling, and vocalizing were recorded. Then, a pair of black and white checkerboards (one 4 x 4 checks, the other 12 x 12 checks) was presented twice, for 30 sec each time, with side of presentation reversed on the second presentation. Total amount and frequency of looking at each checkerboard were recorded. The infant was then held before the one-way mirror for 30 sec. Again, total amount and frequency of looking, smiling, and vocalizing in response to the mirror image were recorded. The infant then was replaced in the infant seat. A ring of colored plastic beads was dangled in front of the infant's face and moved first in one direction and then the other. Then, a set of keys was jiggled once on each side of the infant's head (out of the infant's eyesight). For each of these trials, eye movement and head movement in the direction of the beads or keys were recorded as being present or absent.

DEPENDENT MEASURES

All interactive behaviors were recorded continuously as they occurred. Observers were positioned behind the one-way mirrors on each side of the experimental room so that they had a clear view of either the parent or infant. There were two observers for the infant and two for the parent. Behaviors were recorded by pressing buttons attached to an event recorder. One observer recorded infant gaze and another recorded parent gaze. Gaze at the partner's face was recorded rather

than eye contact, since eye contact is less reliably discerned at a distance (Argyle & Cook, 1976). The other two observers recorded the presence or absence of smiling and vocalizing. A smile was defined as a widening and/or upturning of the corners of the lips which was judged to reflect positive affect. Any vocal sound produced by the infant was considered a vocalization. Although an attempt was made to stop recording whenever the infant became upset, recorded vocalizations included those of both a positive and negative nature. Adult vocalizations were recorded as present or absent and defined as any vocally-produced sound (whether or not a word).

Inter-observer reliabilities were assessed before the study was begun and periodically throughout the course of data collection. Each of 15 observers was tested at least once before being allowed to record usable data. The two-minute period preceding the two-minute recordings were frequently used to re-test observer reliabilities. Since not all of these were systematically scored, but rather checked by eye, the reliabilities reported here are based on the initial tests. The reliability measure used was the percent agreement on the presence of a behavior during a particular second for a pair of observers. Agreement for gaze averaged 85% (range 80% to 96%), and for smile and vocalize 75% (range 68% to 94%) and 78% (range 70% to 94%) respectively. Although the reliabilities for smile and vocalize were lower than expected, further practice did not seem to improve them. The differences between observers seemed to be the result of differences in reaction time and the small unit of analysis (one sec). This may bias the sec-by-sec analyses, but not the analyses of the frequency, percent, mean, and interval of behaviors.

At the end of each experimental session, the four observers were asked to rate the attractiveness of the infant, mother, and father (if present) on a 5-point continuous scale (see Appendix A, A-7). Ratings were transformed to a percentage of the total scale with higher numbers indicating higher attractiveness ratings.

DATA REDUCTION

The output of the event recorder was scored second by second. Each sec of each interaction was scored as 0 (behavior absent), 1 (behavior present), 2 (behavior both present and absent, one transition), 3 (behavior both present and absent, two transitions), or 4 (behavior both present and absent, three transitions) for parent gaze, parent smile, parent vocalize, infant gaze, infant smile, and infant vocalize. In addition, each sec was scored for the presence (1) or absence (0) of mutual gaze. During the Stop condition, only infant behaviors were scored. For each behavior within a part (A or B) and condition (Interacting or Stop), four summary variables were produced: 1)the frequency of the behavior (doubled for the Stop condition since it was half as long as the Interacting condition), 2)the percent of total time spent engaged in the behavior (for secs coded 2, 3, or 4, one half sec was added to the sum), 3)the mean length of behavior occurrence, and 4)the mean length of interval between behaviors. These summary variables were treated in multivariate analyses of variance, with simple effects tests performed on significant univariate interactions. The simple probabilities of occurrence of each interactive behavior were compared with the conditional probabilities of occurrence during parent or infant gaze, and preceding infant gaze onset or offset. Pearson

product-moment correlations between interactive behaviors, observer attractiveness ratings, parent questionnaire responses, and Infant Test items were calculated for the entire group of mothers and infants, and for Group 1 mothers, fathers, and infants. Multiple regression analyses also were used to test some of the hypotheses presented in the Introduction.

CHAPTER 4

RESULTS

The results are presented in several sections. First, the interactive behaviors of parents and infants were analyzed separately for each group using multivariate analyses of variance (MANOVA). Then, the two groups were combined and detailed analyses of mother and infant interactive behavior (Part A) and relationships between interactive behaviors, performance on the Infant Test and the mother's responses to the questionnaires were performed. A set of Sex of Infant x Group x Order MANOVAs (Tables C-1 to C-4, infant and parent interactive behaviors analyzed concurrently) revealed no differences between the groups in mothers' or infants' interactive behaviors, thereby justifying combining the groups. Some analyses were repeated using just Group 1, for the purpose of comparing mothers and fathers.

Interactive Behaviors - MANOVAs

These analyses were performed separately for each group and, within groups, separately for parents and infants. Parent MANOVAs were of the form: Sex of Infant (2) x Order (2) x Part (2). Infant MANOVAs included an additional factor, Condition (2). Part and Condition were within subjects factors. For Group 1, Part A was the mother interaction and Part B was the father interaction; for Group 2, Part A was the non-pacifier interaction and Part B was the pacifier interaction. Condition refers to the Interaction and Stop conditions. MANOVAs were

performed separately for frequency, percent, mean, and interval with the three variables, gaze, smile, and vocalize, analyzed concurrently.

MANOVA tables are presented in Appendix B, Tables B-1 to B-24. Univariate ANOVA results and standardized discriminant coefficients are reported for significant multivariate effects. Means and standard deviations for reported univariate effects (whether or not significant) are given in Appendix B, Tables B-25 to B-43. Simple effects tests for significant interactions are shown in Tables B-44 to B-51.

GROUP 1

The analyses of parents' behavior in Group 1 (Tables B-1 to B-4) revealed no significant effects. Thus, this group of mothers and fathers did not differ from one another in their interactive behavior with their infants in a structured laboratory situation. Neither were the behaviors measured influenced by infant sex or the order in which parents interacted with their infants.

In contrast, there were several significant influences of the independent variables on infants' interactive behaviors. These effects were on the frequency and percent of behaviors; there were no effects on mean or interval.

The multivariate test of the effects of Sex of Infant on the frequency of infant behaviors (gaze, smile, vocalize) was significant, but none of the univariate tests were (Table B-5). Although the effect for gaze was nearest significance of the three ($p<.06$), the standardized discriminant coefficients were nearly equal, indicating that all three behaviors were influenced equally by the multivariate effect.

There were three significant interactions involving the percent of

infant interactive behaviors (Table B-6). The Sex x Order x Parent interaction was accounted for primarily by gaze, $F(1,8)=14.31$, $p<.01$. Simple effects tests (Table B-44) revealed that the only significant component of the interaction was the simple two-way interaction for Sex x Order during Part B, $F(1,8)=6.38$, $p<.05$. Since the simple simple main effects contained in this interaction were not significant, no further interpretation of the interaction could be made.

The multivariate test of the interaction between Sex, Condition, and Parent was also significant, but none of the univariate tests even approached significance. Therefore, no attempt was made to explain this interaction. The relevant means are presented in Table B-29.

The four-way interaction between Sex, Order, Condition and Parent was significant for infant vocalization, $F(1,8)=7.61$, $p<.03$. Inspection of the cell means (Table B-30) revealed that one cell was substantially different from the others. The amount of vocalization by male infants in Order 2 with their mothers in the Stop condition was over four times as great as the largest amount of vocalization in any of the other cells. A Newman-Keuls test confirmed that the mean of this cell was significantly different from the means of all the other cells, with none of the other cells differing from one another. Checking the experimental records of the three infants in the condition with the extreme mean revealed that two of these infants had become fussy during the Mother-Stop condition. Since fusses were recorded as vocalizations, a large mean was obtained for this one cell.

There were two significant effects in the analyses of mutual gaze (Tables B-9 to B-12). First, there was a Sex x Parent interaction for the frequency of mutual gaze, $F(1,8)=5.92$, $p<.05$. None of the simple

main effects were significant (Table B-45).

The Sex x Order x Parent interaction for percent of mutual gaze also was significant, $F(1,8)=11.19$, $p<.02$. The means for this interaction are presented in Table B-28. All but one of the simple simple main effects are significant (Table B-46). The most apparent summarization of this interaction is that more mutual gaze occurred with the first parent for male infants and with the second parent for female infants (see Figure 1). The pattern of means for this interaction corresponded closely to that for the same interaction with infant gaze. However, more of the simple effects were significant in this case. It seems that mutual gaze is determined largely by infant gaze, probably because parents gazed most of the time whereas infants looked away more frequently, but there was less variability in mutual gaze than infant gaze.

GROUP 2

Although both Sex and Sex x Order multivariate effects were significant for the frequency of mothers' behavior in Group 2, none of the univariate effects were significant (Table B-13). The standardized discriminant coefficients indicate that the effects were strongest for smile, fairly strong for gaze, and minimal for vocalize.

The effect of Sex was also significant for the mean length of infant smiles (Table B-19), $F(1,8)=7.94$, $p<.03$. However, Sex interacted with Order, again for smiling, $F(1,8)=12.94$, $p<.01$. The Sex x Order interaction also was significant for the frequency of smiling (Table B-17), $F(1,8)=79.29$, $p<.01$, and the interval between smiles (Table B-20), $F(1,8)=43.75$, $p<.01$. None of the simple main effects was signi-

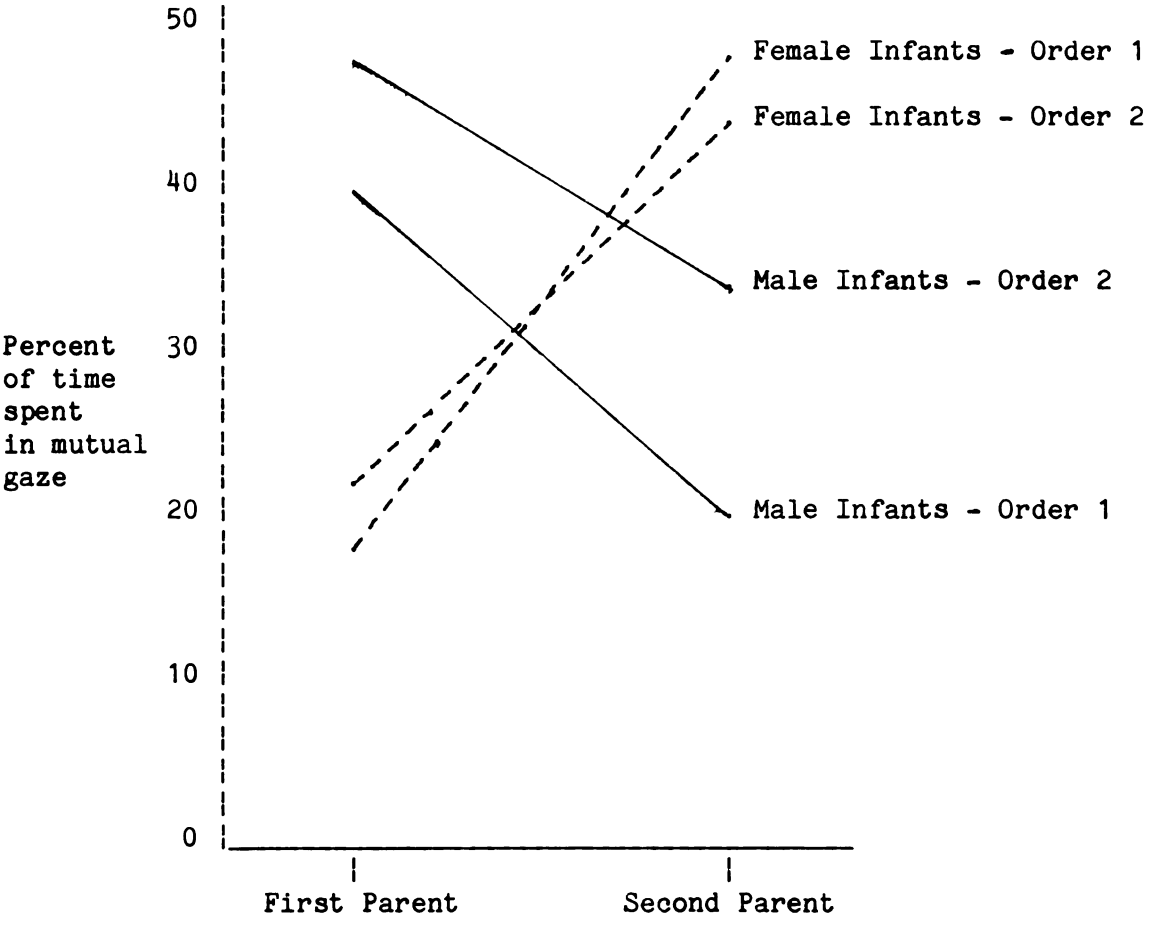


Figure 1. Sex x Order x Parent Interaction for Mutual Gaze Percent

ficant (Tables B-47, B-50, and B-51). According to the main effect of sex, boys' smiles were longer than girls' (Table B-38).

The interaction between Order and Part was significant for the frequency and percent of vocalizing, $F(1,8)=10.90$, $p<.02$, $F(1,8)=13.69$, $p<.01$, respectively. The simple effects tests showed that none of the simple main effects for frequency were significant, but two out of four were significant for percent (Tables B-48 and B-49). More vocalizing occurred during the no-pacifier interaction than the pacifier interaction when the no-pacifier interaction followed the pacifier interaction, whereas there was no difference when the no-pacifier interaction preceded the pacifier interaction (means presented in Table B-36). In addition, more vocalizing occurred during the pacifier interaction when it came second than when it came first. In general, there seemed to be more vocalizing during the second interaction than during the first. Even though the simple effects for frequency of vocalization were not significant, the pattern of means corresponded with that for percent (Table B-34).

The effect of Part was significant for smiling percent, $F(1,8)=5.68$, $p<.05$, and interval, $F(1,8)=8.54$, $p<.02$ (Tables B-18 and B-20). There were more smiling and shorter intervals between smiles during the no-pacifier interaction than during the pacifier interaction (Tables B-35 and B-42). Part also influenced the frequency of mutual gaze (Table B-21), $F(1,8)=5.37$, $p<.05$. Mutual gaze was more frequent in the no-pacifier interaction than during the pacifier interaction (Table B-43).

Condition (Interaction vs. Stop) significantly influenced the percent of gaze (Table B-18), $F(1,8)=7.86$, $p<.03$, and the mean length of

smile (Table B-19), $F(1,8)=8.87$, $p<.02$. There were more gaze and longer smiles during the Interaction condition than during the Stop condition (Tables B-37 and B-40).

All subjects - Part A

INTERACTIVE BEHAVIORS - CONDITIONAL PROBABILITIES

For each interactive behavior, first the simple probability of occurrence during any 1 sec interval was determined. The simultaneous conditional probabilities of the occurrence of infant smiling and vocalizing, and parent gazing, smiling, and vocalizing, given the occurrence of infant gaze during any particular second were calculated, as well as the conditional probabilities of the occurrence of behaviors other than parent gaze given the occurrence of parent gaze. Finally, transition conditional probabilities for behaviors other than infant gaze, given infant gaze onset and offset, were determined. An infant gaze onset was defined as a sec coded 1, 2, 3 or 4 (gaze present) preceded by a sec coded 0 (gaze absent). Thus, only those gaze onsets preceded by at least 1 sec of gaze aversion were included. Similarly, gaze offset was defined as a sec coded 0 (gaze absent) preceded by a sec coded 1, 2, 3 or 4 (gaze present). The probabilities of occurrence of behaviors other than infant gaze in the sec preceding infant gaze onset or offset were defined as transitional probabilities.

The mean simple, simultaneous, and transitional probabilities for all mothers and infants (Part A) are displayed in Table 3. Binomial tests (Siegal, 1956) were performed to compare the simple and conditional probabilities for each dyad. The test could not be used in cases where the simple probability was either 1.0 or 0.0 (the behavior

occurred either all of the time or none of the time), and the result was meaningless when the conditional probability was 1.0. Thus the table reports both the number of subjects for whom the simple and conditional probabilities differ significantly ($p<.05$) and the number of subjects for whom the test could be used meaningfully. As can be seen in the table, none of the comparisons were significant for more than half the subjects.

Table 3
Interactive Behaviors - Simple and Conditional Probabilities

	Infant			Parent		
	Gaze	Smile	Voc	Gaze	Smile	Voc
Simple p	.461	.115	.094	.850	.363	.757
Conditional p/given BG	--	.156	.105	.848	.422	.790
Conditional p/given PG	.463	.114	.097	--	.369	.759
Transitional p/ preceding BG onset	--	.074	.046	.799	.266	.687
Transitional p/ preceding BG offset	--	.085	.090	.828	.410	.744
Simple vs. conditional p/ given BG						
#binomial test	--	8/21	3/18	1/12	9/23	4/20
&sign test	--	16/19*	8/17	9/16	19/21*	11/22
Simple vs. conditional p/ given PG						
#binomial test	1/23	3/21	0/18	--	0/23	0/23
&sign test	8/15	6/10	8/10	--	13/16*	9/14
Simple vs. transitional p/ preceding BG onset						
#binomial test	--	5/20	1/17	1/7	2/22	2/18
&sign test	--	6/20	3/18*	10/16	4/23*	10/23

Table 3 (cont'd)

Simple vs. transitional p/ preceding BG offset						
#binomial test	--	4/20	4/17	0/16	3/20	2/17
&sign test	--	8/20	8/18	12/16	14/22	13/23

#For binomial tests:
Number of subjects for whom test is significant ($p<.05$)/
Number of subjects for whom meaningful test could be done.

&For sign tests
Number of subjects with higher conditional p than simple p/
Number of subjects with conditional p different from simple p.

*Significant at $p<.05$ (two-tailed).

The most consistent effects were for infant and mother smiling given infant gaze. There appeared to be a tendency for both infants and mothers to smile more while the infant was gazing than their base rates of smiling would predict.

Sign tests were performed to determine whether any of the differences between simple and conditional probabilities were consistently in one direction (see Table 3). Again, both infant and mother smiling were more likely during infant gaze. Mothers' smiling is more likely during mothers gaze as well. In addition, infant gaze onsets tend to be preceded by less infant vocalizing and less parent smiling than would be predicted by the base rates. These results must be interpreted cautiously, since in all cases the differences between the simple and conditional probabilities are significant for only a few mother-infant pairs.

Other measures

Mothers' responses to the Parent Questionnaire and Survey of Temperamental Characteristics (see Appendix A, A-5 and A-6) are

summarized in Table C-5. Intercorrelations among the questionnaire items are reported in Table C-6. (Degrees of freedom for all correlations are 22; all tests are two-tailed with $p<.05$ unless otherwise indicated.) Although all the means and correlations are presented, only some were of particular interest. The mothers' temperament ratings of the infants were correlated with ratings of the infants' behavioral cuteness ($r=.45$), satisfaction with the infants' temperament ($r=-.55$), and similarity of the infants' temperament to their own ($r=.44$). More difficult infants were rated as being less cute in behavior, having less satisfactory temperaments and being less similar to the mother in temperament.

The intercorrelations among the questions about physical appearance (questions 13, 14, 15, 16, 31, and 32) were also of interest. Of the six correlations between questions about the infant's cuteness (questions 13, 14, 15, and 16), three were significant (13 and 14, $r=.60$; 14 and 16, $r=-.47$, and 15 and 16, $r= 66$) (note that low numbers indicate high cuteness on questions 13 and 14 but the opposite is true for questions 15 and 16). Correlations were highest for questions using the same scale (13-14 and 15-16), even though the questions in these pairs differ in content. It is interesting to note that the cuteness ratings on question 13 were not significantly correlated with the cuteness ratings on question 16, even though the questions are essentially the same. Both of these ratings were significantly correlated with the rating of behavioral cuteness (question 14), which indicates that the mothers took behavior as well as physical appearance into account in their cuteness ratings. They also may have considered the similarity of their infants' appearance to their own and their

husbands', since one of the cuteness ratings (question 16) was significantly correlated with the mothers' rating of how much the infant looks like their husbands (question 32, r=.49). Infants who looked less like their fathers were given higher cuteness ratings. In addition, questions 31 and 32 were significantly correlated (r=-.48), indicating that infants who were perceived as looking more like their fathers were perceived as looking less like their mothers. These correlations imply that mothers should perceive infants who look like them as cuter. The appropriate correlation (questions 16 and 31) approached significance (r=-.36, .05<p<.10).

It was possible to compare the mothers' ratings of the cuteness of their infants with a presumably more objective measure, the observers' cuteness ratings. The scale used by the observers was identical to that used by the mothers on questions 15 and 16. The means, standard deviations, and reliabilities (Cronbach's alpha) for the observer ratings are reported in Table 4. The ratings given to male and female infants were not significantly different. Mothers' ratings of their infants (question 16) were significantly higher than the ratings made by the observers, $t(23)$=4.75, p<.01. Correlations between observers' ratings and the mothers' responses to questions about physical appearance are presented in Table 5. First, note that the observers' ratings of the mother and infant were positively correlated (r=.42). This could be due either to halo effects on observer ratings or to the fact that cuter infants have more attractive mothers. Since the observers' ratings were not made independently for the mother and infant, this question cannot be answered.

Table 4
Observer Attractiveness Ratings

	Mean	SD	Alpha
Male Infants	69.05	17.87	
Female Infants	75.83	14.79	
All Infants	72.44	16.41	.79
Mothers	59.53	15.43	.81

Table 5
Correlations Between Observer Attractiveness Ratings
And Mothers' Questionnaire Responses

	Observer Ratings	
	Infant	Mother
Question 13	-21	25
Question 14	-33	-16
Question 15	37*	09
Question 16	49*	31
Question 31	-36*	08
Question 32	48*	24
Observer ratings of infant cuteness	---	42*

The observers' ratings of the infant's cuteness were correlated with the cuteness ratings the mothers gave using the same scale (r=.49) and the mothers' ratings of the infant's similarity of appearance to the father (r=.48). Cuter infants, according to observer ratings, were rated cuter and less similar in appearance to their fathers by their mothers. The observers' ratings of the mothers' attractiveness were not correlated with any of the physical appearance questions.

Infant Test Behavior

The average responses of the infants as a group and for each sex during the Infant Test are presented in Table C-7. Intercorrelations

among the measures and their correlations with infant sex and temperament are presented in Table C-8. Boys and girls differed significantly in the frequency of smiling during the photograph presentation (r=.45) and in both the total amount and frequency of smiling during the mirror image presentation (r=.46 and r=.44, respectively). In all three cases girls smiled more than boys.

The relationship between temperament ratings and behavior during the Infant Test was investigated. First, some of the Infant Test measures were combined into composite scores on the basis of an exploratory factor analysis. Composites were formed from 1) the two measures of looking at the photograph (PHLK), 2) the two measures of vocalizing during the photograph (PHVOC), 3) the two measures of looking at the mirror image (MIRLK), 4) the two measures of vocalizing during the mirror presentation (MIRVOC), and 5) the four measures of smiling during the photograph and the mirror image presentations (SMILE).

The multiple correlation of these composites plus the difference in looking at the complex and noncomplex checkerboards (CHECKS), the total number of eye and head movements to the movement of the beads (BEADS), and the total number of eye and head movements to the sound of the keys (KEYS) with temperament ratings (TEMP) was determined using a stepwise procedure. The results of this analysis are shown in Table 6. The multiple correlation is significant at each of the first four steps. Infants rated as being more difficult by their mothers vocalized more and smiled less than less difficult infants. Vocalizations during the Infant Test were typically of the fussy variety, so it appears that the more difficult infants fussed more in this situation.

Table 6
Multiple Regression: Infant Test Measures and Mothers' Temperament Ratings

Step	Variable Entered	Multiple R	R^2	R^2 Change	Simple r	Partial r
1	PHVOC	.46*	.21	.21*	.46*	---
2	PHLK	.57*	.32	.11	.24	.38
3	MIRVOC	.61*	.37	.05	.44*	.27
4	SMILE	.63*	.40	.03	-.41*	-.22
5	KEYS	.64	.41	.01	-.06	-.09
6	BEADS	.64	.41	.00	-.22	-.09
7	MIRLK	.64	.41	.00	.08	.05
8	CHECKS	.64	.41	.00	-.04	-.04

Correlates of Infant Interactive Behaviors

An attempt was made to discover correlates of infant interactive behaviors in order to describe and suggest explanations for individual differences. Only the frequency and percent of behaviors are considered, since they appear to have been most amenable to influence and because both mean and interval are linearly dependent on them and therefore somewhat redundant.

First, the mothers' and infants' interactive behaviors were correlated (Table C-9). Infants who gazed and smiled more had mothers who smiled more frequently (r=.45 and r=.69, respectively). It is impossible to tell from this analysis whether infant gazing and smiling produced parent smiling or vice versa. It is evident from the probability analysis described earlier that smiling was more likely during infant gaze than nongaze, which implies that gaze was a precursor of smiling.

Table C-10 presents the correlations between infant interactive behaviors and certain questionnaire items. The mothers' ratings of how

much their infants look at them were positively correlated with the frequency (r=.36) but not the percent (r=-.02) of looking the infant did in the interactive situation (a one-tailed test, p<.05, was used since this relationship was predicted). The ratings of how much the infant likes to look were not related to either measure of looking.

Most of the potential correlates of infant interactive behavior listed in Table C-10 were not significantly related to any of the interactive measures. The exceptions to this are the time since the infant's last nap and medication given to the mother during birth. The longer the time since the infant's last nap the more the infant gazed and vocalized (r=.41 for gaze percent, r=.70 for vocalize frequency, and r=.64 for vocalize percent). In addition, mothers who had received more medication had infants who smiled more.

Table C-11 shows the correlations between Infant Test behavior and interactive behaviors. Infant gaze during the interaction with the mother was not related to looking at the visual stimuli in the Infant Test. However, the percent of mutual gaze was positively correlated with the total time the infant looked at the photograph (r=.44). The frequency of smiling during the interaction, but not the percent, was positively correlated with the frequency of smiling at both the photograph and mirror (r=.71 and r=.60, respectively). Frequency of smiling seems to be a stable individual characteristic across these laboratory situations. In addition, frequency of smiling with the mother was positively correlated with total looking at the photograph (r=.43), as was frequency of vocalization with the mother (r=.41). Infants who vocalized more with their mothers also looked more at the photograph and mirror (r=.43 and r=.44, respectively). Perhaps the more

socially active infants were more visually alert during the Infant Test. Vocal behavior with the mother was not related to vocal behavior during the Infant Test.

The infants' behavior during the Stop condition was analyzed further. The frequency and percent of behaviors during the first 30 sec of the Stop were compared with the frequency and percent during the last 30 sec. None of the differences was significant. In addition, the changes in percent of infants' behaviors from the Interaction to the Stop condition were not correlated with the mothers' participation in the care of the infant (question 17).

Correlates of Mothers' Gaze Behavior

Maternal attitudes and characteristics of the infants were investigated as possible correlates of maternal gaze and mutual gaze. Contrary to hypothesis, infant temperament was not related to maternal gaze frequency (r=.15) or percent (r=-.19), or to mutual gaze frequency (r=-.07) or percent (r=.08).

It was predicted that mothers' looking would be positively correlated with infant cuteness. Stepwise multiple regression was used to correlate three measures of infant cuteness (questions 13 and 14 and observers' ratings of cuteness) with the frequency and percent of mothers' gaze. As shown in Tables 7 and 8 the multiple correlation did not reach significance, nor did any of the simple correlations. There does not appear to be a relationship between mother's gaze and their own or others' ratings of their infants' cuteness.

Table 7
Multiple Regression: Mother Gaze Frequency and Infant Cuteness

Step	Variable Entered	Multiple R	R^2	R^2 Change	Simple r	Partial r
1	Question 13	.17	.03	.03	-.17	---
2	Question 14	.35	.12	.09	.14	.31
3	Observer rating	.36	.13	.01	.02	.06

Table 8
Multiple Regression: Mother Gaze Percent and Infant Cuteness

Step	Variable Entered	Multiple R	R^2	R^2 Change	Simple r	Partial r
1	Question 13	.15	.02	.02	-.15	---
2	Observer rating	.21	.05	.03	-.11	-.15
3	Question 14	.22	.05	.00	-.09	-.04

Another prediction was that mothers with more positive attitudes toward their infants would look more at their infants. Again, stepwise multiple regression was used to test this hypothesis. The results are reported in Table 9. Looking was significantly associated with attitudes, with most of the variance accounted for by the mothers' ratings of her present relationship with her infant (18% of the variance), her attitude toward taking care of her infant (13% of the variance), and her attitude toward playing with her infant (14% of the variance). More looking was associated with a better relationship, but the partial correlations indicated that more looking was also associated with more negative attitudes toward caring for and playing with her infant.

Table 9
Multiple Regression: Mothers' Attitudes and Percent Looking

Step	Variable Entered	R	R^2	R^2 Change	Simple r	Partial r
1	Question 3	.43*	.18	.18	-.43	--
2	Question 9	.56*	.31	.13	-.06	.40
3	Question 13	.57*	.32	.01	-.15	-.13
4	Question 14	.61	.38	.05	-.09	.28
5	Question 10	.72*	.51	14	- 32	.47
6	Satisfaction w/infant temp.	.72*	.52	.00	.07	09
7	Question 6	.72	.52	.00	-.01	-.05

The relationship between mutual gaze and maternal attitudes was tested separately for male and female infants, based on Moss and Robson's (1968) finding that mothers' attitudes (assessed during pregnancy) were related to the frequency of mutual gaze with daughters but not with sons when the infants were three months old. The measure of mutual gaze in their study was much cruder than that in the present study: mutual gaze was scored as present or absent for each minute during a 6-hour home visit. Since their measure is not clearly comparable to the measures of either frequency or percent of mutual gaze in the present study, analyses were performed on both measures. Again, stepwise multiple regression was used. Results are reported in Tables 10 to 13.

Mutual gaze frequency was predicted by maternal attitudes better for female infants than for male infants. In both cases the majority of the variance was accounted for by the mothers' responses to question 9, "What is your attitude toward taking care of your baby?" More frequent

Table 10
Multiple Regression: Mothers' Attitudes and Mutual Gaze Frequency
Male Infants

Step	Variable Entered	R	R^2	R^2 Change	Simple r	Partial r
1	Question 9	.61*	.37	.37	.61	--
2	Question 6	.71*	.50	.13	.30	.46
3	Question 3	.75	.57	.06	.28	-.36
4	Question 10	.77	.60	.03	-.24	.27
5	Satisfaction w/infant temp	.78	.61	.01	.32	-.16
6	Question 13	.80	.63	.02	-.32	.25
7	Question 14	.81	.66	.03	.08	-.26

Table 11
Multiple Regression: Mothers' Attitudes and Mutual Gaze Frequency
Female Infants

Step	Variable Entered	R	R^2	R^2 Change	Simple r	Partial r
1	Question 9	.88*	.77	.77	.88	---
2	Satisfaction w/infant temp	.89*	.79	.02	.10	-.31
3	Question 13	.90*	.82	.02	.33	.33
4	Question 6	.91*	.83	.02	.55	-.29
5	Question 3	.92*	.84	.01	.62	-.22
6	Question 14	.92	.84	.00	.41	-.09
7	Question 10	.92	.85	.01	.35	-.20

Table 12
Multiple Regression: Mothers' Attitudes
and Mutual Gaze Percent
Male Infants

Step	Variable Entered	R	R^2	R^2 Change	Simple r	Partial r
1	Question 14	.61*	.37	.37	-.61	--
2	Question 6	.75*	.56	.19	-.16	-.55
3	Question 10	.81*	.65	.10	-.51	-.47
4	Satisfaction w/infant temp	.83	.69	.04	.01	.34
5	Question 13	.84	.70	.01	-.48	-.13
6	Question 9	.85	.72	.02	-.13	- 28

Table 13
Multiple Regression: Mothers' Attitudes
and Mutual Gaze Percent
Female Infants

Step	Variable Entered	R	R^2	R^2 Change	Simple r	Partial r
1	Question 9	.32	.10	.10	.32	---
2	Question 3	.49	.24	.14	.00	-.39
3	Question 13	.64	.41	.18	-.04	-.48
4	Question 14	.68	.47	.05	.19	.30
5	Question 6	.74	.54	.08	.30	-.38
6	Question 10	.76	.57	.03	.16	.25
7	Satisfaction w/infant temp	.76	.58	.01	-21	-.14

mutual gaze was associated with a more negative response to this question. Most of the other correlations also indicate that more frequent mutual gaze is associated with negative maternal attitudes.

Mutual gaze percent was predicted better for male infants than for female infants. The multiple correlation did not reach significance in the analysis of percent for females However, a significant multiple

correlation was obtained for males with three variables entered. More mutual gaze was associated with higher ratings of infant behavioral cuteness, satisfaction with the infant's sex, and belief in the importance of playing with infants.

Group 1 - Comparison of Mothers and Fathers

Although the mothers and fathers in Group 1 did not differ in their interactive behavior with their infant, the possibility remains that they differed in their responses to questionnaire items and in the correlates of their interactive behaviors. Thus, some of the analyses described in the preceding section were repeated for the 12 mothers and fathers in Group 1.

The parents' responses to questionnaire items are shown in Table 14. The mothers and fathers disagreed in their mean responses on 5 out of 23 of these items (*t*-tests). In addition, their responses were not significantly correlated for 13 out of 23 items. Agreement was best (significant *r*, nonsignificant *t*) for attitudes toward the pregnancy (questions 1 and 2), the desired sex of infant (question 5), the attitude toward playing with the infant (question 10), the cuteness of the infant (question 13), and the father's participation in the care of the infant (question 17). For the remaining 4 questions with significant correlations, the means for mothers and fathers were different. The mothers were more satisfied with their infants' sex (question 6), thought their infants liked to look at them more (question 12), thought their infants were more behaviorally cute (question 14), and thought their infants were less similar to their fathers in temperament. Mothers found caring for their infants more enjoyable than fathers did

(question 9), and fathers thought their infants looked more like the mothers than the mothers did (questions 31 and 32).

Table 14
Group 1 Parents Responses to Questionnaires

Fathers			Mothers				
Question	Mean	SD	Question	Mean	SD	r	t
1	26.19	28.43	1	20.55	27.88	.80	-1.08
2	18.92	16.68	2	24.44	28.15	.50*	0.78
3	4.83	2.55	3	8.96	8.16	.13	1.75
4	17.04	27.33	4	22.24	30.71	-.30	0.37
5	50.31	33.76	5	43.36	32.51	.66*	-0.90
6	15.92	16.90	6	5.95	3.15	.60*	-2.27*
7	52.51	35.55	7	59.90	32.85	.28	0.63
8	25.38	19.87	8	20.43	19.28	-.05	-0.60
9	20.11	13.36	9	8.65	14.92	.25	-2.28*
10	12.28	12.87	10	9.40	11.03	.68*	-1.03
11	35.28	19.21	11	28.63	24.33	.17	-0.80
12	10.90	8.82	12	6.33	3.77	.74*	-2.54
13	21.68	12.12	13	20.74	16.32	.66*	-0.21
14	34.71	13.33	14	24.12	15.51	.62*	-2.85*
15	83.40	14.43	15	83.96	14.78	-.18	0.10
16	86.40	9.90	16	91.79	8.74	.00	1.42
17#	24.58	7.82	17#	24.46	11.63	.60*	-0.19
32	44.06	19.72	31	57.89	18.30	.37	2.82*
31	30.28	17.07	32	34.30	21.88	.29	0.59
Temp	1.71	0.11	Temp	1.61	0.20	.25	-1.70
Sat. w/ temp	13.31	14.84	Sat. w/ temp	14.36	20.79	.35	0.18
Sim. to mother	36.28	19.13	Sim. to mother	31.51	13.93	-.35	-0.60
Sim. to father	25.84	16.93	Sim. to father	40.55	24.78	.67*	2.74*

#Father participation

Mothers' and fathers' ratings of their infants' temperaments were not significantly correlated. On average, they gave the same responses on 24.25 of the 46 temperament questions.

Intercorrelations between parent questionnaire items are reported for the mothers in Table C-12 and for the fathers in Table C-13. The patterns of significant correlations are obviously quite different. Contrary to the findings with the entire group of mothers, none of the questionnaire items correlated with ratings of infant temperament for either mothers or fathers. It should be emphasized that, because of the smaller sample size, a substantially larger correlation is necessary for statistical significance to be obtained in these analyses. In addition, the standard error of correlation coefficients with only 12 subjects is giving a 95% confidence interval of plus or minus .59, which means that most of the correlations between the mothers' responses are not significantly different from those between the fathers' responses.

For the questions related to physical appearance (13, 14, 15, 16, 31, and 32), none of the intercorrelations were significant for the mothers whereas several were for the fathers. The initial cuteness rating of the infant obtained from the father (question 13) was correlated with both of the other (physical) cuteness ratings obtained (questions 15 and 16, r=-.61 and r=-.72, respectively). Both ratings on the 5-point scale (questions 15 and 16) were correlated as well (r=.79). Finally, infants who looked more like their mothers (question 32) were rated cuter (question 13) by their fathers (r=.61). Recall that the mothers in both groups combined gave higher cuteness ratings to infants who looked less like their fathers.

Again, it is possible to compare the parents' cuteness ratings with the observers' ratings (Table 15). The observers' ratings of the mothers and fathers were not significantly different. The reliabilities for the ratings of the fathers were quite low, however. There are two

potential explanations for the low reliabilities for the fathers. First, fewer fathers were rated (12) than mothers or infants (24). Thus, observers had less practice rating fathers. Second, there is some evidence that the physical attractiveness stereotype is applied more stringently to women than men in our culture (Bar-Tal & Saxe, 1976). The standards for rating the physical attractiveness of women may thus be better established and more universal than those for rating men.

Table 15
Observer Attractiveness Ratings
Group 1

	Mean	SD	Alpha
Mothers	60.13	10.92	.60
Fathers	58.62	10.56	.48
Infants	73.42	16.37	.82

Correlations between the parents' responses to questions about physical appearance and the observers' ratings are reported in Table 16. The parents' and observers' ratings were not correlated. The only meaningful correlation is that between the observers' ratings of the infant's cuteness and the mothers' ratings of how much the infant looks like the father (r=.82). As in the entire group of mothers, cuter infants were rated as looking less like their fathers.

As with the entire sample of mothers, cuteness ratings were not significantly related to parental gaze behavior. The results of multiple regressions predicting parent looking are reported in Tables 17, 18, 19, and 20.

Table 16
Physical Appearance Correlations
Group 1

	Observer Ratings					
	Mothers' Responses			Fathers' Responses		
Question	Infant	Mother	Father	Infant	Mother	Father
13	.08	.35	.11	-.44	.22	.08
14	.04	-.23	.03	.26	-.61	.20
15	.22	.38	.11	-.07	-.26	-.42
16	.16	.23	-.36	- 20	-.42	-.39
31	-.40	-.07	-.33	.09	-.10	.35
32	.82*	.01	.40	- 47	.00	-.23
Observer rating of infant	---	.23	.51	---	.23	.51
Observer rating of mother	.23	---	.16	.23	---	.16

Table 17
Multiple Regression: Mother Gaze Frequency and Infant Cuteness
Group 1

Step	Variable Entered	R	R^2	R^2 Change	Simple r	Partial r
1	Observer rating	.19	.04	.04	.19	---
2	Question 14	.25	.06	.03	.17	.16
3	Question 13	.27	.08	.01	.00	-.11

Table 18
Multiple Regression: Mother Gaze Percent
and Infant Cuteness
Group 1

Step	Variable Entered	R	R^2	R^2 Change	Simple r	Partial r
1	Question 13	.35	.12	.12	-.35	---
2	Question 14	.38	.14	.02	-.31	-.16

Table 19
Multiple Regression: Father Gaze Frequency
and Infant Cuteness
Group 1

Step	Variable Entered	R	R^2	R^2 Change	Simple r	Partial r
1	Question 14	.36	.13	.13	.36	---
2	Question 13	.37	.13	.01	.02	.09

Table 20
Multiple Regression: Father Gaze Percent
and Infant Cuteness
Group 1

Step	Variable Entered	R	R^2	R^2 Change	Simple r	Partial r
1	Question 13	.23	.05	.05	.23	---
2	Observer rating	.28	.08	.03	.04	.17

The relationships between percent looking and parental attitudes were also tested (Tables 21 and 22). Fathers' looking was predicted by satisfaction with infants' temperament and the ratings of behavioral cuteness. More looking was associated with greater satisfaction, but once that effect was partialled out, more looking was associated with rating the infant as less cute in behavior. None of the correlations was significant for this subset of mothers.

Table 21
Multiple Regression: Mothers' Attitudes and Percent Looking
Group 1

Step	Variable Entered	R	R^2	R^2 Change	Simple r	Partial r
1	Question 3	.54	.30	.30	-.54	---
2	Question 9	.64	.41	.11	-.17	.40
3	Question 10	.68	.46	.05	-.51	.30
4	Sat w/temp	.71	.50	.04	-.12	-.28
5	Question 14	.74	.54	.04	-.31	.29
6	Question 13	.81	.66	.12	-.34	-.51
7	Question 6	.83	.70	.04	-.41	-.32

Table 22
Multiple Regression: Fathers' Attitudes and Percent Looking
Group 1

Step	Variable Entered	R	R^2	R^2 Change	Simple r	Partial r
1	Sat w/temp	.58*	.33	.33	-.58	---
2	Question 14	.71*	.50	.17	-.01	.50
3	Question 10	.73	.54	.04	-.09	-.27
4	Question 3	.75	.56	.03	.18	.24
5	Question 13	.77	.60	.03	.23	-.27
6	Question 9	.78	.60	.01	-.19	-.12
7	Question 6	.78	.61	.01	-.19	.15

A final analysis was conducted to determine whether more experienced fathers were more similar to their wives in their interactive behaviors than were less experienced fathers. Responses to question 17 (participation in care of the infant) were used as a measure of interactive experience. The absolute value of the difference between each set of parents' scores for each interactive behavior was correlated with the fathers' responses to question 17. None of the correlations was significant.

Summary of Results

1. Mothers did not differ from fathers in any of their interactive behaviors.
2. Male infants in Group 1, Order 2 (fathers first) vocalized more during the Stop condition with their mothers than any other infants in Group 1.
3. There was a sex difference in the amount of mutual gaze between parents and infants in Group 1. With female infants, more mutual gaze occurred during the second interaction than during the first, and with male infants, more mutual gaze occurred during the first interaction than during the second.
4. Male infants had longer smiles than female infants in Group 2.
5. Infants in Group 2 generally vocalized more during their second interaction than during their first.
6. Infants in Group 2 smiled more and engaged in more frequent mutual gaze when they did not have their pacifiers than when they did.
7. Infants in Group 2 gazed more and smiled longer when their mothers were interacting with them than when they weren't.

8. Mothers and infants tended to smile more during infant gaze.
9. Mothers' ratings of their infants' cuteness were higher than, but correlated with, observers' ratings. Cuter infants were rated cute in behavior and dissimilar to their fathers in appearance.
10. Girls smiled more frequently than boys during the Infant Test.
11. Difficult infants vocalized more and smiled less during the Infant Test.
12. Infants who smiled more frequently during the interaction also smiled more frequently during the Infant Test.
13. Mothers who had positive attitudes toward caring for their infants looked longer at their infants
14. More frequent mutual gaze was associated with negative maternal attitudes.
15. More total mutual gaze was associated with positive maternal attitudes for mothers of male infants but not for mothers of female infants.
16. Mothers and fathers differed in many of their questionnaire responses.
17. Fathers who were satisfied with their infants' temperaments looked longer at their infants.

CHAPTER 5

DISCUSSION

The purpose of this study was to investigate the regulation of gaze during face-to-face interactions between parents and their young infants. Although only a short segment of behavior was observed in a relatively artificial setting, the importance of such factors as infant fatigue and parental attitudes was evident.

This discussion is divided into three major sections. First findings related to the original hypotheses are summarized and the status of the hypotheses is discussed Then, incidental findings and their relationships to hypotnesized relationships are considered. Finally, some of the problems encountered in conducting the study and interpreting the results are discussed.

Tests of Hypotheses

Across the entire group of infants the hypothesized lack of sex differences was confirmed. However, in Group 1, Infant Sex interacted with Order and Parent to influence the percent of infant gaze. Although this interaction could not be interpreted, the same interaction was significant and interpretable for the percent of mutual gaze, which was determined primarily by infant gaze behavior. More mutual gaze occurred with the first parent for male infants and with the second parent for female infants. It did not seem to matter which parent was first or second.

The same effect was not observed in Group 2. However, the conditions to which the infants were exposed were not comparable in the two groups. Group 2 infants interacted with the same parent in the second condition, but pacifier availability changed, and the mothers' behavior differed as a function of both Sex and the interaction between Sex and Order. There was also less time and disruption between parts in Group 2 since the mothers had been instructed in advance as to the procedure. In Group 1, on the other hand, both parents and the experimenter were with the infant for a short period between parts.

Since the parents in Group 1 did not differ in any of their interactive behaviors, the two interactions might be construed as two habituation trials. The boys habituated while the girls increased their looking from trial 1 to trial 2. In support of this interpretation, Cohen and Gelber (1975) reviewed several studies which found greater habituation in male than female infants. In addition, Cohen (1973) presented evidence that female infants oriented more quickly to a stimulus if previously presented stimuli were interesting. In this condition, the females seemed to increase rather than decrease their attention over trials. Thus, the female infants in Group 1 may have gone through a process of "warming up" to the interactive setting while the male infants habituated to it.

If the change in looking during the interaction was due to a generalizable sex difference, differences in looking during the Infant Test might also be expected. Although for the entire group of infants, the only sex differences were in smiling, for Group 1 infants alone there was a sex difference in looking at the photograph (which was the first stimulus presented). Again, male infants looked longer than

female infants, r=-.70, mean for male infants = 20.43 sec, mean for female infants = 9.47 sec. There were no sex differences in looking at any of the other Infant Test stimuli.

These findings imply that the decrease in male looking and increase in female looking across trials is a relatively stable characteristic of the particular infants in Group 1. If this effect is not a spurious one, it must be limited to very specific conditions, which were not met in Group 2.

The hypothesized relationships between mother-infant mutual gaze and maternal attitudes was not confirmed. Although mothers' attitudes did predict mutual gaze better for girls than for boys on the frequency measure, the variables which contributed most to the multiple correlation correlated positively with mutual gaze frequency, indicating that more frequent mutual gaze was associated with negative maternal attitudes. This result is contradictory to the finding of Moss and Robson (1968) that positive pregnancy attitudes were associated with more frequent mutual gaze at three months with girls but not with boys. The methods of measuring mutual gaze frequency in these two studies were so dissimilar that direct comparisons between the studies must be made with caution.

It may be that the percent measure of mutual gaze in the present study is more comparable to Moss and Robson's frequency measure. In this case (percent), mothers' attitudes predicted mutual gaze with sons but not with daughters. The variables contributing to this effect were negatively correlated with mutual gaze with sons, indicating that more mutual gaze was associated with positive maternal attitudes. This finding is in line with Moss and Robson's observation that mutual gaze

was associated with a mother's concurrent concern about her infant's well-being for male infants but not for female infants.

If these two studies can be considered comparable in their measurements of mothers' attitudes and mutual gaze, more mutual gaze at three months should occur if mothers of female infants had positive attitudes toward infants and parenthood during pregnancy, and if mothers of male infants currently have positive attitudes toward them.

Another hypothesized predictor of mutual gaze, mothers' temperament ratings of their infants, was not related to mutual gaze. In fact, none of the interactive behaviors of the infants were related to the temperament ratings. However, some infant behaviors were related to temperament ratings during the Infant Test. More difficult infants smiled less and vocalized more. Temperament ratings were not related to looking, however.

The mothers rated their infants' temperaments soon after the administration of the Infant Test, which they could watch from across the room. The mothers' temperament ratings therefore may have been determined in part by their infants' concurrent behavior. An alternative explanation of these findings is that temperamental "difficulty" is evident only under moderately stressful situations. The face-to-face interactions may have been familiar enough to the infants to have prevented them from becoming upset. By the time the Infant Test took place, however, the infants may have been tired, and the exposure to unfamiliar stimuli, including handling by a strange woman (the experimenter), may have been sufficient to cause distress in some infants. These same infants may also be more easily distressed in other situations, leading to their mothers' perceptions of them as difficult.

It is impossible to differentiate between these explanations in the present study. It does raise the methodological issue of when and how parental attitude information is collected in studies of infants.

The hypothesis that infants whose parents report they have a low level of interest in social gaze will look less than other infants was tentatively confirmed. Mothers who reported that their infants look at them more than they expected had infants who looked at them more frequently, but not more in total amount. Mothers' reports of how much their infants like to look at them were not related to either measure of gaze.

Again, the possibility that the mothers answered this question based on the infant's immediately preceding behavior rather than on a more general trait must be recognized. Even so, only 13 percent of the variance in frequency of infant gaze was accounted for by mothers' answers to this question.

The fact that mothers' answers to this question were correlated with frequency but not percent of mutual gaze suggests that the infant's frequency of looking is more salient to the mothers than the infant's total amount of looking. Gaze transitions tend to be fairly obvious, whereas the length of looking may be a less obvious aspect of gaze behavior to mothers.

The hypothesized relationship between parents' perceptions of their infants' cuteness and their own looking behavior was not confirmed. There was no relationship between parents' or observers' ratings of the infants' cuteness and parent looking. There are several possible explanations for this finding. Perhaps the most obvious is that there is no relationship between infant physical attractiveness and parent

looking. Although these findings are consistent with this explanation, a more complete test of the hypothesis would be desirable before rejection.

In a previous study of mothers' responses to infant physical attractiveness (Hildebrandt & Fitzgerald, Note 1), longer looking was associated with higher cuteness ratings when infant photographs were presented in pairs but not when they were presented individually. It may be that physical attractiveness affects looking only when there is a choice of what to look at. In the present study, parents had litle of interest to look at besides their infant. The experimental room was relatively barren, and the parents had been instructed to direct their attention to their infant. It is somewhat surprising, under these circumstances, that parent looking varied as much as it did.

If physical attractiveness effects on looking occur only under conditions of a choice between two or more objects, they may occur in a visually interesting setting, when an adult is caring for more than one child, or when an adult is distracted by other people or objects. It seems reasonable to test this hypothesis in other settings than the short laboratory interactions reported here. The amount of parent looking recorded may have been too short to reveal effects.

Only one of the predicted effects of pacifier availability was found. Although there were no effects of pacifier availability on gaze behaviors, it did have a suppressing effect on smiling. Vocalizations were not directly affected by pacifier availability, but there was an interaction with Order. The hypothesis was supported for vocalization when the pacifier interaction preceded the no-pacifier interaction, but not when the order was reversed. As might be expected, taking a

pacifier away from an infant causes some distress, which is reflected by increased vocalization. Recall that both positive and negative vocalizations were being recorded. Vocalizing was most effectively reduced by the pacifier when the pacifier interaction came first. In general, infants seemed to vocalize more during the second interaction, probably because they were tired. Even in this short a study, the effects of infant fatigue were evident.

A possible explanation for the absence of differences in gaze during the pacifier and no-pacifier interactions rests on Sroufe and Waters' (1976) interpretation of the role of infant smiling. They suggested that smiling serves a tension reduction function. In line with the gaze/arousal hypothesis, infants who gaze more would be expected to smile more, since they are not using gaze aversion to reduce their arousal. This speculation is supported by the strength of the correlation between gazing and smiling during Part A (r=.79). Infants who gazed more also smiled more. If the overall rate of smiling is suppressed by pacifier availability it cannot act as a buffer and the infant must find some other way of reducing arousal (tension). Both sucking and gaze aversion have been suggested as serving this function. If infant buffering systems are hierarchically organized and sucking is more easily activated than gaze aversion, then it would not be necessary for the infants in this study to change their gaze behavior when provided with the opportunity to suck. It seems reasonable to assume that gaze aversion would be used as an arousal reducing mechanism only as a last resort because of the importance of perceiving changes in the environment. Neither sucking nor smiling require the infant to pay less attention to environmental stimuli.

Contrary to expectation, mother-infant and father-infant interactions did not differ. There were no overall differences between mothers and fathers in their interactive behaviors, and no main effects of parent on infant interactive behaviors. The Sex x Order x Parent interaction for mutual gaze was related to differences between the temporal orders of the interactions rather than to sex of parent.

Considering the nature of this study it is not too surprising that there were no parent effects. Other studies which have found differences between mothers and fathers have studied their behaviors in more detail than in the present study, and the differences found have been relatively minor. The requirements of the parents in this study were fairly rigid, not allowing for much variability in behavior. Again, differences might have occurred in a less structured, longer interaction.

The fathers in Group 1 did not seem to differ as a function of their prior interactive experience with their infants either. More experienced fathers were not more similar to their wives in their interactive behavior than less experienced fathers were. As stated earlier, interactions may have been too structured and the measures too crude to disclose differences between mothers and fathers. It may also be that these parents do not differ from one another in any obvious ways in their typical interactions with their infants.

The hypothesis that more parental looking would be associated with more positive parental attitudes was confirmed for the entire group of mothers (but not for Group 1 alone) and for the entire group of fathers. It should be noted that the questions chosen as predictors of parent gaze were not highly intercorrelated, implying that no singular

construct of a "positive parental attitude" was being tapped. However, some positive feelings toward an infant seem to be related to looking behavior even in a structured situation such as this one. It would be reasonable to expect these effects to occur in other settings as well.

The interaction of parent sex with infant sex was not significant for either parent or infant behavior. Again, this may be due to the short length and high structure of the recorded interactions. Also, only three behaviors were recorded, and differences might have been more obvious in other behaviors.

The hypothesized pattern of infant response to the cessation of their parents' behaviors was not observed. Infant behavior during the first half of the Stop condition was not different from behavior during the second half. The infants behavior did change from the Interaction to the Stop condition (at least for Group 2), with both the amount of gazing and length of smiling decreasing.

It seemed obvious while observing the experiment that most infants noticed the cessation of their parent's behavior. However, different infants seemed to respond to this condition in different ways, thereby attentuating group effects. Some infants simply switched their attention to something else (the patterned cover on the infant seat and the fluorescent lights overhead were favorite objects of attention), while others seemed to try to elicit behavior from the quiescent parent by kicking and vocalizing. A few infants seemed distressed, whereas a few who had been distressed during the interaction became quiet when the parent stopped interacting with them. These types of responses could not be quantified from the data collected.

It was expected that infants in dyads with low interactive experience would show a smaller change in behavior in response to parent behavior cessation than infants in dyads with high interactive experience. The hypothesis was not supported, however. The measure of interactive experience used (question 17) was probably not adequate for this test. Providing more of the care for an infant does not necessarily imply spending more time interacting with the infant. In addition, the measure was a relative one, comparing the amount of care provided with that provided by the spouse, rather than an absolute measure of time spent with the infant. Thus, a more accurate measure of the amount of interactive experience of parents and infants is needed to adequately test this hypothesis.

Other Findings

A number of significant findings were not predicted. Considering the large numbers of tests performed and the relatively small sample size, these findings must be interpreted cautiously, since many of them may be due to Type I error. Replication studies will be needed to confirm or reject these results.

EFFECTS OF INFANT FATIGUE

Some of the significant findings may have been the result of infant fatigue. For example, the 4-way interaction in Group 1 for vocalization was due to the fussing of two male infants during the second Stop condition. At this point the infants had been in the laboratory situation for 15-20 minutes and may have been tired. In addition, recall that in Group 2, more vocalizing tended to occur during the

second interaction than during the first. For both groups of infants combined, more vocalizing during the no-pacifier interaction with the mother was associated with a longer time since the infant's last nap. This supports the idea that vocalizations were a result of fatigue.

Time since the infant's last nap was also associated with more gaze during the interaction. There are several possible explanations for this observation. A tired infant may be less easily distracted by nonsocial objects in the environment than an alert infant. It could also be more difficult for a tired infant to actively avert gaze, and if the gaze/arousal hypothesis is correct, there is less need for a tired (low arousal) infant to avert gaze. The suggestion that tired infants look longer is supported by the correlations between vocalization during the interaction and looking during the Infant Test (Table C-11). More vocalizing during the interaction was associated with more looking during the Infant Test. This interpretation is based on the assumption that vocalizations were negative and indicative of fatigue. However, no differentiation was made in the recording of positive and negative vocalizations, so this interpretation must be tentative. In any event, fatigue appeared to influence infant behavior even within the 30 minutes required for testing.

INFANT TEST BEHAVIOR

Only the frequency of smiling was stable across the interaction and the Infant Test. Frequency of smiling seems to be a stable individual trait, whereas gazing and vocalizing are not. Two of the correlations for gaze which approached significance ($.05<p<.10$) suggest that infant

social and nonsocial looking may differ. Higher gaze percent during the interaction was associated with more total looking at the photograph (r=.40) and the mirror (r=.34), and more frequent gaze during the interaction was associated with more frequent gaze at the mirror (r=.35). Frequency of gaze may be stable across social objects, whereas amount of gaze may be stable across both social and nonsocial stimuli.

PHYSICAL APPEARANCE

Although infant cuteness ratings were not related to parent gaze behavior, as had been hypothesized, other aspects of the physical attractiveness data were of interest. It is particularly notable that the mothers' ratings of their infants' cuteness were correlated with the observers' ratings. This is important since it is often assumed that essentially all mothers consider their infant to be the cutest. The mothers in this study did rate their infants as being more cute than the observers did, but the ratings were correlated nonetheless.

The observation that mothers rated as cuter infants who looked less like their fathers was interesting, particularly since the observers' ratings of the mothers and infants were correlated. It would have been useful to collect observers' ratings of the similarity of infants' appearance to that of the mother and father. It would then be easier to assess how objective the parents' assessments of similarity of physical appearance were.

PARENT DIFFERENCES

Although mothers and fathers did not differ in their interactive behaviors, they did differ on many of their questionnaire responses.

The implications of these differences for parent-infant relations were not evident in the present study. A longer sample of interactive behavior might have aided this attempt. In addition, the small sample size (12) provided little power for statistical tests.

Conclusion

The present study illustrates that much can be learned about parents and infants in a very short laboratory visit. The relevance of this knowledge to more typical parent-infant interactions can only be assessed through additional studies. Explanations of infant interactive behavior in terms of arousal changes seem to be supported by some of the results reported here, but again, more work is needed to confirm some of the speculations offered here.

APPENDICES

APPENDIX A

A-1
Letter to Parents

MICHIGAN STATE UNIVERSITY

Department of Psychology East Lansing, Michigan 48824

Dear Parents:

Since 1967 the Infant Learning Laboratory at Michigan State University has been actively involved in studies of various aspects of infant development, parent-infant relationships and infant care. Our studies have explored learning, memory, attention, pacification, breast versus bottle feeding, and basic visual and auditory processes during the first year of life. Hundreds of babies in the Lansing metropolitan area have participated in these studies.

One of our current projects concerns how young infants interact with their parents Even though your infant can't yet talk, you have probably noticed that he or she can interact with you in a "conversational" manner. We would like to study these face-to-face interactions in detail, by asking parents to interact with their infants in our laboratory for a few minutes while we record various behaviors.

In order to conduct this study, we need parents to volunteer to bring their infants to our laboratory on the Michigan State University campus. Two groups of infants will be tested, and if you and your infant fit the requirements for either group, we would like to ask you to consider participating in this study

Group 1: For this group we need first-born infants who experienced no serious birth complications. Both parents must be willing to accompany their infant to the laboratory and participate in the study. Although quite a lot is known about mother-infant interaction, much less is known about father-infant interaction, and we would like to study infant interactive behaviors with both parents.

Group 2: For this group we need infants of any birth order who experienced no serious birth complications. Only mothers need particpate with their infants. We would like to observe these infants' interactive behaviors when they are sucking on a pacifier and compare them with their usual interactive behaviors. Therefore, infants in this group must be pacifier users.

The entire test session lasts about an hour. Besides observing the interaction between you and your infant, we will ask you to complete a questionnaire on various characteristics of your infant and yourselves Your responses to these questions, as well as your infant's and your own behaviors, will be kept in strictest confidence and will be identified only by number, assuring anonymity. Testing takes place in room 120 of

the Psychology Research Building (see enclosed map). If you are interested in participating in this study, please call Katherine Hildebrandt at 353-3933 (if she isn't there, leave a message; if there is no answer, leave a message at 353-8690; and she will return your call). Your questions will be answered and an appointment will then be made. We would like to test infants as close to 3 months of age as possible.

We appreciate your help in conducting this research project. If you have any questions, do not hesitate to call. We would be glad to describe the testing procedure in more detail before you decide whether or not you want to participate. We hope to hear from you soon.

Sincerely,

Katherine A. Hildebrandt, M.A.
Doctoral Candidate

Hiram E. Fitzgerald, Ph.D.
Professor of Psychology

A-2

Research Consent Form

1. I have freely consented to take part in, and to allow my child to take part in, a scientific study being conducted by Katherine Hildebrandt and Hiram E. Fitzgerald.

2. The study has been explained to me and I understand the explanation that has been given and what our participation will involve.

3. I understand that I am free to discontinue our participation in the study at any time without penalty.

4. I understand that the results of the study will be treated in strict confidence and that my child and I will remain anonymous. Within these restrictions, results of the study will be made available to me.

5. I understand that our participation in the study does not guarantee any beneficial results to us.

6. I understand that, at my request, I can receive additional explanation of the study after my participation is completed.

Signed_____

Date_____

A-3

SUBJECT NO._____
Completed by MOTHER or FATHER

Today's Schedule and Trip to the Laboratory

When was your baby last fed?

When did your baby wake up from his or her last nap?

Were there any obvious differences in your baby's routine today?

Yes___ No___

If yes, describe:

How would you describe your baby's mood during today's laboratory visit?

___unusually irritable

___slightly more irritable than usual

___typical

___slightly more quiet than usual

___unusually quiet

___other:

A-4

SUBJECT NO._____
TO BE COMPLETED BY MOTHER

Background Information

Date of birth_____

Due date_____

Birth weight_____

Did you experience any complications during pregnancy?

___Yes ___No

If yes, describe:

Did you experience any complications during labor?

___Yes ___No

If yes, describe:

Did you experience any complications during delivery?

___Yes ___No

If yes, describe:

Were you given any medications during labor?

___Yes ___No

If yes, describe:

Were you given any medications during delivery?

___Yes ___No

If yes, describe:

Has your baby experienced any prolonged or general illnesses since birth?

___Yes ___No

If yes, describe:

Is your baby breast or bottle fed?

___Breast ___Bottle

___Combination (___% breast, ___% bottle)

Does your baby regularly use a pacifier?

___Yes ___No

If yes, how frequently?

Background Information on Parents

Last year of education completed:

	High School	College	Graduate School	Degrees
Mother	8 9 10 11 12	1 2 3 4	1 2 3 4 5	
Father	8 9 10 11 12	1 2 3 4	1 2 3 4 5	

Occupation:

Mother:

Father:

Age:

Mother:

Father:

Years married:

A-5

SUBJECT NO._____
Completed by MOTHER or FATHER

Parent Questionnaire

1. How would you describe your feelings when you first found out you were (your wife was) pregnant?

very happy	indifferent	very unhappy

2. Over the course of the entire pregnancy, how would you describe your overall feelings about it?

very happy	indifferent	very unhappy

3. How would you rate your present relationship with your baby?

very good	neither good nor bad	very poor

4. At this point, do you think you would like to have another baby?

yes	maybe	no

5. Which sex did you want your baby to be?

male	didn't care	female

6. How satisfied are you with the sex of your baby?

very satisfied	indifferent	not satisfied

7. If you were to have a second baby, which sex would you prefer?

male	wouldn't care	female

8. How much do you think you will like your baby when he or she is older?

more	the same	less

9. What is your attitude toward taking care of your baby?

very enjoyable	tolerable	very unpleasant

10. What is your attitude toward playing with your baby?

very important for babies this age	slightly important for babies this age	not at all important for babies this age

11. How much does your baby look at you?

more than I expected	about as much as I expected	less than I expected

12. Does your baby seem to like to look at you?

yes	can't tell	no

13. Compared with other babies this age, how cute (physically attractive) is your baby?

much cuter than average	average	much less cute than average

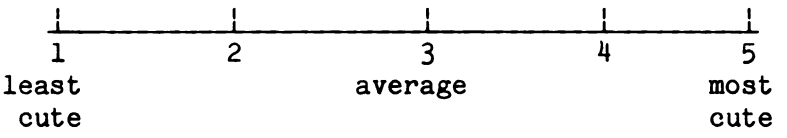
14. Compared with other babies this age, how cute (behaviorally) is your baby?

much cuter than average	average	much less cute than average

15. A group of college students were asked to rate the cuteness of the infant photographs shown on the last page, and they gave them the ratings shown. If we were to take a similar photograph of your baby and ask college students to rate him or her on the same scale, what rating do you think we would get?

1 least cute	2	3 average	4	5 most cute

16. If your were to rate your baby on this scale, what rating would you give?



17. How do you and your spouse distribute the care of your baby?

yourself	____%
your spouse	____%
total	100%

18. How much of your baby's awake time are each of you with the baby?

yourself	____%
your spouse	____%
total	100%

19. How is the time you spend with your baby distributed?

	yourself	your spouse
play	____%	____%
caregiving	____%	____%
other ( )	____%	____%
not interacting	____%	____%
total	____%	____%

20. If you want your baby to look at you, what do you do?

21. If you want your baby to smile, what do you do?

22. What have you tried to make your baby smile that doesn't work?

23. How does your baby typically respond when you look at him or her?

24. How does your baby typically respond when you smile at him or her?

25. How does your baby typically respond when you talk to him or her?

26. How does your baby typically respond when you touch him or her?

27. Why does your baby look away from you some of the time when you are interacting?

28. How was your interaction with your baby in the laboratory different from your typical face-to-face interaction in the home?

29. In what ways did your baby's behavior in the laboratory change from day 1 to day 2?

30. In what ways did your baby's behavior change from the interaction without a pacifier to the interaction with a pacifier?

31. How much do you think you baby looks like you?

|_____|

very much — not at all

32. How much do you think your baby looks like your spouse?

|_____|

very much — not at all

A-6

SUBJECT NO._____
Completed by MOTHER or FATHER

Survey of Temperamental Characteristics

Sleep

1. ___Generally goes to sleep at about same time for night and naps (within 1/2 hour).
___Partly the same times, partly not.
___No regular pattern. Times vary 1-2 hours or more.

2. ___Generally wakes up at about same time from night and naps.
___Partly the same times, partly not.
___No regular pattern. Times vary 1-2 hours or more.

3. ___Generally happy (smiling, etc.) on waking up and going to sleep.
___Variable mood at these times.
___Generally fussy on waking up and going to sleep.

4. With change in time, place or state of health:
___Adjusts easily and sleeps fairly well within 1-2 days.
___Variable pattern.
___Bothered considerably. Takes at least 3 days to readjust sleeping routine.

Feeding

5. ___Generally takes milk at about same time. Not over 1 hour variation.
___Sometimes same, sometimes different times.
___Hungry times unpredictable.

6. ___Generally takes about same amount of milk, not over 2 oz. difference.
___Sometimes same, sometimes different amounts.
___Amounts taken unpredictable.

7. ___Easily adjusts to parents' efforts to change feeding schedule within 1-2 tries.
___Slowly (after several tries) or variable.
___Adjusts not at all to such changes after several tries.

8. ___With interruptions of milk or solid feedings, as for burping, is generally happy, smiles.
___Variable response.
___Generally cries with these interruptions.

9. ___Always cries loudly when hungry.
___Cries somewhat but only occasionally hard or for many minutes.
___Usually just whimpers when hungry, but doesn't cry loudly.

10. ___After feeding, baby smiles and laughs.
___Content but not usually happy (smiles, etc.) or fussy.
___Fussy and wants to be left alone.

11. ___When full, clamps mouth closed, spits out food or milk, bats at spoon, etc.
___Variable.
___Just turns head away or lets food drool out of mouth.

12. ___Initial reaction to new foods (solids, juices, vitamins) acceptance. Swallows them promptly without fussing. without fussing.
___Variable response.
___Usually rejects new foods. Makes face, spits out, etc.

13. ___Initial reaction to new foods pleasant (smiles, etc.), whether accepts or not.
___Variable or intermediate.
___Response unpleasant (cries, etc.) whether accepts or not.

14. ___This response is dramatic whether accepting (smacks lips, laughs, squeals) or not (cries).
___Variable.
___This response mild whether accepting or not. Just smiles, makes face or no expression.

15. ___After several feedings of any new food, accepts it.
___Accepts some, not others.
___Continues to reject most new foods after several tries.

16. ___With changes in amounts, kinds, timing of solids does not seem to mind.
___Variable response. Sometimes accepts, sometimes not.
___Does not accept these changes readily.

Soiling and Wetting

17. ___When having bowel movement, generally cries.
___Sometimes cries.
___Rarely cries though face may become red. Generally happy (smiles, etc.) in spite of having bowel movement.

18. ___Bowel movements generally at same time of day (usually within 1 hour of same time).
___Sometimes at same time, sometimes not.
___No pattern. Usually not same time.

19. ___Usually fusses when diaper soiled with bowel movement.
___Sometimes fusses.
___Usually does not fuss.

20. ___Usually fusses when diaper wet.
___Sometimes fusses.
___Usually does not fuss.

21. ___When fussing about diaper, does so loudly. A real cry.
___Variable.
___Usually just a little whimpering.

Diapering and Dressing

22. ___Generally pleasant (smiles, etc.) during diapering and dressing.
___Variable.
___Generally fussy during these times.

23. ___These feelings usually intense: vigorous laughing or crying.
___Variable.
___Mildly expressed usually. Little smiling or fussing.

Bathing

24. ___Usual reaction to bath: smiles or laughs.
___Variable or neutral.
___Usually cries or fusses.

25. ___Like or dislike of bath is intense. Excited.
___Variable or intermediate.
___Like or dislike is mild. Not excited.

26. ___Reaction to very first tub (or basin) bath. Seemed to accept it right away.
___At first protested against bath.

27. ___If protested at first, accepted it after 2 or 3 times.
___Sometimes accepted, sometimes not.
___Continued to object even after two weeks.

28. ___If bath by different person or in different place, readily accepts change first or second time.
___May or may not accept.
___Objects consistently to such changes.

Procedures-Nail Cutting, Hair Brushing, Washing Face and Hair Medicines

29. ___Initial reaction to any new procedure: generally acceptance.
___Variable.
___Generally objects. fusses or cries.

30. ___If initial objection, accepts after 2 or 3 times.
___Variable acceptance. Sometimes does, sometimes does not.
___Continues to object even after several times.

31. ___Generally pleasant during procedures once established - smiles, etc.
___Neutral or variable.
___Generally fussy or crying during procedures.

Visits to Doctor

32. ___With physical exam, when well generally friendly and smiles.
___Both smiles and fusses: variable.
___Fusses most of time.

33. ___With shots cries loudly for several minutes or more.
___Variable.
___Cry over in less than a minute.

Response to Illness

34. ___With any kind of illness, much crying and fussing.
___Variable.
___Not much crying with illnesses. Just whimpering sometimes. Generally his usual self.

Sensory-Reactions to Sounds, Light, Touch

35. ___Reaction to unusual loud sound or bright light is intense - startles or cries loudly.
___Intermediate-sometimes does, sometimes not.
___Mild reaction-little or no crying.

36. ___On repeated exposure to these same lights or sounds, does not react so much any more.
___Variable.
___No change from initial negative reaction.

Responses to People

37. ___Initial reaction to approach by strangers positive, friendly (smiles, etc.).
___Variable reaction.
___Initial rejection or withdrawal.

38. ___This initial reaction to strangers is intense: crying or laughing.
___Variable.
___Mild-frown or smile.

39. ___General reaction to familiar people is friendly - smiles, laughs.
___Variable reaction.
___Generally glum or unfriendly. Little smiling.

40. ___This reaction to familiar people is intense - crying or laughing.
___Variable.
___Mild-frown or smile.

Reaction to New Places and Situations

41. ___Initial reaction acceptance-tolerates or enjoys them within a few minutes.
___Variable.
___Initial reaction rejection - does not tolerate or enjoy them within a few minutes.

42. ___After continued exposure (several minutes) accepts these changes easily.
___Variable.
___Even after continued exposure, accepts changes poorly.

Play

43. ___Takes new toy right away and plays with it.
___Variable.
___Rejects new toy when first presented.

44. ___If rejects at first, after short while (several minutes) accepts new toy.
___Variable.
___Adjusts slowly to new toy.

45. ___Play usually accompanied by laughing, smiling, etc.
___Variable or intermediate.
___Generally fussy during play.

46. ___Play is intense: much activity, vocalization or laughing.
___Variable or intermediate.
___Plays quietly and calmly.

The preceding questions are related to your baby's temperamental characteristics ("personality"). How satisfied are you with your baby's temperament?

very satisfied — indifferent — not satisfied

Which parent is your baby most like in temperament?

mother — neither — father

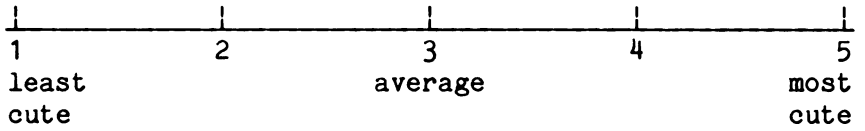
A-7

Observer Cuteness Ratings

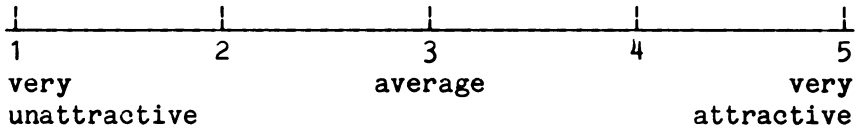
Subject No._____

Observer_____

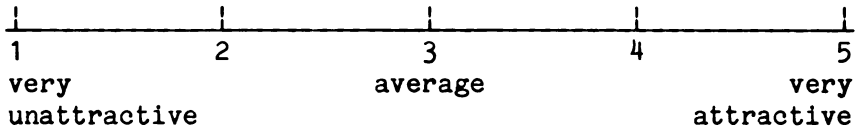
Cuteness of baby



Attractiveness of mother:



Attractiveness of father:



APPENDIX B

Table B-1
MANOVA
Group 1 - Parents - Frequency

Source	df	F	p<
Sex (S)	3,6	1.92	.23
Order (O)	3,6	0.17	.91
S x O	3,6	1.65	.28
Parent (P)	3,6	1.18	.40
S x P	3,6	0.03	1.00
O x P	3,6	0.97	.47
S x O x P	3,6	0.76	.56

Table B-2
MANOVA
Group 1 - Parents - Percent

Source	df	F	p<
Sex (S)	3,6	0.89	.50
Order (O)	3,6	0.12	.95
S x O	3,6	2.15	.20
Parent (P)	3,6	1.31	.36
S x P	3,6	1.00	.46
O x P	3,6	0.23	.88
S x O x P	3,6	0.57	.66

Table B-3
MANOVA
Group 1 - Parents Mean

Source	df	F	p<
Sex (S)	3,6	1.04	.45
Order (O)	3,6	0.43	.74
S x O	3,6	1.93	.23
Parent (P)	3,6	0.91	.50
S x P	3,6	3.50	.09
O x P	3,6	0.53	.69
S x O x P	3,6	0.16	.93

Table B-4
MANOVA
Group 1 - Parents - Interval

Source	df	F	p<
Sex (S)	3,6	0.85	.52
Order (O)	3,6	0.47	.72
S x O	3,6	1.09	.43
Parent (P)	3,6	3.39	.10
S x P	3,6	2.01	.22
O x P	3,6	0.17	.92
S x O x P	3,6	1.25	.39

Table B-5
MANOVA
Group 1 - Infants - Frequency

Source	MS	df	F	p<	Standardized Discriminant Coefficient
Sex (S)	--	3,6	7.33	.02*	
Gaze	645.33	1	4.86	.06	1.26
Error	132.67	8			
Smile	234.08	1	1.66	.24	-1.30
Error	141.00	8			
Vocalize	494.08	1	0.55	.49	1.30
Error	903.33	8			
Order (O)	--	3,6	0.23	.87	
S x O	--	3,6	1.08	.43	
Condition (C)	--	3,6	3.16	.11	
S x C	--	3,6	3.03	.12	
O x C	--	3,6	3.07	.12	
S x O x C	--	3,6	1.69	.27	
Parent (P)	--	3,6	0.08	.98	
S x P	--	3,6	0.48	.71	
O x P	--	3,6	0.31	.82	
S x O x P	--	3,6	0.75	.56	
C x P	--	3,6	1.15	.41	
S x C x P	--	3,6	1.68	.27	
O x C x P	--	3,6	0.49	.71	
S x O x C x P	--	3,6	1.30	.36	

Table B-6
MANOVA
Group 1 - Infants - Percent

Source	MS	df	F	p<	Standardized Discriminant Coefficient
Sex (S)	--	3,6	2.07	.21	
Order (O)	--	3,6	1.41	.33	
S x O	--	3,6	1.96	.23	
Condition (C)	--	3,6	0.78	.55	
S x C	--	3,6	2.61	.15	
O x C	--	3,6	0.57	.66	
S x O x C	--	3,6	1.17	.40	
Parent (P)	--	3,6	2.27	.19	
S x P	--	3,6	2.20	.19	
O x P	--	3,6	2.25	.19	
S x O x P	--	3,6	14.06	.01*	
Gaze	6417.19	1	14.31	.01*	-1.47
Error	448.52	8			
Smile	5.14	1	0.03	.87	0.82
Error	167.18	8			
Vocalize	439.84	1	4.15	.08	0.88
Error	106.06	8			
C x P	--	3,6	2.68	.15	
S x C x P	--	3,6	5.54	.04*	
Gaze	91.30	1	1.13	.32	-1.54
Error	80.86	8			
Smile	17.82	1	1.21	.31	0.19
Error	14.65	8			
Vocalize	123.36	1	3.18	.12	1.60
Error	38.74	8			
O x C x P	--	3,6	3.81	.08	
S x O x C x P	--	3,6	7.51	.02*	
Gaze	19.76	1	0.24	.64	-1.43
Error	80.86	8			
Smile	23.87	1	1.63	.24	0.18
Error	14.65	8			
Vocalize	294.77	1	7.61	.03*	1.64
Error	38.74	8			

Table B-7
MANOVA
Group 1 - Infants - Mean

Source	df	F	p<
Sex (S)	3,6	3.50	.09
Order (O)	3,6	1.02	.45
S x O	3,6	2.08	.21
Condition (C)	3,6	0.46	.73
S x C	3,6	1.68	.27
O x C	3,6	0.70	.59
S x O x C	3,6	1.04	.45
Parent (P)	3,6	0.87	.51
S x P	3,6	1.58	.30
O x P	3,6	1.47	.32
S x O x P	3,6	3.67	.09
C x P	3,6	1.36	.35
S x C x P	3,6	0.57	.66
O x C x P	3,6	2.14	.20
S x O x C x P	3,6	1.02	.45

Table B-8
MANOVA
Group 1 - Infants - Interval

Source	df	F	p<
Sex (S)	3,6	1.44	.33
Order (O)	3,6	0.39	.77
S x O	3,6	0.85	.52
Condition (C)	3,6	3.86	.08
S x C	3,6	2.13	.20
O x C	3,6	2.08	.21
S x O x C	3,6	1.02	.45
Parent (P)	3,6	0.69	.60
S x P	3,6	2.05	.22
O x P	3,6	0.73	.58
S x O x P	3,6	0.35	.79
C x P	3,6	0.82	.53
S x C x P	3,6	0.48	.71
O x C x P	3,6	0.44	.74
S x O x C x P	3,6	0.49	.71

TABLE B-9
ANOVA
Group 1 - Mutual Gaze - Frequency

Source	MS	df	F	p<
Sex (S)	3.00	1	0.16	.71
Order (O)	8.33	1	0.44	.53
S x O	12.00	1	0.64	.45
Error	18.83	8		
Parent (P)	1.33	1	0.11	.76
S x P	75.00	1	5.92	.05*
O x P	3.00	1	0.24	.64
S x O x P	1.33	1	0.11	.76
Error	12.67	8		

Table B-10
ANOVA
Group 1 - Mutual Gaze - Percent

Source	MS	df	F	p<
Sex (S)	47.60	1	0.02	.90
Order (O)	397.90	1	0.17	.70
S x O	342.40	1	0.15	.72
Error	2355.10	8		
Parent (P)	0.07	1	0.00	1.00
S x P	162.07	1	0.33	.58
O x P	229.69	1	0.47	.52
S x O x P	5448.54	1	11.19	.02*
Error	486.72	8		

Table B-11
ANOVA
Group 1 - Mutual Gaze - Mean

Source	MS	df	F	p<
Sex (S)	45.90	1	0.32	.59
Order (O)	221.02	1	1.27	.30
S x O	78.54	1	0.45	.53
Error	174.24	8		
Parent (P)	60.30	1	0.38	.56
S x P	128.71	1	0.82	.40
O x P	81.64	1	0.52	.50
S x O x P	513.52	1	3.26	.11
Error	157.58	8		

Table B-12
ANOVA
Group 1 - Mutual Gaze - Interval

Source	MS	df	F	p<
Sex (S)	2.08	1	0.01	.94
Order (O)	3.85	1	0.01	.92
S x O	30.08	1	0.10	.77
Error	312.82	8		
Parent (P)	9.01	1	0.09	.77
S x P	401.36	1	4.19	.08
O x P	5.33	1	0.06	.82
S x O x P	483.87	1	5.06	.06
Error	95.58	8		

Table B-13
MANOVA
Group 2 - Mothers - Frequency

Source	MS	df	F	p<	Standardized Discriminant Coefficient
Sex (S)	--	3,6	8.74	.02*	
Gaze	27.00	1	0.35	.58	1.86
Error	78.33	8			
Smile	290.08	1	4.93	.06	2.25
Error	58.83	8			
Vocalize	385.33	1	0.30	.61	0.30
Error	1298.92	8			
Order (O)	--	3,6	1.64	.28	
Gaze	147.00	1	1.88	.21	1.93
Error	78.33	8			
Smile	30.08	1	0.51	.50	-2.19
Error	58.83	8			
Vocalize	396.75	1	0.31	.60	0.42
Error	1298.92	8			
Part (P)	--	3,6	0.33	.81	
S x P	--	3,6	0.76	.76	

Table B-14
MANOVA
Group 2 - Mothers - Percent

Source	df	F	p<
Sex (S)	3,6	1.22	.38
Order (O)	3,6	0.84	.53
S x O	3,6	2.27	.19
Part (P)	3,6	0.06	.99
S x P	3,6	1.29	.36
O x P	3,6	2.23	.19
S x O x P	3,6	0.26	.86

Table B-15
MANOVA
Group 2 - Mothers - Mean

Source	df	F	p<
Sex (S)	3,6	0.15	.93
Order (O)	3,6	0.31	.82
S x O	3,6	1.10	.42
Part (P)	3,6	0.12	.95
S x P	3,6	1.89	.24
O x P	3,6	1.66	.28
S x O x P	3,6	0.20	.90

Table B-16
MANOVA
Group 2 - Mothers - Interval

Source	df	F	p<
Sex (S)	3,6	1.94	.23
Order (O)	3,6	0.95	.48
S x O	3,6	0.74	.57
Part (P)	3,6	0.40	.76
S x P	3,6	0.25	.86
O x P	3,6	0.59	.65
S x O x P	3,6	1.08	.43

Table B-17
MANOVA
Group 2 - Infants - Frequency

Source	MS	df	F	p<	Standardized Discriminant Coefficient
Sex (S)	--	3,6	2.72	.14	
Order (O)	--	3,6	4.22	.07	
S x O	--	3,6	26.40	.01*	
Gaze	8.33	1	0.02	.89	0.46
Error	343.50	8			
Smile	1850.08	1	79.29	.01*	-1.14
Error	23.33	8			
Vocalize	108.00	1	0.23	.65	0.50
Condition (C)	--	3,6	2.99	.12	
S x C	--	3,6	1.88	.24	
O x C	--	3,6	0.19	.90	
S x O x C	--	3,6	1.49	.31	
Part (P)	--	3,6	2.72	.14	
S x P	--	3,6	2.36	.18	
O x P	--	3,6	5.84	.04*	
Gaze	21.33	1	1.57	.25	-0.67
Error	13.63	8			
Smile	20.02	1	0.66	.45	-1.06
Error	30.33	8			
Vocalize	290.08	1	10.90	.02*	1.47
Error	26.60	8			
S x O x P	--	3,6	0.54	.68	
C x P	--	3,6	1.81	.25	
S x C x P	--	3,6	2.59	.15	
O x C x P	--	3,6	0.22	.88	
S x O x C x P	--	3,6	1.67	.28	

Table B-18
MANOVA
Group 2 - Infants - Percent

Source	MS	df	F	p<	Standardized Discriminant Coefficient
Sex (S)	--	3,6	1.00	.46	
Order (O)	--	3,6	0.34	.80	
S x O	--	3,6	4.69	.06	
Condition (C)	--	3,6	4.83	.05*	
Gaze	5777.24	1	7.86	.03*	-1.11
Error	734.80	8			
Smile	278.40	1	4.74	.07	-0.15
Error	58.72	8			
Vocalize	11.90	1	0.96	.36	0.97
Error	12.42	8			
S x C	--	3,6	0.51	.70	
O x C	--	3,6	0.34	.80	
S x O x C	--	3,6	1.58	.30	
Part (P)	--	3,6	6.16	.03*	
Gaze	510.91	1	1.31	.29	1.32
Error	389.89	8			
Smile	133.33	1	5.68	.05*	-1.42
Error	23.47	8			
Vocalize	6.53	1	1.16	.32	-0.06
Error	5.65	8			
S x P	--	3,6	2.77	.14	
O x P	--	3,6	6.09	.03*	
Gaze	13.65	1	0.04	.86	-0.09
Error	389.89	8			
Smile	7.68	1	0.33	.59	-0.74
Error	23.47	8			
Vocalize	77.27	1	13.69	.01*	1.22
Error	5.65	8			
S x O x P	--	3,6	1.86	.24	
C x P	--	3,6	0.65	.62	
S x C x P	--	3,6	0.86	.52	
O x C x P	--	3,6	0.32	.81	
S x O x C x P	--	3,6	1.22	.39	

Table B-19
MANOVA
Group 2 - Infants - Mean

Source	MS	df	F	p<	Standardized Discriminant Coefficient
Sex (S)	--	3,6	5.89	.04*	
Gaze	6950.45	1	5.13	.06	-0.92
Error	1355.15	8			
Smile	7.36	1	7.94	.03*	-1.07
Error	0.93	8			
Vocalize	0.16	1	0.13	.73	0.67
Error	1.21	8			
Order (O)	--	3,6	3.23	.11	
S x O	--	3,6	9.95	.01*	
Gaze	6730.80	1	4.97	.06	-0.86
Error	1355.25	8			
Smile	12.00	1	12.94	.01*	-1.11
Error	0.93	8			
Vocalize	0.27	1	0.22	.65	0.82
Error	1.21	8			
Condition (C)	--	3,6	6.33	.03*	
Gaze	445.30	1	1.05	.34	1.03
Error	426.07	8			
Smile	4.32	1	8.87	.02*	-2.11
Error	0.49	8			
Vocalize	0.01	1	0.04	.85	-0.94
Error	0.33	8			
S x C	--	3,6	2.87	.13	
O x C	--	3,6	0.23	.87	
S x O x C	--	3,6	0.26	.86	
Part (P)	--	3,6	1.58	.30	
S x P	--	3,6	0.74	.57	
O x P	--	3,6	0.92	.49	
S x O x P	--	3,6	0.89	.50	
C x P	--	3,6	0.46	.72	
S x C x P	--	3,6	0.80	.54	
O x C x P	--	3,6	0.61	.64	
S x O x C x P	--	3,6	1.46	.32	

Table B-20
MANOVA
Group 2 - Infants - Interval

Source	MS	df	F	p<	Standardized Discriminant Coefficient
Sex (S)	--	3,6	1.01	.46	
Order (O)	--	3,6	0.79	.55	
S x O	--	3,6	11.42	.01*	
Gaze	702.27	1	1.16	.32	-0.18
Error	605.93	8			
Smile	85801.34	1	43.75	.01*	-0.99
Error	1960.81	8			
Vocalize	6435.70	1	0.86	.38	0.06
Error	7450.16	8			
Condition (C)	--	3,6	2.19	.19	
S x C	--	3,6	1.74	.26	
O x C	--	3,6	0.81	.54	
S x O x C	--	3,6	3.66	.09	
Part (P)	--	3,6	7.06	.03*	
Gaze	208.33	1	2.99	.13	1.28
Error	69.69	8			
Smile	3291.80	1	8.54	.02*	-1.09
Error	385.44	8			
Vocalize	9.81	1	0.02	.90	-0.65
Error	517.52	8			
S x P	--	3,6	0.22	.88	
O x P	--	3,6	4.30	.07	
S x O x P	--	3,6	1.50	.31	
C x P	--	3,6	3.85	.08	
S x C x P	--	3,6	0.30	.83	
O x C x P	--	3,6	0.97	.47	
S x O x C x P	--	3,6	1.35	.35	

Table B-21
ANOVA
Group 2 - Mutual Gaze - Frequency

Source	MS	df	F	p<
Sex (S)	52.08	1,8	1.62	.24
Order (O)	14.08	1	0.44	.53
S x O	0.08	1	0.00	.97
Error	32.25	8		
Part (P)	114.08	1	5.37	.05*
S x P	44.08	1	2.07	.19
O x P	18.75	1	0.88	.38
S x O x P	14.08	1	0.67	.44
Error	21.25	8		

Table B-22
ANOVA
Group 2 - Mutual Gaze - Percent

Source	MS	df	F	p<
Sex (S)	5250.08	1	2.66	.15
Order (O)	79.05	1	0.04	.85
S x O	7620.48	1	3.86	.09
Error	1971.92	8		
Part (P)	162.80	1	0.17	.69
S x P	3420.56	1	3.67	.10
O x P	363.00	1	0.39	.55
S x O x P	1391.05	1	1.49	.26
Error	930.99	8		

Table B-23
ANOVA
Group 2 - Mutual Gaze - Mean

Source	MS	df	F	p<
Sex (S)	2610.75	1	1.99	.20
Order (O)	1240.33	1	0.94	.36
S x O	2517.20	1	1.92	.21
Error	1313.53	8		
Part (P)	306.03	1	0.34	.58
S x P	316.21	1	0.35	.57
O x P	574.08	1	0.64	.45
S x O x P	651.21	1	0.72	.42
Error	899.98	8		

Table B-24
ANOVA
Group 2 - Mutual Gaze - Interval

Source	MS	df	F	p<
Sex (S)	1550.41	1	1.29	.29
Order (O)	387.60	1	0.32	.59
S x O	1514.25	1	1.26	.30
Error	1198.14	8		
Part (P)	1825.33	1	1.50	.26
S x P	1713.63	1	1.41	.27
O x P	253.92	1	0.21	.66
S x O x P	263.20	1	0.22	.66
Error	1214.22	8		

Table B-25
Means for MANOVA
Sex - Frequencies of Infant Behavior
Group 1

	Gaze	Smile	Vocalize
Male Infants	10.46	2.08	13.00
	(2.35)	(2.83)	(4.41)
Female Infants	6.79	4.29	9.79
	(2.97)	(3.16)	(8.82)

Table B-26
Means for MANOVAs
Sex x Part - Frequencies of Mutual Gaze
Group 1

	Mother	Father
Male Infants	8.17	5.33
	(2.93)	(2.42)
Female Infants	5.17	7.33
	(2.93)	(2.16)

Table B-27
Means for MANOVA
Sex x Order x Parent - Percent of Infant Behaviors
Group 1

	Gaze		Smile		Vocalize	
	Mother	Father	Mother	Father	Mother	Father
Male Infants						
Order 1	36.58	17.70	4.57	0.98	6.67	7.48
	(22.72)	(17.37)	(6.07)	(1.70)	(7.11)	(8.22)
Order 2	36.52	56.02	2.57	0.97	35.48	7.37
	(23.79)	(29.97)	(3.58)	(1.67)	(13.60)	(7.74)
Female Infants						
Order 1	12.35	44.10	2.63	5.35	7.15	9.43
	(9.90)	(5.07)	(4.22)	(4.78)	(8.37)	(4.68)
Order 2	1.87	19.50	6.78	14.10	7.48	5.05
	(36.78)	(10.78)	(5.53)	(18.47)	(5.98)	(4.80)

Table B-28
Means for MANOVA
Sex x Order x Parent - Mutual Gaze Percent
Group 1

	Mother	Father
Male Infants		
Order 1	40.27	19.73
	(24.36)	(19.73)
Order 2	34.43	47.77
	(24.83)	(39.20)
Female Infants		
Order 1	18.63	48.07
	(24.40)	(17.98)
Order 2	44.73	22.80
	(36.75)	(16.71)

Table B-29
Means for MANOVA
Sex x Condition x Parent - Percent of Infant Behaviors
Group 1

	Gaze		Smile		Vocalize	
	Mother	Father	Mother	Father	Mother	Father
Male Infants						
Interact	35.88	32.62	4.78	1.25	9.08	8.75
	(13.51)	(27.39)	(5.48)	(2.33)	(8.75)	(11.63)
Stop	37.22	41.10	2.35	0.70	33.07	6.10
	(32.92)	(39.32)	(5.37)	(1.72)	(35.14)	(7.28)
Female Infants						
Interact	29.92	42.07	8.58	7.78	6.43	6.85
	(32.43)	(20.26)	(8.90)	(5.52)	(6.72)	(7.29)
Stop	24.30	21.53	0.83	11.67	8.20	7.63
	(26.74)	(18.53)	(1.39)	(24.97)	(10.78)	(7.81)

Table B-30
Means for MANOVA
Sex x Order x Condition x Parent - Percent of Infant Behaviors
Group 1

	Gaze		Smile		Vocalize	
	Mother	Father	Mother	Father	Mother	Father
Male Infants						
Order 1						
Interact	35.67	18.73	4.43	0.57	6.10	4.70
	(18.27)	(14.46)	(4.84)	(0.98)	(10.57)	(7.80)
Stop	37.50	16.67	4.70	1.40	7.23	10.27
	(33.23)	(20.48)	(7.46)	(2.43)	(6.32)	(8.91)
Order 2						
Interact	36.10	46.50	5.13	1.93	12.07	12.80
	(11.07)	(32.99)	(7.15)	(3.35)	(7.30)	(15.10)
Stop	36.93	65.53	0.00	0.00	58.90	1.93
	(40.05)	(40.68)	(0.00)	(0.00)	(32.31)	(0.98)
Female Infants						
Order 1						
Interact	15.53	55.13	5.27	8.47	3.47	10.53
	(17.04)	(12.42)	(8.43)	(7.02)	(3.01)	(9.09)
Stop	9.17	33.07	0.00	2.23	10.83	8.33
	(8.20)	(21.18)	(0.00)	(2.54)	(15.13)	(9.26)
Order 2						
Interact	44.30	29.00	11.90	7.10	9.40	3.17
	(41.45)	(18.96)	(9.70)	(5.05)	(8.80)	(3.10)
Stop	39.43	10.00	1.67	21.10	5.57	6.93
	(32.14)	(3.30)	(1.65)	(35.86)	(6.36)	(8.08)

Table B-31
Means for MANOVA
Sex - Frequency of Parent Behaviors
Group 2

	Gaze	Smile	Vocalize
Male Infants	10.75	9.92	31.21
	(4.69)	(4.66)	(19.63)
Female Infants	12.25	5.00	25.54
	(4.98)	(1.87)	(12.66)

Table B-32
Means for MANOVA
Sex x Order - Frequency of Parent Behaviors
Group 2

	Gaze		Smile		Vocalize	
	Order 1	Order 2	Order 1	Order 2	Order 1	Order 2
Male	10.84	10.67	11.00	8.83	30.00	32.42
Infants	(6.81)	(2.93)	(5.64)	(4.37)	(18.30)	(24.98)
Female	15.83	8.67	4.50	5.50	30.08	21.00
Infants	(4.51)	(1.75)	(2.78)	(0.50)	(16.97)	(7.21)

Table B-33
Means for MANOVA
Sex x Order - Frequency of Infant Behaviors
Group 2

	Gaze		Smile		Vocalize	
	Order 1	Order 2	Order 1	Order 2	Order 1	Order 2
Male	7.75	10.08	4.25	0.75	3.17	4.50
Infants	(4.02)	(5.97)	(1.89)	(0.43)	(3.56)	(4.09)
Female	10.17	13.33	0.33	9.25	7.92	6.25
Infants	(5.75)	(1.01)	(0.58)	(1.32)	(7.67)	(5.41)

Table B-34
Means for MANOVA
Order x Part - Frequency of Infant Behaviors
Group 2

	Gaze		Smile		Vocalize	
	Order 1	Order 2	Order 1	Order 2	Order 1	Order 2
No-pac	10.58	12.00	5.67	11.33	4.08	8.83
	(6.26)	(4.56)	(6.47)	(13.46)	(5.53)	(7.75)
Pac	7.33	11.42	2.50	5.33	7.00	1.92
	(4.02)	(4.41)	(3.02)	(8.45)	(6.48)	(1.32)

Table B-35
Means for MANOVA
Part - Percent of Infant Behavior
Group 2

	Gaze	Smile	Vocalize
No-pacifier	31.28	4.84	3.34
	(18.43)	(6.15)	(3.09)
Pacifier	37.81	1.51	2.60
	(24.96)	(2.06)	(2.44)

Table B-36
Means for MANOVA
Order x Part - Percent of Infant Behavior
Group 2

	Gaze		Smile		Vocalize	
	Order 1	Order 2	Order 1	Order 2	Order 1	Order 2
No-Pac	35.30	40.76	5.88	1.74	2.39	4.28
	(21.92)	(33.56)	(8.00)	(2.37)	(2.66)	(3.44)
Pac	27.27	34.86	3.81	1.28	4.19	1.01
	(15.10)	(14.95)	(4.08)	(1.89)	(2.56)	(0.71)

Table B-37
Means for MANOVA
Condition - Percent of Infant Behavior
Group 2

	Gaze	Smile	Vocalize
Interact	45.52 (26.75)	5.58 (7.67)	2.47 (2.28)
Stop	23.58 (19.95)	0.77 (1.93)	3.47 (3.49)

Table B-38
Means for MANOVA
Sex - Mean Length of Infant Behavior
Group 2

	Gaze	Smile	Vocalize
Male Infants	14.54 (16.83)	0.68 (0.49)	0.60 (0.29)
Female Infants	2.50 (1.24)	0.28 (0.26)	0.55 (0.27)

Table B-39
Means for MANOVA
Sex x Order - Mean Length of Infant Behavior
Group 2

	Gaze		Smile		Vocalize	
	Order 1	Order 2	Order 1	Order 2	Order 1	Order 2
Male Infants	25.67 (18.22)	3.41 (2.15)	1.09 (0.27)	0.26 (0.06)	0.68 (0.36)	0.53 (0.24)
Female Infants	1.79 (1.46)	3.22 (0.43)	0.20 (0.35)	0.37 (0.18)	0.70 (0.23)	0.39 (0.25)

Table B-40
Means for MANOVA
Condition - Mean Length of Infant Behavior
Group 2

	Gaze	Smile	Vocalize
Interact	11.57	0.78	0.56
	(20.09)	(0.70)	(0.26)
Stop	5.48	0.18	0.59
	(11.48)	(0.34)	(0.48)

Table B-41
Means for MANOVA
Sex x Order - Intervals between Infant Behavior
Group 2

	Gaze		Smile		Vocalize	
	Order 1	Order 2	Order 1	Order 2	Order 1	Order 2
Male	8.23	14.42	30.30	62.33	46.04	35.46
Infants	(3.42)	(9.94)	(7.18)	(13.03)	(20.56)	(17.73)
Female	7.63	6.17	81.84	29.31	35.15	47.73
Infants	(6.26)	(1.37)	(14.13)	(8.31)	(12.66)	(31.07)

Table B-42
Means for MANOVA
Part - Intervals between Infant Behavior
Group 2

	Gaze	Smile	Vocalize
No-pacifier	11.19	42.66	41.55
	(8.89)	(25.52)	(28.92)
Pacifier	7.03	59.23	40.64
	(5.21)	(27.84)	(22.16)

Table B-43
Means for ANOVA
Part - Mutual Gaze Frequency
Group 2

No-pacifier	8.67
	(4.08)
Pacifier	5.58
	(3.06)

Table B-44
Simple Effects Tests
Sex x Order x Parent - Infant Gaze Percent
Group 1

Simple 2-Way Interactions

			MS	F
For Sex	By Order	At level 1 of Part	1449.98	2.97
For Sex	By Order	At level 2 of Part	3115.02	6.38*
For Sex	By Part	At level 1 of Order	301.52	0.62
For Sex	By Part	At level 2 of Order	1890.34	3.87
For Order	By Part	At level 1 of Sex	1932.05	3.95
For Order	By Part	At level 2 of Sex	1475.39	3.02

Simple Main Effects

		MS	F
For Sex	At level 1 of Order	1097.87	2.25
For Sex	At level 2 of Order	18.15	0.04
For Sex	At level 1 of Part	.29	0.00
For Sex	At level 2 of Part	65.98	0.14
For Order	At level 1 of Sex	3.53	0.01
For Order	At level 2 of Sex	728.68	1.49
For Order	At level 1 of Part	124.23	0.25
For Order	At level 2 of Part	6.18	0.01
For Part	At level 1 of Sex	267.34	0.55
For Part	At level 2 of Sex	76.81	0.16
For Part	At level 1 of Order	650.92	1.33
For Part	At level 2 of Order	141.18	0.29

Simple Simple Main Effects

			MS	F
For Sex				
At level 1 of Order	And level 1 of Part		880.64	1.80
At level 1 of Order	And level 2 of Part		1045.44	2.14
At level 2 of Order	And level 1 of Part		42.93	0.09
At level 2 of Order	And level 2 of Part		2000.57	4.10
For Order				
At level 1 of Sex	And level 1 of Part		.01	0.00
At level 1 of Sex	And level 2 of Part		2202.63	4.51
At level 2 of Sex	And level 1 of Part		1307.15	2.68
At level 2 of Sex	And level 2 of Part		907.74	1.86
For Part				
At level 1 of Sex	And level 1 of Order		534.68	1.09
At level 1 of Sex	And level 2 of Order		570.38	1.17
At level 2 of Sex	And level 1 of Order		1512.09	3.10
At level 2 of Sex	And level 2 of Order		750.63	1.54

Table B-45
Simple Effects Tests
Sex x Parent - Mutual Gaze Frequency
Group 1

	Simple Main Effects	MS	F
For Sex	At level 1 of Part	24.20	1.91
For Sex	At level 2 of Part	14.00	1.10
For Part	At level 1 of Sex	27.00	2.13
For Part	At level 2 of Sex	12.00	0.95

Table B-46
Simple Effects Tests
Sex x Order x Parent - Mutual Gaze Percent
Group 1

Simple 2-Way Interactions

			MS	F
For Sex	By Order	At level 1 of Part	1071.13	84.54*
For Sex	By Order	At level 2 of Part	2048.10	161.65*
For Sex	By Part	At level 1 of Order	1289.09	101.74*
For Sex	By Part	At level 2 of Order	1143.46	90.25*
For Order	By Part	At level 1 of Sex	1139.29	89.92*
For Order	By Part	At level 2 of Sex	1852.05	146.18*

Simple Main Effects

		MS	F
For Sex	At level 1 of Order	369.63	29.17*
For Sex	At level 2 of Order	.52	0.04
For Sex	At level 1 of Part	38.88	3.07
For Sex	At level 2 of Part	42.30	3.34
For Order	At level 1 of Sex	33.67	2.66
For Order	At level 2 of Sex	161.41	12.74*
For Order	At level 1 of Part	59.41	4.69
For Order	At level 2 of Part	55.34	4.37
For Part	At level 1 of Sex	96.45	7.61*
For Part	At level 2 of Sex	8.52	0.67
For Part	At level 1 of Order	307.85	24.30*
For Part	At level 2 of Order	5.75	0.45

Simple Simple Main Effects

			MS	F
For Sex				
At level 1 of Order	And level 1 of Part		702.43	55.44*
At level 1 of Order	And level 2 of Part		1204.73	95.09*
At level 2 of Order	And level 1 of Part		159.14	12.56*
At level 2 of Order	And level 2 of Part		935.25	73.82*
For Order				
At level 1 of Sex	And level 1 of Part		51.16	4.04
At level 1 of Sex	And level 2 of Part		1179.36	93.08*
At level 2 of Sex	And level 1 of Part		1021.82	80.65*
At level 2 of Sex	And level 2 of Part		957.86	75.60*
For Part				
At level 1 of Sex	And level 1 of Order		632.84	49.95*
At level 1 of Sex	And level 2 of Order		266.93	21.07*
At level 2 of Sex	And level 1 of Order		1300.07	102.61*
At level 2 of Sex	And level 2 of Order		721.39	56.94*

Table B-47
Simple Effects Tests
Sex x Order - Infant Smile Frequency
Group 2

		MS	F
For Sex	At level 1 of Order	18.38	0.79
For Sex	At level 2 of Order	119.35	5.12
For Order	At level 1 of Sex	23.05	0.99
For Order	At level 2 of Sex	108.38	4.65

Table B-48
Simple Effects Tests
Order x Part - Infant Vocalize Frequency
Group 2

		MS	F
For Part	At level 1 of Order	96.11	3.61
For Part	At level 2 of Order	24.03	0.90
For Order	At level 1 of Part	30.15	1.13
For Order	At level 1 of Part	108.00	4.06

Table B-49
Simple Effects Tests
Order x Part - Infant Vocalize Percent
Group 2

		MS	F
For Part	At level 1 of Order	10.72	1.90
For Part	At level 2 of Order	30.34	5.37*
For Order	At level 1 of Part	9.72	1.72
For Order	At level 2 of Part	32.08	5.68*

Table B-50
Simple Effects Tests
Sex x Order - Infant Smile Mean
Group 2

		MS	F
For Sex	At level 1 of Order	1.03	1.11
For Sex	At level 2 of Order	0.04	0.05
For Order	At level 1 of Sex	1.19	1.28
For Order	At level 2 of Sex	0.02	0.02

Table B-51
Simple Effects Tests
Sex x Order - Infant Smile Interval
Group 2

		MS	F
For Sex	At level 1 of Order	1538.88	0.78
For Sex	At level 2 of Order	4139.10	2.11
For Order	At level 1 of Sex	3984.56	2.03
For Order	At level 2 of Sex	1635.48	0.83

APPENDIX C

Table C-1
Part A - Sex x Group x Order
Mothers and Infants - Frequency

Source	df	F	p<
Sex (S)	6	1.03	.46
Group (G)	6	1.96	.16
Order (O)	6	1.37	.31
S x G	6	2.70	.08
S x O	6	1.83	.19
G x O	6	0.55	.77
S x G x O	6	0.75	.63
Error	11		

Table C-2
Part A - Sex x Group x Order
Mothers and Infants - Percent

Source	df	F	p<
Sex (S)	6	0.39	.88
Group (G)	6	2.46	.10
Order (O)	6	0.78	.60
S x G	6	0.65	.70
S x O	6	1.08	.43
G x O	6	0.81	.59
S x G x O	6	0.51	.79
Error	11		

Table C-3
Part A - Sex x Group x Order
Mothers and Infants - Mean

Source	df	F	p<
Sex (S)	6	0.90	.54
Group (G)	6	0.95	.50
Order (O)	6	0.72	.65
S x G	6	0.87	.55
S x O	6	0.69	.67
G x O	6	0.50	.80
S x G x O	6	0.91	.53
Error	11		

Table C-4
Part A - Sex x Group x Order
Mothers and Infants - Interval

Source	df	F	p<
Sex (S)	6	0.09	1.00
Group (G)	6	0.24	.96
Order (O)	6	1.47	.28
S x G	6	2.16	.13
S x O	6	1.28	.35
G x O	6	0.39	.87
S x G x O	6	0.72	.65
Error	11		

Table C-5
Mothers' Responses to Questionnaire Items

Question	Mean	SD
1	16.17	24.27
2	18.67	22.26
3	6.92	6.75
4	32.58	33.86
5	50.06	34.20
6	8.43	8.94
7	55.89	35.96
8	23.75	20.23
9	7.68	12.54
10	8.71	9.31
11	30.73	27.43
12	5.08	3.66
13	23.37	16.94
14	23.43	15.57
15	78.73	17.45
16	87.97	15.28
17#	26.70	12.73
31	60.35	22.02
32	30.10	25.74
Temperament	1.60	1.97
Satisfaction with infant temperament	13.73	16.72
Similarity to mother in temperament	29.83	18.31
Similarity to father in temperament	37.61	27.28

#Father participation

Table C-6
Intercorrelations between
Parent Questionnaire Items
All Mothers

	1	2	3	4	5	6	7	8	9	10	11
1	-										
2	42*	-									
3	30	-10	-								
4	18	-23	28	-							
5	-38	21	-14	-18	-						
6	-16	-27	-05	26	17	-					
7	04	17	-13	00	25	17	-				
8	-05	-10	-02	13	-33	-02	-19	-			
9	-01	-26	73*	35	-19	08	-12	-05	-		
10	43*	16	49*	-01	02	02	-16	21	06	-	
11	-28	10	40	06	33	-17	-14	04	35	22	-
12	22	20	51*	12	02	-11	05	-23	44*	43*	40
13	03	01	-02	-07	15	03	15	-04	-14	34	07
14	01	-15	46*	09	-02	-09	23	-26	37	07	33
15	26	21	21	14	-21	-14	-38	03	-04	15	-10
16	09	03	15	10	-19	26	-29	19	18	17	-17
17	16	22	26	-08	-48*	06	-36	17	-08	04	-32
31	09	27	10	14	-07	-32	01	45*	02	30	30
32	-18	-41	05	-07	-20	64*	-05	-08	27	-09	-40
Temp	-06	-20	27	-25	17	-04	19	03	22	07	09
Sat	-09	-18	22	-07	-01	09	07	-27	35	-02	03
Sim1#	-00	17	27	02	10	-43*	-11	01	18	-08	43*
Sim2$	26	-22	05	-19	-26	-25	05	20	02	19	-06

	12	13	14	15	16	17	31	32	Temp	Sat	Sim1#
13	09	-									
14	22	60*	-								
15	23	-22	-27	-							
16	28	-34	-47*	66*	-						
17	13	-26	-55*	41*	54*	-					
31	-03	30	18	-22	-36	-14	-				
32	-03	-03	-07	12	49*	37	-48*	-			
Temp	-14	25	45*	-18	-37	-36	06	07	-		
Sat	07	28	33	15	-03	-10	-07	30	-55*	-	
Sim1#	-11	04	40	09	-34	-33	45*	-35	44*	27	-
Sim2$	18	-05	-09	-09	05	-04	-15	-10	20	16	-15

#Similarity to mother in temperament
$Similarity to father in temperament

Table C-7
Infant Test Means

	Male Infants		Female Infants		All Infants	
	Mean	SD	Mean	SD	Mean	SD
Photograph						
Look total (PHLKT)	18.91	7.36	13.01	9.22	15.96	8.70
Look freq. (PHLKF)	3.42	1.51	3.67	2.43	3.54	1.98
Smile total (PHSMT)	0.00	0.00	1.61	4.84	0.80	3.45
Smile freq. (PHSMF)	0.00	0.00	0.33	0.49	0.17	0.38
Voc total (PHVOCT)	1.02	1.59	0.36	0.71	0.69	1.25
Voc freq. (PHVOCF)	1.08	1.31	0.50	1.00	0.79	1.18
Mirror						
Look total (MIRLKT)	19.13	9.29	19.78	7.77	19.46	8.38
Look freq. (MIRLKF)	2.67	1.88	3.50	1.78	3.08	1.84
Smile total (MIRSMT)	1.02	1.81	5.76	6.58	3.39	5.30
Smile freq. (MIRSMF)	0.50	0.80	2.08	2.23	1.29	1.83
Voc total (MIRVOCT)	2.10	3.60	1.30	1.84	1.70	2.83
Voc freq. (MIRVOCF)	1.42	2.31	1.08	1.38	1.25	1.87
Checkerboards (complex minus noncomplex) (CHECKS)	12.13	25.14	12.99	8.20	12.56	18.29
Beads (total number of eye and head movements out of 4 possible) (BEADS)	1.75	1.14	2.75	1.66	2.25	1.48
Keys (total number of eye and head movements out of 4 possible) (KEYS)	0.50	0.67	0.67	1.23	0.58	0.97

Table C-8
Infant Test Intercorrelations

	1	2	3	4	5	6	7	8	9
1 PHLKT	---								
2 PHLKF	18	---							
3 PHSMT	-25	-14	---						
4 PHSMF	21	-01	53*	---					
5 PHVOCT	-16	-29	-13	-16	---				
6 PHVOCF	03	-15	-16	-21	72*	---			
7 MIRLKT	04	03	-10	-01	-10	-05	---		
8 MIRLKF	-02	25	13	23	-27	-19	-45*	---	
9 MIRSMT	-31	04	28	40	-33	-37	35	-15	---
10 MIRSMF	-10	-03	10	43*	-31	-35	29	06	60*
11 MIRVOCT	22	-26	-13	-08	30	48*	-18	-22	-20
12 MIRVOCF	07	-10	-15	12	38	60*	-05	-27	-16
13 CHECKS	-12	07	-04	04	17	10	27	-26	03
14 BEADS	-10	17	27	23	-12	-22	-27	22	02
15 KEYS	31	19	-14	-16	-30	-34	08	19	-13
16 SEX	-35	06	24	45*	-27	-25	04	23	46*
17 TEMP	17	20	-02	-25	40	45*	-13	-26	-55*

	10	11	12	13	14	15	16	17
11 MIRVOCT	-31	---						
12 MIRVOCF	-30	84*	---					
13 CHECKS	00	-46*	-06	---				
14 BEADS	-14	-33	-42*	12	---			
15 KEYS	-12	-04	-06	-18	-05	---		
16 SEX	44*	-15	-09	02	34	09	---	
17 TEMP	-38	38	47*	-04	-22	06	-39	---

Table C-9
Correlations between Infant and Mother
Interactive Behaviors
All Infants - Part A

	Infant							
	Gaze		Smile		Vocalize		Mutual gaze	
Mother	Freq	%	Freq	%	Freq	%	Freq	%
Gaze freq	10	-08	-10	12	-35	-38	-05	-11
Gaze %	-12	20	25	25	14	-01	26	47
Smile freq	-38	45	27	69	02	00	-29	48
Smile %	-11	40	20	23	20	26	10	36
Voc freq	-16	-03	-10	27	-22	-21	01	06
Voc %	18	19	32	14	25	16	-03	20
Mutual gaze freq	72	-13	05	-23	-17	-28	---	08
Mutual gaze %	05	93	69	79	50	38	08	---

Table C-10
Correlates of Interactive Behaviors
All Infants - Part A Behavior

	Gaze		Smile		Voc	
	Freq	%	Freq	%	Freq	%
Question 11 - amount infant looks	36	-02				
Question 12 - amount infant likes to look	19	-26				
Temperament rating	-08	13	-10	16	05	18
Time since last feeding	23	-24	-22	-26	-07	03
Time since last nap	31	41*	26	13	70*	64*
Length of last nap	10	-03	-09	-02	-24	-19
Differences in today's routine	05	24	17	14	24	18
Baby's mood	-28	-27	-27	-22	-13	00
Baby's age	37	-08	-06	-14	-17	-14
Early/late birth	-04	04	25	12	11	01
Birth weight	-01	21	30	11	06	05
Pregnancy and delivery complications	-22	16	-03	-02	06	08
Birth medication	-11	40	42*	55*	32	20
Corrected age	15	-01	18	03	00	-06
Baby illnesses	-39	-01	06	16	-05	03
Pacifier use	-10	-04	00	11	18	20
Birth order	16	-03	-01	-04	-20	-28

Table C-11
Correlations Between Infant Test Behavior
and Interactive Behaviors

	Infant							
	Gaze		Smile		Voc		Mutual gaze	
	Freq	%	Freq	%	Freq	%	Freq	%
PHLKT	28	40	43*	34	41*	27	24	44*
PHLKF	-06	-06	-02	13	17	15	-13	-06
PHSMT	39	-05	21	-02	-15	-16	43*	07
PHSMF	39	19	71*	18	29	08	41*	35
PHVOCT	-18	-25	-23	-26	-04	-01	-09	-24
PHVOCF	-22	-06	-18	-18	16	36	-30	-18
MIRLKT	00	34	23	33	43*	44*	02	33
MIRLKF	35	-20	-01	-12	-09	-12	11	-16
MIRSMT	-06	-15	26	01	05	-03	04	-05
MIRSMF	21	13	60*	18	26	12	04	22
MIRVOCT	04	-06	-06	-08	-14	-06	03	-09
MIRVOCF	-18	-03	-10	00	-03	09	-19	-08
CHECKS	-37	17	01	06	17	20	-27	11
BEADS	10	-26	-18	-25	-15	-17	24	-20
KEYS	17	14	00	29	-21	-18	28	23

Table C-12
Intercorrelations Between Parent Questionnaire Items
Group 1 Mothers

	1	2	3	4	5	6	7	8	9	10	11
1	-										
2	42	-									
3	43	-19	-								
4	19	-14	39	-							
5	-24	33	-16	-18	-						
6	-17	-15	48	12	27	-					
7	-25	01	01	28	25	00	-				
8	-29	-03	-19	-55	05	-03	12	-			
9	07	-30	73*	49	-24	20	17	-41	-		
10	60	14	59*	08	07	42	-10	21	-09	-	
11	-25	21	32	41	46	60*	37	-11	22	18	-
12	13	10	59*	59*	32	48	22	-56	54	18	73*
13	-06	-17	20	08	12	76*	-25	02	-21	52	33
14	01	-40	76*	57	-09	75*	-03	-39	62*	34	55
15	30	33	28	16	-10	41	-43	-10	09	28	21
16	14	33	21	-13	37	40	15	-07	14	11	19
17	13	40	-40	-02	-37	-53	-43	09	-22	-29	-31
31	36	44	-07	10	-19	-39	16	44	-36	38	38
32	-26	-56	13	-16	-38	26	-28	09	30	-22	-35
Temp	-16	-15	-23	-41	-03	-16	27	32	-20	-14	-32
SAT	-04	-23	33	20	-32	39	-08	-17	54	-06	-02
SIM1#	27	25	19	40	00	07	-19	03	22	19	08
SIM2$	-09	-50	-01	-25	05	05	20	-01	07	-02	-47

	12	13	14	15	16	17	31	32	Temp	SAT	SIM1#
12	-										
13	19	-									
14	68*	50	-								
15	37	41	29	-							
16	48	10	08	55	-						
17	-27	-22	-51	47	-07	-					
31	04	-22	-09	09	-26	48	-				
32	-10	17	21	36	33	11	-50	-			
Temp	22	04	-42	-06	36	12	-29	61	-		
SAT	12	34	36	40	22	11	26	10	21	-	
SIM1#	14	03	11	60*	16	52	-48	32	-35	33	-
SIM2$	-28	09	-06	-50	04	-53	06	39	46	28	-38

#Similarity to mother in temperament
$Similarity to father in temperament

Table C-13
Intercorrelations Between
Parent Questionnaire Items
All Fathers

	1	2	3	4	5	6	7	8	9	10	11
1	-										
2	44	-									
3	-02	-03	-								
4	16	87*	12	-							
5	-11	60*	16	62*	-						
6	74*	52	26	32	30	-					
7	16	-09	14	11	15	05	-				
8	-39	21	20	34	62*	-07	-07	-			
9	46	17	06	20	03	40	16	-31	-		
10	37	-04	-01	03	-02	-02	54	-18	70*	-	
11	-27	-34	25	-03	-12	-14	58*	14	-05	02	-
12	00	-03	19	-05	32	-01	29	54	-26	13	13
13	-02	15	73*	20	40	31	20	07	-13	-15	-03
14	-26	-68*	08	-38	-28	-09	31	02	17	11	58*
15	34	42	-62*	37	05	07	09	-22	32	26	-22
16	-03	10	-76*	16	-16	-41	11	-06	-09	16	-06
17	-04	-20	13	-19	12	-21	-05	28	14	47	-43
31	-33	19	54	29	54	05	10	56	-26	-33	43
32	-09	31	28	23	32	15	01	13	-70*	-65*	-03
Temp	-36	14	18	49	38	-03	34	40	-28	-30	41
Sat	-02	-12	-01	00	10	18	-02	33	13	-05	12
Sim1#	09	21	-46	-12	26	23	-08	08	-37	-43	-05
Sim1$	-05	-18	08	-17	18	26	-12	28	53	22	15

	12	13	14	15	16	17	31	32	Temp	Sat	Sim1#
12	-										
13	14	-									
14	02	-17	-								
15	-18	-61*	-13	-							
16	-13	-72	-02	79*	-						
17	47	-04	05	03	03	-					
31	54	41	-09	-33	-46	-08	-				
32	03	61*	-45	-30	-23	-44	37	-			
Temp	14	21	34	16	22	-14	45	38	-		
Sat	31	-32	59*	32	17	35	16	-34	47	-	
Sim1#	09	-18	-29	12	08	-40	10	37	-13	-09	-
Sim2$	15	-02	-16	43	-23	-37	12	-03	-66*	-13	-09

#Similarity to mother in temperament
$Similarity to father in temperament

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