MOTHER AND INFANT COMMUNICATION: MOTHERS' EXPERIENCES AND INFANTS' PREFERENCES

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Dissertation submitted to the Faculty of Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Psychology

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October, 1995

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Key Words: Communication, Infants, Mothers, Preferences
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ABSTRACT

Two longitudinal studies were conducted to explore the mother-infant communication process during the first four months of postnatal life. One study focused on mothers' experiences communicating with their infants. Forty-seven mothers were interviewed when their infants were 6 to 8 weeks of age; 42 of the same mothers were interviewed when their infants were 16 to 18 weeks of age. Mothers were asked questions about their interactions with their infants, how they talked to their infants, why they talked to their infants, how they learned to talk to their infants, and what their beliefs were about the relationship between talking to infants and development. A model was constructed from these data, conceptualizing the communication process between mothers and their young infants. Four themes were identified: expert advice influenced some mother-infant communication; mothers and infants co-regulated some of their communication; maternal communication behaviors were consistent across age and ethnicity; and experience
talking to pets influenced some new mothers' speaking styles.

The second study focused on the infants of the mothers who participated in the first study. Seventeen infants were tested at age 6 to 8 weeks and again at 16 to 18 weeks to measure their preference for maternal adult-directed (AD) speech or unfamiliar female infant-directed (ID) speech using an infant visual preference procedure. It was found that infants preferred the speech that they heard first. That is, if they heard maternal AD speech on the first trial, they listened longer to AD speech throughout the session, and if they heard unfamiliar female ID speech on the first trial, they listened longer to ID speech throughout. Cross-sectional analyses of 21 6 to 8-week-olds supported these findings. Since infants were listening to two speech types for which they have previously demonstrated preferences, the order in which they heard the speech was a strong enough influence to affect their listening times.

Finally, the relationship between infants preferences and mother experiences was explored by examining infant speech preferences, gender, age, and birth order, and maternal age, income level, education, speech behaviors, and frequency of speaking. No relationship emerged among any of these variables.
This dissertation is dedicated to the memory of my father, 
Stanley J. (Skowronski) Larkin 
1919-1963
ACKNOWLEDGMENTS

The quest for my degree has been a long, arduous journey. However, I am happy that I pursued my dream and am ready to begin the next phase of my life. There are many people I acknowledge who helped me in the pursuit of this dream. First, I thank all the mothers and infants who allowed me into their lives and gave of their time so that I could conduct this study. I learned much from them, and without them this dissertation would not exist.

Next, I thank my advisor, Dr. Robin Panneton Cooper. What I have learned from her has made me a better researcher, teacher, and professor. I give special appreciation to Dr. Ellie Sturgis, mentor and friend, for helping me through the troubled times. Thanks also go to the rest of my committee: Dr. Sue Magliaro, who contributed her time and wisdom to help me through the qualitative portion of this dissertation; Dr. Roseanne Foti, who spurred me on at a low point without even realizing that she had; and Dr. Sigrid Gustafson, whose previous research was great help to me. I believe my committee to be of highest quality and was honored to have the first all-women supervisory committee in the history of the psychology department.

Next, I thank many friends who not only gave moral support and encouragement, but also their assistance in helping me think things through, and by typing and coding.
Thank you! to Dr. Ellen Silverman, Dr. Lera Joyce Johnson, Merry Sleigh, Dr. Darren Ritzer, Noelle Dijoud, Heather Theaux, Dr. Robin Russell, and Jason McCartney.

There were many people from the lab and the community who also were instrumental in helping me to complete this dissertation. Thanks to all the lab assistants who observed infants, and transcribed and coded interviews. Also, thanks to Judy Williamson from the Health Department, Kathy Kelly from the Roanoke Teen Pregnancy Program, and Kenneth Singletary from The Current who helped me find participants for my study and Becca Klein who conducted several second interviews.

Last, but most important, I thank my family. My husband, Michael, was never failing in his support, love, and encouragement throughout my years of school and the development of this dissertation. He believed in me even when I lost faith in myself. I want to thank my daughter, Whitney, who has never known her mommy as anything but a student. Although I am proud of my academic achievements, she will always be my greatest life achievement. I also thank my mother, Betty Lince, who had faith in my abilities and was especially helpful during my prelims, and my sister, Peggy Maine, who was kind enough to provide two empathic ears.
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Introduction

Soon after a baby is born, its mother usually performs certain actions. She will look at her baby, hold it, feel its skin, smell it, and talk to it softly. Thus begins a communication dynamic between mother and child which will evolve as the infant grows to childhood, adolescence, and finally adulthood. Because the infant is unable to speak, the mother will rely on nonverbal behaviors and vocal sounds, such as crying or cooing, to gauge its reaction to her communication attempts. Because communication is dynamic, the mother's and infant's behaviors will change as development and experience affect them both.

The purpose of this dissertation was to explore the mother-infant communication process in the first months after birth. Since there are two participants in this dynamic, mother and infant, this study had two components. The first focused on mothers and how they perceived their own behaviors when communicating with their infants. That is, what their intentions, beliefs, awareness of actions, and feelings of effectivity were. These maternal perceptions were examined twice during the first four months of postnatal life, since during this time several aspects of the communication dynamic between infants and caretakers are thought to change.

The second component of this study examined infants'
perceptions of maternal speech. Specifically, infants were assessed longitudinally for their preferences for certain features of maternal vocalizations in order to determine whether their attention to speech changed as the communication dynamic evolved. In order to lay the groundwork for this study, a more detailed discussion of the construct of communication is needed, particularly as it pertains to the mother-infant dyad.

The Communication Process

In order to understand the communication process between an infant and his/her mother, it is useful to define what communication is and identify a framework that best describes the infant/mother interaction. Traditionally, communication has been defined as a sender transmitting a signal which is received by a listener (Smith, 1977). Included in this signal are not only vocalizations, but nonverbal and situational components as well. For example, nonverbal components include facial expressions and gestures, whereas situational components refer to the context in which the interaction takes place such as feeding, mating, nurturing, etc. Communication occurs when the signal has some effect on the receiver, such as causing some change in behavior (Fogel & Thelen, 1987; Smith, 1977). Fogel (1993) identifies this view of communication as a discrete state communication system.
In a discrete state communication system, information is transmitted in one direction, from sender to receiver, rather than exchanged between them. While the sender talks, the receiver listens. If a behavior change occurs, it is often only detectable when the receiver exchanges roles with the sender and begins talking. Sender, receiver, and signal are easily identified, and there is an assumption that one signal ends before another one begins. An example of discrete state communication is talking on the telephone. In most telephone conversations, the signals are unidirectional as one conversant states the message while the other listens, then the other conversant responds to the message.

However, in most face-to-face interactions, both sender and receiver are concomitantly active, and signals are bidirectional. While the sender is stating a message, the receiver is communicating, primarily nonverbally, such that the sender may adjust his/her message or own nonverbal signals based on those perceived from the receiver. The model for this style of communication is called a continuous process communication system (Fogel, 1993). It is a more appropriate framework for infant/mother communication because both are active when engaged in communication. Their responses to one another are dynamic and emergent, i.e., occurring without a specific plan, with continuous
adjustment of behaviors. Continuous process communication does not imply that there is no beginning and end to the interaction, but that when communication is occurring the information exchange is bidirectional, i.e., that individuals co-regulate themselves depending on the anticipated and ongoing actions of one another.

For example, if a mother picks up her crying infant from his crib, the infant's cry begins the communication process. As the mother holds the infant and talks to him the infant may continue crying. The mother will adjust her behaviors based on the infant's response to them, just as the infant will either calm down or continue crying, in part because of his mother's behaviors. In this interaction the information exchange is bidirectional and continuous, not unidirectional and discrete. The mother and infant change their behaviors based on each other's actions. This is what Fogel (1993) means by co-regulation.

According to Fogel (1993), communication facilitates a sense of self. That is, the infant becomes aware of him/herself through physical and social relationships with other people. Communication also reflects the cultural context of the communicators. Cultures develop through communication and can consist of just two communicators, a family, groups of families, gangs, community, organization, and country. What each of these cultures provides are the
conventions which govern who may communicate, what can be discussed, how discourse should be stated, and the gestures and language which may be used. For example, in some cultures, communication is not permitted between males and females and between children and adults (Mead, 1934; Valsiner, 1989).

Among the cultures that he discusses, Fogel (1993) includes a culture of infancy and parent-infant relationships. This infancy culture includes tools for child care such as diapers, toys, clothing, and furniture, practices of child care such as how to hold babies, when to change them, how they should sleep, and infant care beliefs. There is much variability on a world-wide scale in the culture of infancy. Differences exist in how much infants are carried, how much they are allowed to explore, what kind of social interaction they receive, and how they are spoken to (Bornstein et al., 1992; Richman, Miller, & LeVine, 1992). For example, Richman, Miller, and LeVine (1992) found that Gusii mothers of Kenya respond to the crying and vocalizing of their infants by touching and holding them and do not believe that children should be talked to until they are capable of speech, which the mothers estimate to occur at about 2 years of age. American mothers from Boston, on the other hand, talk to and look at their infants more often as a way to interact with them.
To summarize, the infant-parent communication process is a continuous one, in which both infant and parent behaviors emerge and are created as a result of co-regulation. Culture plays both constraining and facilitating roles in how and when communication will occur and what behaviors may be exhibited. Some studies examining communication between infants and mothers have identified some common maternal behaviors that emerge during communication such as prosody of speech (Fernald & Simon, 1984; Stern, Spieker, & MacKain, 1982), content of speech (Bornstein et al., 1992), turn-taking (Beebe, Jaffe, Feldstein, Mays & Alson, 1985; Mayer & Tronick, 1985) and facial expressions (Brazelton, Koslowski, & Main, 1974). What accounts for this common repertoire of behaviors consistent across mothers when communicating with their infants?

**Intuitive Parenting**

One possible explanation for the emergent responses of parents when interacting with their infants has been offered by H. Papousek and M. Papousek (1987). In their research on infant-adult communication, they have noted that there are a number of universal behaviors, such as exaggerated facial expressions, turn-taking, and infant-directed speech, which are used by parents when talking to their infants. These behaviors occur at slower speed than simple reflexes, but
faster than conscious, rational decisions. Individuals are unaware of carrying out these behaviors, will sometimes deny or misinterpret their occurrence, and find the behaviors difficult to control. Papousek and Papousek call this collective set of behaviors "intuitive parenting" (1987).

The universality of intuitive parenting behaviors has led Papousek and Papousek (1987, 1991) to propose that these behaviors are innate and a result of phylogenetic adaptation as a way to increase the probability that infants' integrative abilities would develop. If parents were not adapted to the newborn's lack of ability to communicate successfully, there would not be successful communication between infant and parents (Papousek & Papousek, 1991). They suggest that if parents are unavailable, then any "experienced" (p. 675) members of the social culture would be able to perform this function. However, their use of the word "experienced" contradicts their explanation that these behaviors are innate and universal, and they do not explain why some parents would not need experience, yet others would. They do acknowledge individual variability in the performance of the behaviors that allows the infant to identify caretakers and develop different types of relationships with them (H. Papousek & M. Papousek, 1989).

However, there are several problems with Papousek and Papousek's evaluation that intuitive parenting behaviors are
universal and innate. Their research, although multicultural at times, does not examine cultures in which descriptions of parental behaviors do not reflect the behaviors they have identified. As described by Heath (1989), one of these cultures is inner city African-American parents. She states that such speakers tend not to simplify their speech nor address children directly. Mothers who are isolated in apartments with their children and lack toys and opportunities for activities have fewer vocal interactions with their children. She describes one mother, who in 500 hours of taped interaction with her three preschool children, began conversations with at least one of them in only 18 instances, primarily when someone else was in the room and wanted to hear about the children's activities. Another example is the Gusii tribe of Kenya where mothers' primary response to infants under 2 years of age is holding and touching rather than talking and looking at their infants (Richman, Miller, & LeVine, 1992). It is quite possible that the infancy culture in these two groups promotes alternative behaviors for mother-infant communication rather than those cited by Papousek and Papousek (1987).

One argument against the idea that intuitive behaviors are innate and due to phylogenetic adaptation is offered by Lickliter and Berry (1990) who are strongly against using
phylogeny as an explanation for behaviors. A phylogenetic explanation assumes that behavioral information is encoded in the genes, i.e., innate, and is exhibited as an organism matures. What such an explanation does not take into account, however, is that what is inherited from one generation to another are not only genes, but also the developmental context such as the maternal reproductive system, parental care, interaction with conspecifics, and relations with the animate and inanimate environment (Lickliter & Berry, 1990; Oyama, 1989). Therefore, intuitive parenting may be due to the inherited developmental context and culture which constrains and facilitates social communication behaviors, rather than genetic encoding.

A third problem with describing intuitive behaviors as universal and innate results from the research used to support these characteristics. Papousek and Papousek have not conducted any longitudinal studies to explore possibilities of how intuitive behaviors might evolve. Fogel (1993) provides a possible explanation of how one of the intuitive behaviors, baby talk, develops. He states that this behavior is not genetic, but more likely, adults observe others of their culture speaking to their infants in certain ways. As the adults interact with infants or become parents, they find that the infants respond to this type of
speech. Through co-regulation with the infants, adults and parents become skilled in this type of speech, and the cultural practice of baby talk is continued.

With Fogel's (1993) explanation in mind, instead of using phylogeny to explain intuitive behaviors, a more constructive interpretation would be that these behaviors are automatic, attempted by parents in the course of communicating with their infants and reinforced by infants' responses to them. Automatic behaviors occur without conscious awareness, are not intentional, and can transpire in conjunction with other cognitive processing (Colley & Beech, 1988; Phillips & Hughes, 1988). After much practice, performance of the behaviors appears to be automatic (Colley & Beech, 1988). In the case of behaviors used with infants, practice can occur before a woman becomes a mother while she interacts with brothers and sisters or babysits. For example, if a mother responds to a crying newborn with certain behaviors, she may have used those behaviors long before she had her baby. If the behaviors stop the crying, she will be more likely to perform those behaviors again when the infant cries. Soon, those behaviors will become part of her repertoire for responding to her infant and will appear intuitive.

Therefore, when a mother talks to her infant and finds that smiles, exaggerated expression, and greater intonation
in her voice brings about a positive response, she will continue to use those behaviors as long as they produce the positive response. These behaviors would be more likely to emerge when communicating to her infant in the continuous communication process such that they would seem intuitive or automatic. These behaviors would also be reinforced by the cultural context in which the mother and infant communicate.

Beliefs About Communication

Besides performing behaviors which appear intuitive in the dynamic process of communication with her infant, a mother's actions may also be influenced by her parental beliefs about communication (Luster & Rhoades, 1989; Luster, Rhoades, & Haas, 1989; Miller, 1989). The development of parental beliefs is influenced by factors external to the home: culture, SES, work, influences of friends and neighbors, and advice from experts, and factors within the home: characteristics of parents, marital relationship, characteristics of the child (Okagaki & Dicecha, 1993). There are a number of ways to define belief. Fishbein and Ajzen (1975) conceptualize a belief as an association or linkage that people establish between an entity and various attributes, that is, their thoughts or ideas about something. For example, a parent may believe that talking to an infant will cause the infant to talk at an earlier age. The act of talking is linked to the
infant's development. Beliefs have also been called "cognitions, knowledge, opinions, information, and inferences" (Eagly & Chaikin, 1993, p. 11), and can be non-evaluative or contain some degree of evaluation.

Sigel (1985) defines belief as knowledge which an individual espouses to be true, based on evidence, faith, or conviction. Beliefs are constructed from an individual's experience, therefore what is perceived as truth is relative to each individual's experience. For example, a father might believe that genes are responsible for a child's intelligence, whereas a mother might hold the belief that experience is the important determinant. Both might be able to offer evidence to support their beliefs. For either parent to change his/her belief would depend on how much either of them accepted the evidence offered by the other parent. Because beliefs may be nonlogical, based on limited experience or emotional factors, the preponderance of rational evidence does not necessarily facilitate a change in belief.

Miller (1989), in his review of studies on parental beliefs about children's cognitive development, states that parents do have beliefs about development, and these beliefs can vary within homogeneous cultural settings. Studies have shown that there is a relation between what parents believe about child development in general and their behavior.
towards their children. That is, more sophisticated beliefs about child development and more accurate assessments of children's abilities are positively correlated with more positive childrearing practices. However, the strength of the relations is modest (r=.25), the number of studies examining these relations is small, and none of the studies have focused on parental beliefs about their own children and subsequent parental practices. Miller suggests that parental beliefs need to studied longitudinally to identify the effects that changes in experience may have on changes in beliefs and to better link parental belief with parental behavior.

One longitudinal study did examine the effects of experience on parent belief. Gustafson and Magnusson (1991) followed young women from early adolescence through early adulthood examining a variety of variables which contributed to their life choices. Parents were asked to evaluate their daughter's academic abilities when the daughters were 13 and 16 years old by choosing whether they thought she was more suited to a vocational or academic education. Gustafson and Magnusson found that parents adjusted their expectations to become consistent with their daughter's level of academic achievement. That is, if the daughter demonstrated a lower level of achievement by age 16, parental expectations were lowered. The researchers suggest this reflects the
"reciprocal nature" (p. 121) of parent-child interactions.

The relationship between belief and behavior is not a straightforward one (Eagly & Chaikin, 1993; Fishbein & Ajzen, 1975). One view proposes beliefs to be a basic component of attitude, which along with intention to perform a behavior, lead to the behavior (Fishbein & Ajzen, 1975). Another view asserts that cognitive processes (i.e., beliefs), affective processes (i.e., mood, emotion) and behavioral processes (i.e., intentions, overt action) form attitudes which are then revealed in cognitive, affective, and behavioral responses (Eagly & Chaikin, 1993). Therefore, beliefs and behavior relate through the intervening variable of attitude.

Generality and specificity of attitudes and behavior are related. That is, general attitudes can predict multiple behaviors. Specific attitudes are better at predicting specific behavior. For example, attitudes toward discipline techniques would be manifested over a period of time and through a number of situations. On the other hand, attitude toward breastfeeding in a shopping mall is more specific, and if connected with a mother's next trip to the mall, would more likely predict her behavior.

Similar relationships between beliefs and behavior have been found by Sigel (1985) in his research with parents. He states that if the belief is one pertaining to action then
parental behavior can be predicted. This is analogous to the single behavior/single attitude relationship. For example, if parents believe that children learn through negative or positive feedback, then they will use rewards and punishments with their child. However, if a belief is global and does not include some action component, then various options for expression exist, and it is more difficult to predict parents' specific behavior. This follows the aggregate behavior/general attitude relationship. For example, if parents believe that children learn through exploration, there are many ways that they can help their child explore the environment, thus it would be difficult to predict what they might do at one specific time and would need to be observed over a period of time.

Three studies that have examined beliefs about the importance of talking and reading to children and maternal behaviors reflecting these beliefs have found a significant positive correlation between the two. Luster and Rhoades (1989) studied adolescent mothers and a comparison group of older mothers. In both groups, mothers who rated talking and reading to children as important in a parent belief survey had higher Home Observation for Measurement of the Environment (HOME) scores for intellectual stimulation. Luster, Rhoades, and Haas (1989) obtained the same results with a large sample of mothers above age 20 who represented
a variety of social classes. In a study of Italian-Canadian mothers of 9-10-month-olds, Borzellino (1995) found that mothers who believed their infants could understand them, responded more often and sensitively to their infants, compared to mothers who believed that their infants could not yet understand them.

In summary, the communication process between infant and mother is dynamic, emerges from the current situation, features behaviors which may be unconscious to the parent, and is affected by culture, individual characteristics of parent and infant, and parental beliefs. With this in mind, what do we know about the maternal half of the infant/mother communication interaction?

Mothers' Communication to Infants

Much has been observed about mother's behavior in infant-mother interaction. Mothers speak infant-directed (ID) speech when talking to their infants (Fernald & Simon, 1984; Stern, Spieker, & MacKain, 1982). ID speech is characterized by high pitch (fundamental frequency or $F_0$), repetition, short utterances, slower tempo, and exaggerated intonation (Fernald, 1985; Jacobson et al., 1983; Stern, Spieker, & MacKain, 1982). The use of ID speech is quite universal. ID speech is spoken by both males and females, parents and non-parents, and has been identified in a number of languages including French, German, Italian, British
English, American English, and Japanese (Fernald, Taeschner, Dunn, Papousek, de Boysson-Bardies, & Fukui, 1989; Jacobson, Boersman, Fields, & Olson, 1983; Shute & Wheldall, 1989). Even speakers of tonal languages such as Japanese and Chinese, which rely on pitch changes to distinguish meaning, use ID speech when speaking to infants (Fernald et al., 1989; Grieser & Kuhl, 1988; Papousek & Papousek, 1991). However, Ratner and Pye (1984) challenge the universality of the higher mean $F_0$ of ID speech with data from the Quiche Mayan community in which their small sample of mothers either maintained or lowered their pitch when speaking to their toddlers.

Mothers also talk to their infants as if having conversation, by pausing to allow the infant to respond (Beebe, Jaffe, Feldstein, Mays, & Alson, 1985; Mayer & Tronick, 1985). Even with newborns, mothers have been observed to use facial expressions and speech as if their infants were communicating with them (Brazelton, Koslowski, & Main, 1974).

Mothers change features of how they speak ID speech to their infants as the babies age (Stern, Spieker, Barnett, & MacKain, 1987). With newborns they pause longer, with four-month-olds they use more exaggerated pitch and repetition, and with 24-month-olds the length of their utterances are longer. This coincides with changes in physical position
and movement dynamics as infants age.

Moreover, within the United States cultural differences exist among mothers in how much they speak to their infants. Heath (1983), in her ethnographic study of the community of Trackton located in the Piedmont area of North and South Carolina, found that adults did not directly speak to their infants except to warn them, give a command, recommend an action, or tease them. American teenage mothers vocalize less to their children (Field, 1981; Osofsky & Osofsky, 1970; Sandler, Vietz, & O'Connor, 1981) and exhibit more passive facial expressions when interacting with their 4-month-olds (Field, 1981) than adult mothers do.

Although much has been observed about what mothers do when talking to their infants, there have been no studies which have examined mothers' interpretations of the experience and what it means to them. As reflected in Luster and Rhoades (1989), surveys have been given to mothers to determine if they think talking and reading are important.

Stern, Hofer, Haft, and Dore (1985) did ask mothers to rate how aware they were of performing behaviors reflecting their infants' affect (attunement) and what functions they thought the maternal behaviors served. The mothers were videotaped playing with their infants. Then, while viewing her own tape, each mother used a 3-point rating scale to
indicate whether she was aware of matching her infant's internal state at the time she actually performed the attunement behaviors. The mothers were almost equally divided between being unaware (38.2%), partially aware (29.5%), and fully aware (31.3%). Mothers were also asked to determine the function of their matching behavior by choosing from a list of six possible functions which included: to be with, respond to, excite or calm the infant, restructure the interaction, and play. Mothers chose to "be with" and "respond to" their infants as their primary reasons. The limitations to the Stern et al. study are that the mothers used rating scales with forced choices determined by the experimenters, and they were asked to rate behaviors carried out in the lab. Mothers would have to fit their behaviors into categories that might not truly reflect their reason for the behavior. Also, a lab setting may limit the number of functions of the attuning behavior.

Because of the lack of knowledge on what communicating with their infants means to mothers, I examined this issue in the present study. More specifically, I focused on the following areas: mothers' awareness of communication patterns, their reasons for communicating, antecedents of their communication behaviors, and maternal beliefs about the importance of communicating with infants.
**Infant Speech Preferences**

In infant-mother communication, the infant also plays a dynamic part in the process. From the infant side of communication process, much is known about infant attention to certain aspects of the communication experience. Babies prefer to listen to infant-directed (ID) speech over adult-directed speech (AD) speech (Cooper & Aslin, 1990; Fernald, 1985; Pegg, Werker, & McLeod, 1992; Werker & McLeod, 1989).

For example, Cooper and Aslin (1990) found that newborns and one-month-old infants fixated longer on a black-and-white checkerboard while listening to female ID speech. Pegg, Werker, and McLeod (1992), using female and male speakers and a habituation-dishabituation procedure, established that seven-week-olds discriminate and prefer ID speech when spoken by both the male and female. Fernald (1985) tested four-month-old infants using a head-turning auditory preference procedure. The infants demonstrated a preference for ID speech when spoken by unfamiliar females. Werker and McLeod (1989) also used both male and female speakers when testing four- to nine-month-olds and found a preference for ID speech when spoken by persons of either gender.

With regard to their mothers, infants recognize their mothers' voices early in infancy. Newborns preferred to listen to their mothers' voices when allowed to choose
between their mothers' voices and an unfamiliar female's voice reading a story (DeCasper & Fifer, 1980). Neonates discriminated between two repeated syllables which were reinforced by either maternal AD speech or quiet, and sucked on a non-nutritive nipple to listen to their mothers speak AD speech, indicating the effectiveness of maternal voice as a reinforcer (Moon & Fifer, 1990). Again using the non-nutritive sucking technique, Moon and Fifer (as cited in Cooper, 1993) also found that neonates preferred to listen to a recording of their mothers' voices altered to sound like the maternal voice sounds in utero (with or without a superimposed recording of an intrauterine heartbeat) over the same unaltered recording. One-month-olds demonstrated a preference for their mothers' voices as long as she spoke normally and not in a monotone (Mehler, Bertoncini, Barriere, & Jassik-Gerschenfeld, 1978; Mills & Melhuish, 1974). In summary, infants prefer listening to infant-directed speech when spoken by both males and females and to their mothers' voices.

Interestingly, infants demonstrate developmental changes in preference for maternal adult-directed (AD) and infant-directed (ID) speech (Cooper, Abraham, Berman, & Staska, 1995). When presented with recordings of their mothers' voices speaking AD or ID speech, one-month-old infants showed no listening preference for either
maternal ID or AD speech, whereas four-month-olds preferred maternal ID speech. The results of the study of one-month-olds were surprising since infants at this age show a preference for ID speech when spoken by females unfamiliar to them (Cooper & Aslin, 1990; Pegg, Werker, & McLeod, 1992). It was assumed that this preference would generalize to the maternal voice. This lack of preference suggests that one-month-old infants are more interested in the maternal voice per se and are still becoming familiar with the variety of speaking styles that the maternal voice has demonstrated to the infant. As the communication dynamic evolves between infant and mother during the first four months, infants have had more opportunity to hear and respond to the maternal voice speaking ID speech, such that four-month-olds are more interested in hearing maternal ID speech.

Present Studies

The present studies were longitudinal in order to observe if there were developmental changes within infants and mothers as they aged and interacted with each other. Did infants who liked listening to their mothers' voices change over time? Did mothers notice changes in how they talked to their infants? Most of the studies cited above about infants' preferences and mothers' behavior have not followed the same subjects over time to look at differences
within the individual.

As mentioned above, there were two components to this study: a mother component and an infant component. The first was an examination of the mothers' experiences with ID speech. Although it is known that mothers speak ID speech and increase this speech style as the baby reaches 4 months of age, the mothers' experiences have not been investigated. More specifically, were they aware of their verbal and nonverbal behavior when they talked to their infants, why did they talk to their infants, where did they learn to interact with their infants, and what were their beliefs about the importance of communicating with their infants?

Besides talking to mothers who represented a more middle class, academic background, I also interviewed mothers representing other cultures such as teen, African-American, and low-income mothers. This provided a wider base from which to explore mothers' experiences and beliefs.

The second component focused on infant preference for maternal speech. For this study, infants of the mothers interviewed above were tested for preference for maternal AD speech or unfamiliar female ID speech. The same infants were followed and tested at two different age periods: 6-8 weeks and 16-18 weeks. Would infants' preferences reflect maternal communicative behavior as stated in the interviews? At 6-8 weeks, infants and mothers have had a short amount of
experience interacting with each other. By 16-18 weeks, infant and mothers vocalize to each other more, and the infant-mother communication dynamic has changed so that maternal ID speech is spoken more. If maternal experiences reveal this change, will infant preferences reflect it also?

It was hypothesized that infants age 6-8 weeks would prefer maternal AD speech because they prefer their mothers' voices speaking any type of speech (see above discussion) and are more familiar with their mothers' voices having heard them in utero. However, when infants reach 16-18 weeks, they will prefer unfamiliar female ID speech over maternal AD speech. Previous research has shown that infants at this age have a demonstrated preference for both maternal and unfamiliar female ID speech, as compared to AD speech. Therefore, at this age I hypothesized that speech style will be more salient to them.

Study One: Maternal Self-perception of Communicative Behavior with Infants

Method

Design. This study was longitudinal so that changes in mothers' communicative experiences with their infants could be assessed. Mothers were interviewed when their infants were 6-8 weeks of age, and again when their infants were 16-18 weeks of age.
Participants. Forty-seven mothers participated when their infants were 6-8 weeks old, and 42 of the original 47 mothers when their infants were 16-18 weeks. Five mothers were unable to be interviewed the second time because they chose not to (2) or moved (3). Mothers were recruited through local birth announcements, the New River Valley Health Department, the Roanoke school district pregnancy program, and personal referral.

The mothers ranged in age from 14 to 41 years, with the mean age being 28 years (SD=7.3). Their median income level was $20,001-30,000/year, and median level of education was college graduate. Seven mothers were African-American, one South African, one Canadian, one Hispanic, and the rest Caucasian. Two of the African-American mothers and the one South African mother did not participate in the second interview. One mother had twins and two mothers had premature infants. Forty-nine percent (n=23) of the mothers were first-time mothers. See Table 1 for demographics.

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Procedure

The mothers who were recruited through birth announcements were initially contacted by letter (see Appendix A) to inform them about the study. They were then
contacted by phone to explain the study and ask them to participate. When they agreed to participate, an appointment for an interview was scheduled. The mothers who were not recruited through birth announcements were contacted through the agency providing them services, either the health department or Roanoke school pregnancy program. I met with the program directors and explained the study. Together, we determined the best way to find participants. For the health department, employees from programs serving low-income mothers contacted me and gave me the names of teen and low-income mothers who were interested, or they had the mothers call me directly, collect. For the Roanoke school program, the director talked to teens whose infants approximated the targeted ages of the study and asked them if they wanted to participate. All health department and Roanoke school mothers were low-income and were given disposable diapers in appreciation for their participation.

Mothers were interviewed in their homes (n=41;36), at work (n=2;3), and at school (n=4;3). A portable, high quality audio cassette recorder (Marantz, Model PMD 221) was used with a lightweight, professional lapel microphone (Sony, Model ECM-011). For approximately one-half of the second interviews, a handheld microphone (Electret Condenser Microphone) had to be used because the lapel microphone was being repaired. The microphone was turned on at the
beginning of the session and ran throughout the visit. The mothers were asked the open-ended questions in Appendix B, and their replies were recorded. They also filled out a demographic information sheet (see Appendix C). Except for the demographic information, the above procedures were repeated when the infants reached 16 weeks of age. Mothers were contacted by phone for a second interview. However, at that time, the interview questions were slightly different (see Appendix D) to reflect the mothers' experiences during the time that had elapsed. As the primary researcher, I conducted all of the first interviews and 34 of the second interviews. A trained undergraduate lab assistant conducted eight of the second interviews.

Analysis

Interviews with the mothers were transcribed in their entirety. Because the data are qualitative, an analysis outlined by Miles and Huberman (1984, 1994) was conducted. Three activities occur in this analysis: data reduction, data display, and conclusion drawing/verification.

In the process of data reduction, the data in the interviews were abstracted and transformed. To do this, the data were coded, that is, sentences or paragraphs were classified into categories which were derived from the research questions. The purpose of this first-level coding was to summarize portions of the data. The codes
facilitated retrieving and organizing information so that all parts of the interviews which related to that code could be identified, extracted, and assembled around the relevant question. I created a coding sheet for each set of interviews (see Appendices E and F). For example, possible codes for the question about why mothers talk to their infants might include "emotion" for answers that reflected feelings, "role" for answers that talked about what mothers are supposed to do, or "language" for answers that pertained to infants learning how to speak. Because coding involves taking natural data and abstracting them, the issue of reliability needs to be carefully addressed.

In a qualitative study, reliability, or the extent to which the study can be replicated, is complicated by three issues: (a) the nature of the data and research process, because natural events cannot be reproduced; (b) the presentation of the findings, which can vary due to the range of techniques and formats that can be used; and (c) the traditional modes of training researchers, so that often researchers assume readers know the methods and procedures (Goetz & LeCompte, 1984). To insure reliability I used the following methods suggested by Goetz and LeCompte (1984): (a) recording the data; (b) presenting a detailed description of data collection and analysis; (c) delineating units of analysis; (d) carefully describing participants.
(but not so they lose anonymity); and (d) using peer review to confirm or disconfirm coding.

As a peer review confirmation, both sets of interviews were coded by others. The 47 first interviews contained approximately 2540 coded responses. Seventy-nine percent (n=37) of the first interviews representing 88% (n=2150) of the responses were also coded by three undergraduate lab assistants who were unmarried and did not have children. There were 199 differences between myself and other coders for an interrater reliability of .91. The differences were resolved by reviewing the original data and noting the reasons for the differences. Reasons included missing information in the original data or defining the code differently. The coding was then corrected to reflect consistency.

The 42 second interviews contained approximately 2310 responses. Forty-eight percent (n=20) of the second interviews representing 40% (n=915) of the responses were also coded by a psychiatric nurse with a PhD in psychology who has a child. There were 78 differences between myself and the other coder for an interrater reliability of .91. The differences were resolved in the same manner as stated above.

After the first level of coding was completed, a second level of coding was done to identify themes, patterns or
explanations by grouping the summaries established in first-level coding. These themes were used to write a memo which elaborated the code's significance. Memos are conceptual and tie different pieces of data together or connect them to concepts. Memos are then formalized into propositions or connected sets of statements which reflect the findings and conclusions of the study. For an example of memos and propositions, see Appendix G.

After coding the data, the second activity of data analysis is to make a display of the data. Using the questions as a guide, I made one matrix each of the first and second interviews. These matrices allowed the data to be displayed spatially in a systematic way so that comparisons could be made across and within mothers.

The final step of analysis is drawing and verifying conclusions. What is critical in this activity is ensuring that the meanings found in the data are valid. I used the following tactics suggested by Miles and Huberman (1994) to generate meaning from the data: counting frequency of responses, noting themes, seeing plausibility, clustering ideas, making contrasts and comparisons, subsuming particulars into the general, noting relations between variables, finding intervening variables, building a logical chain of evidence, and making conceptual/theoretical coherence. These are defined in Appendix H.
During these analyses procedures, validity was ensured by employing the following tactics: checking for representativeness, checking for researcher effects, triangulating, weighting the evidence, checking the meaning of outliers, using extreme cases, making if-then tests, and checking out rival explanations. See Appendix I for definitions of each of these tactics.

Goetz and LeCompte (1984) also discuss problems with and strategies for assuring validity or that the propositions generated match the actual conditions in qualitative research. Internal validity can be affected by history and maturation, observer effects, selection of subjects, and spurious conclusions. External validity is threatened by selection, setting, history, and construct effects. Strategies used to ensure both internal and external validity included: reflecting on my ideas and conclusions by keeping a log of the analyses, using the language of participants whenever possible, selecting a variety of participants, and looking for disconfirming as well as confirming evidence. I also offered the participants the opportunity to read their own interviews, but none of them did because of embarrassment of seeing what they said in print.

Descriptive Data Analysis and Results

For the analysis of the descriptive data, frequency of
answers were tabulated. These included: type of feeding; when mothers began talking to their infants; frequency of talking to their infants; whether they sang, played music, or read to their infants; at what age they thought infants began to understand what is said to them; mothers' descriptions of their speech to their infants, why mothers talked to their infants; where they learned to interact with their infants; and what their beliefs were about the benefits of talking to their infants to their infants' development. Table 2 contains frequency counts of activities that allowed mothers to interact with their infants, that is, feeding, talking, singing, playing music, and reading.

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Two-thirds (68%; n=32) of the mothers were breastfeeding when their infants were 6-8 weeks of age, including one out of the nine teens who participated. Three of the mothers who were bottlefeeding were already back to work. By 16-18 weeks, a little over one-half (55%; n=23) were still breastfeeding. The one teen mom who had breastfed changed to bottlefeeding by this point. Although eight mothers returned to work during this time period, only one of those switched to bottlefeeding.
When asked how often they talked to their infants, mothers' answers were coded "always" when they said "all the time", "situational" when they answered "when I am doing something with the baby", and "frequently" when they said "whenever s/he is awake". Their answers reflected their view of frequency, not an objective measurement of hours and minutes. That is, mothers saying "all the time" and "whenever the baby is awake" may talk the same amount to their infants, but interpret the time differently. At 6-8 weeks, 53% (n=25) of the mothers said they always talk to their infants. This jumped to 83% (n=35) when the infants were 16-18 weeks. This increase reflects infants' developmental changes such as being awake more, smiling and laughing, and responding vocally and physically when their mothers spoke to them. Five of the six mothers who said "situational" and nine of the 13 mothers who said "frequently" at the first interview changed to "always" by the second interview. The reasons for this become apparent when later asked if they were talking to infants more and why. All of them except one said that they were, the reasons being that their infants were awake more and more responsive. Two of the four mothers whose answers changed from more time to less time (i.e., "always"--->"frequently" or "frequently" --"situational") had gone back to work when their infants were four months. The other two had older
children who took up more of their time.

Mothers were asked if they sang, played music, or read to their infants. The changes in percentages from two months to four months were negligible. Those mothers who indirectly sang did so to vocal music playing on the radio or recordings. Mothers who answered "no" insisted that their singing voices were so bad that their infants were thankful that they did not sing to them. The youngest teen mom had sung to her infant at two months, but quit at four months because her throat hurt.

When asked about playing music, most mothers did so. The type of music played varied from rock and roll, reggae, rhythm and blues, classical, opera, and children's music. One infant was especially fond of Elton John, and his mother noticed that at four months, he would play longer alone if she played Elton John for him. Another mother started to play classical music at age four months, because a study had come out stating that students who listened to Mozart scored higher on intelligence tests. The family normally listened to country music, but were now playing classical tapes in the car.

When it came to reading to their infants, the percentages of mother who did and did not read remained virtually unchanged from two to four months. Mothers who indirectly read to their infants included them when reading
to older children. Two mothers had tried to read to their 6-8-week-olds, but the infants showed no interest so they stopped. Many of the mothers were apologetic at four months when they answered "no" saying it was something that they should probably start doing.

Mothers were asked to estimate when they thought infants begin to understand what is said to them (see Table 3). When they had difficulty answering, the question was then divided between tone of voice and words. There were noticeable changes between two and four months. At two months, 34% (n=16) of the mothers answered that they did not know. This changed as mothers had two more months to interact with their infants. At four months, only one mother answered that she did not know, and out of the 13 mothers indicating infants understood at 4-5 months, 10 actually identified the words they thought that their infants understood at the time of the interview. These words included their names, bottle, bye-bye and cereal.

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Of the 20 mothers who had to be probed further in the first interview, 17 thought that their infants understood tone of voice at birth or in the first month afterwards. Six of these mothers changed their minds when interviewed.
the second time, with four of them saying that infants understood tone "now", meaning at four months. The number of mothers answering that infants understood tone of voice at four months during the second interview reflected a large increase from the first interview, from 2% (n=1) at two months to 38% (n=16). This increase seemed to be due to the increased responsiveness of the infants.

Only 14 of the 18 mothers further questioned about a specific age for understanding words during the first interview, ventured an answer with 56% (n=8) of those stating between 6-7 months. During the second interviews, more mothers were specifically asked about when infants understood words (n=29). Seventy-six percent (n=22) of these mothers tried to estimate when they thought infants began to understand words with 41% (n=12) saying 6-7 months and another 21% (n=6) saying that they did not know. Four of the mothers who stated 6-7 months also answered that their infants currently understood one or two words such as their names or bottle.

Mothers were asked when they started talking to their infants. It is known that fetuses are able to hear their mothers' voices (Richards et al., 1992) and that these experiences have been shown to produce preferences for mothers' voices after birth (DeCasper & Spence, 1986; Moon & Fifer, 1990; Spence & DeCasper, 1987). However, the
The purpose of this question was to determine when mothers began the communication dynamic with their infants. Mothers could be divided into three groups based on their answers.

One set actively spoke to their babies while the infants were in utero. This set included 64% (n=30) of the mothers, across all ages. Some mothers (11%, n=5) talked to infants before birth, but only when the baby moved. Twenty of these 35 mothers who interacted with their infants before birth were first-time mothers. The last group did not talk to their infants until they were born (26%, n=12). One mother stated that she did not speak to her infant while he was in utero, but she would "think" to it.

Four questions were raised in the introduction concerning mothers' experiences talking to their infants: Are mothers aware of their verbal and nonverbal behavior when they talk to their infants? Why do they talk to their infants? Where have they learned to interact with their infants? What are their beliefs about the importance of communicating with their infants? These questions will now be examined.

Mothers description of speech to infants. All mothers were able to describe how they talked with their infants, that is, if they changed the pitch of their voice, adjusted how loud or softly they spoke, repeated what they said, smiled more, and asked more questions or made more
statements. When talking to their infants, 74% (n=35) of the mothers raised the pitch of their voices when their infants were 6-8 weeks old. Eight mothers stated they did not change their voice at all, and four said their voices became lower. Most mothers (n=42) could easily identify how they spoke to their infants, including all the teen mothers. Others (n=5) were unsure and had to be provided with specific probes about their behaviors. Table 4 shows their answers at two and four months.

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By the second interview, 86% (n=36) of the mothers reported raising the pitch of their voices when talking to their infants. Three of the mothers, including the youngest teen mom, changed from no voice difference to using a higher pitch. One mother with a gravelly voice stated that she had made a conscious effort between interviews to experiment with her voice. She found that her baby responded much more when she raised the pitch, so she started talking that way to him whenever she wanted his attention and would use her regular voice when she just wanted to talk to fill time, such as when they were in the car together. Another point of view was given by a mom who had reported a lower pitch for both interviews. She said at four months,
I think it gets a little lower pitched 'cause he doesn't like anything high-pitched...He gives you a pout like he's gonna start crying so I usually find that I lower my voice...he just seems to respond a lot better when I'm talking to my husband and I'm trying to talk normal. (M16)

During the time period between interviews, mothers seemed to be paying attention to how their infants responded when they talked to them. Their answers at four months reflected their awareness of what brought out the most favorable responses.

Almost all mothers were aware of smiling when talking to their infants at both ages. One mother reported she was not sure she smiled, since she was unable to see herself. But by the time her infant was four months, she stated that she smiled and assumed her face was more expressive. Two mothers were not asked about smiling during the second interview due to interview dynamics (i.e., interference of small children during interview process), but although they did not directly state it, both reported smiling during the first interview and most likely were continuing to do so.

Most mothers also repeated themselves when they talked to their infants at both ages. A number of mothers commented on how much they did repeat themselves. One mother stated it this way,
...more repetition. I think the last time I really didn't, didn't think about it quite right. I really do repeat a lot when I, when I talk to him. I say the same things over and over and over again. (M40)

One issue that some mothers dealt with was whether or not to talk baby talk to their infants. Twenty-six percent (n=12) of the mothers brought up the issue of talking baby talk to their infants at 6-8 weeks, and 10 of these mothers admitted actually doing so. Two were adamant about "trying not to get into...the baby talk too much" (M44). A number of mothers talked about how "they" say that you should not speak "baby talk" when talking to their infants. At the first interview, when questioned who "they" were, they replied, doctors and books. When queried about what "baby talk" is, they explained substituting words like "ba ba" for bottle. One mother stated, "I don't use baby talk though...although we do call nursing nummies" (M39). By four months, one of the mothers resolved her problem of whether or not to talk baby talk as advised by her mother. She said,

Yeah, people are crazy. I don't know why you should talk to them like adults because...he doesn't respond. If I talk to him like an adult, he just listens. But if I talk to him in, in like his own little personal language, then he goes nuts. I mean his leg is going, his arms is [sic] going, everything goes crazy. (M16)

Finally, by the time infants were four months, 21%
(n=9) of the mothers reported turn-taking with their infants. That is, when talking with the infants the mothers would pause long enough for the infant to respond. These mothers actually referred to their infants as talking back to them, although none of the infants were able to speak words yet. All the infants in this study were cooing, babbling, and making sounds at this age.

In summary, most of the mothers in this study did not report a dramatic change in how they talked to their infants from two to four months. This is in contrast to Stern et al's (1983) findings that mothers' pitch and repetition showed more exaggeration when infants were four months old. Turn-taking emerges at four months, and individual mothers may experiment with pitch, baby talk, or other aspects of communication. At four months, mothers are basing their communication style on their infants' developing changes in response.

Maternal rationales for talking to infants. Mothers talk to their infants for a variety of reasons, the most common ones being voice recognition, bonding, language development, infant's presence, and communication. Two unusual responses were given by the youngest mother and a mother in her 30s whose infant was born 10 years after her 3rd youngest. The teen mom talked to her infant because "she's mine" (M13) which did not fit into the category of
wanting to bond or connect with an infant. The other mother stated that "it's like a new start and he doesn't know all my faults and it's like I have a new chance, that this is a little person that only needs me" (M28). Table 5 contains the tabulation of their answers at two and four months.

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When discussing why they talk to their infants at age four months, mothers were given the reasons they previously stated and asked if these were still valid or if they had changed. Seventy-nine percent (n=33) of the mothers stated that their reasons were still the same. Of these, 21 mothers had additional reasons, some of which reflected the infants' development (e.g., the baby enjoys it, initiates interaction, and converses back) and their own enjoyment (e.g., like it, it's natural, wants to hear infant's sounds). The nine mothers who changed their reasons did so because of the infants' development. That is, they were more concerned about language development or were turn-taking when talking to their infants.

How mothers learned to talk to infants. When discussing how they learned to talk to infants, 26% (n=12) of the mothers had difficulty determining this. Eight-nine percent (n=42) were able to recall experience with siblings
or watching their mothers interacting with infants or both. Fifty-one percent (n=24) of the mothers had direct previous experience because they had other children. These multiparous mothers plus six of the 42 mothers who had experience with siblings constitute the 30 mothers answering "experience". Seventeen percent (n=8) mentioned that having pets contributed to how they were currently communicating with their infants. As one first-time mother replied when asked how she learned to talk to her infant,

I think from talking to animals...the way you treat dogs and cats and other creatures that can't interact with you...cause it's the guessing game, and I think the guessing game is the same...I find myself using a lot of tones and stuff that I might use with a puppy or cat or some other creature. (M36)

Twenty-three percent (n=11) of the mothers cited instinct as their immediate answer. However, all of these mothers were able to recall watching someone, usually mother or sister, model talking behaviors or having experience with infants. Finally, 21% (n=10) cited having learned through books, babysitting courses, hospital video, and television. See Table 6 for the tabulations of these answers. Since some mothers gave multiple answers, the responses add up to more than 47.
During the second interviews mothers were asked if they had learned anything during their two months of communicating with their infants. While 69% (n=29) stated that they did learn something during this time, 31% (n=13) of the mothers said they did not. Mothers who did learn something ranged from first- to fourth-time mothers. Some remarked on the individuality of infants, others had become more at ease talking and had tried new things with their babies or had found that they were able to talk to other babies more comfortably. Regarding the question asked during the first interview about how they had learned to talk to infants, two mothers remarked about watching their other children imitate them when interacting with the infants. As one mother said,

And I thought, oh, that's learning that starts so young...I was thinking ...it had to have been when I was older. But, it was already starting for them and they imitated exactly what you said, the exact same inflection. (M31)

See also Table 6 for a summary of these responses.

Maternal beliefs about talking to infants. Two questions in each of the interviews probed mothers about their beliefs about: 1) the importance of talking to infants (global belief), and, 2) the effects that talking to
their own infants have on their infants' development (specific belief). During both interviews, all mothers answered that they believed that it was important to talk to infants giving 16 different reasons during the first interview and 19 different reasons during the second interview.

During the second interview mothers were also asked if the infant's age made a difference in how important talking to them was. Fifty-seven percent (n=24) said it did not, with four mothers adding that talking serves a different function at different ages and that it is easier to do so as the infant ages. Thirty-one percent (n=13) thought age made a difference, with only one mother thinking infants needed it more when they were younger, and all the others thinking that older infants benefitted more. One mother stated that theoretically the answer was no, but from a practical standpoint, it was a lot easier to talk to infants as they were older since they responded more.

When mothers were asked during the first interview how talking to their infants helps their own infants' development, 51% (n=24) responded that it would help develop language. By this they meant learning vocabulary and talking, not the art of conversation. Other reasons were divided among 17 other categories. Three mothers did not know how it would help development.
During the second interview, when mothers were asked if they believed that talking to their specific infants has helped them to develop, all mothers said yes. However, only 21% (n=9) responded that it had helped language development with other answers divided among 19 categories. One mother did state she thought it increased synaptic growth in the brain so that her infant would be more intelligent.

Mothers were then asked how talking might affect their infants' future development. Language development again emerged as the primary reason with 48% (n=20) of the mothers giving that as their response. One mother stated, "And I'm waiting for that ultimate first word" (M16). Twenty-nine percent (n=12) gave answers reflecting socialization such as interacting with, getting to know, or talking with other people. See Table 8 for a summary of answers.

Model relating descriptive data. A model which conceptualizes the mother-infant communication process was constructed based on a careful analysis of the data (see Figure 1). The model shows two primary communicators: mother and infant. Both communicators have individual characteristics making them who they are. Mothers' characteristics include age, personality, experience,
beliefs and values. In this study, mothers' ages ranged from 14-41 years. Some were first-time mothers (n=23), others had two or three other children (n=25). All mothers believed that talking to infants was important. Other child-care beliefs along with personality variables and values were not assessed. Some of these other beliefs, personality differences, and values were implied as mothers talked. For instance, during the first interviews a few mothers (n=3) talked about allowing their infants to sleep in bed with them, whereas other mothers kept their infants in cribs.

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Infants' characteristics include activity level, emotionality, and sociability. According to Buss (1995) activity is the amount of energy expended in body movement, emotionality is tendency to become aroused easily and intensely, and sociability is preference for being with other people. Infants demonstrate individual differences on each of these attributes. Although no measures of these qualities were taken, mothers would talk about whether their infants were fussy, "good", easy, never fussy.

Maternal and infant characteristics influence one another. For example, if a mother is high in sociability,
she may take her infant around many other people. If her infant is low in sociability, s/he may not respond well to a lot of interaction. These two characteristics will oppose one another and set up a potential conflict which will have to be negotiated.

Maternal characteristics are influenced by resources available to the mother such as child care manuals, television, or classes. Resources influence mothers to varying degrees with some mothers carefully following advice from manuals and others ignoring it. The arrows between resources and maternal characteristics are bidirectional because some mothers actively seek out resources.

Maternal characteristics are also influenced by culture. Cultural influences will affect child care practices and beliefs. For example, 68% of the mothers breastfed their infants at two months. Reasons for breastfeeding include cultural influences. The arrows are bidirectional because mothers can affect culture by choosing to accept or reject practices common to their culture. For example, one of the teens chose to breastfeed her infant when all of her friends were bottlefeeding, thus, rejecting a child care practice that is normative for her peer group.

Both mother and infant styles of communication that are influenced by their characteristics. For example, one young mother (M30) had a loud, boisterous voice which she reported
was a result of growing up in a large family of talkers. Infants also have a style of communication influenced by their characteristics. Some infants cry more because they are easily aroused.

Maternal and infant styles of communication are also influenced by the support systems present. These include other family members, extended family, and friends. One mother (M42) reported listening to how her husband interacted with their son, and trying some of the behaviors that he exhibited. Infants are influenced by the different styles of interaction that they experience with their mothers and other members of the support system. As one mother so aptly put it,

...having your own is a whole lot different...than someone else's...I think you still learn...the way your infant wants to be talked to is different than any...other infant wants to be talked to so...I think, just the way that I talk to her makes her decide the way she wants to be talked to...(M23)

Mother and infant communication styles interact to form a dynamic communication pattern. This pattern can reflect either a continuous communication process with co-regulation or a discrete communication process. These will be elaborated on more in the general discussion.

**Thematic Analysis**

Besides conducting a descriptive analysis, I analyzed the data for themes by doing a second level of coding was
done. From the codes, memos which elaborated the code's significance were written. Memos are conceptual and tie different pieces of data together or connect them. From these memos evolved propositions which connected the memos. Using this technique and others explained below, I generated four themes: expert advice influenced some mother-infant communication; one pattern of communication between mothers and infants is similar to Fogel's (1993) notion of co-regulation; maternal communication behaviors were consistent across age and ethnicity; and experience talking to pets influenced some new mothers' speaking styles. The following is an explanation of the process of analysis for each of these.

**Theme 1: Expert advice influenced some mother-infant communications.** When the data first indicated to me that advice was an issue a couple mothers were considering, I noted the issue and wrote a memo (see Appendix G). After writing several memos as mothers spoke about advice, I combined them to form the initial proposition: first-time mothers consider advice from experts and significant others when learning how to talk to infants. However, I changed this proposition to the theme, expert advice influences some mother-infant communications, after I interviewed one mother (M41) who had just had her third child and spoke extensively about expert advice, therefore disconfirming by original
assertion.

Initially I had separate codes for advice from books, TV, videos, doctors, and mothers. I clustered these because the issue of whether or not to listen to what these resources were saying was common to all of them. The origin of the resource seemed not to make a difference. All were seen as credible by the mothers who spoke about them.

I counted the frequency of mothers who discussed this issue. It included 21% (n=10) of the mothers. I then compared and contrasted those mothers influenced by advice to those who did not mention it. I found that 60% (n=6) of the mothers were in the lower income bracket (<$20,000/year) compared to 36% of the total mothers. However, one of the low-income mothers who discussed advice worked in day care and was referring to courses she had taken in school. Four of the low-income mothers who discussed advice had been told by doctors or a video in the hospital that they should talk to their infants. The sixth mother of the low-income group and the mothers whose incomes were >$20,000 had read or had mothers giving advice. All of these were college-educated. Other than the higher percentage of low-income mothers, I could find no other differences between mothers mentioning advice and those not mentioning it.

As I examined the relationship between the variables of advice and how mothers spoke to infants, I found a continuum
of how advice affected mothers. On one end of the continuum was one first-time mother following the advice faithfully and stating it as one of the reasons she talked to her infant at both age 2 and 4 months. The other end of the continuum was represented by a third-time mother who felt resentful because the book made her feel like she "wasn't talking to her [the infant] enough" (M41).

I searched for intervening variables. Since I did not take measurements of maternal characteristics, I was unable to determine what personal variables might affect a mother to seek, listen to, or reject advice. But I did decide that initially expert advice acts as an intervening variable because it intervenes between mother and infant communication by affecting the mothers actions to the infant. However, by the time the infants were four months, the mothers either have incorporated the advice in their speaking style or have rejected it.

Throughout my thinking process I would outline what was happening with the issue of advice. The last logical chain of evidence I drew is shown in Figure 2. Although it is simplistic, it reinforced the theme that some of the mother-infant communication was influenced by expert advice. As I outlined what happened between the first and second interviews to the mothers who had considered advice, I realized that not all mothers chose to follow it, thus
advice did not affect all mothers in the same way.

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Insert Figure 2 here
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Conceptualizing the theme, i.e., expert advice influenced some mother-infant communication, occurred during the second interviews, specifically after the interview of one mother (M16) who vehemently objected to advice from her mother to not talk baby talk to her infant. I realized then that mothers considered advice in different ways and came to their individual conclusions on how it would affect them.

Once I decided that this theme was important, I began using some of the tactics suggested by Miles and Huberman (1994) for confirming/disconfirming findings. I started by examining how representative of the entire group of mother the mothers who discussed advice were. The mothers' ages were teens to 41-year-old, and as previously mentioned, over majority (60%) were of lower income. Half (50%) of these mothers were first-time mothers, and the rest recounted the effects of advice on interactions with the present infants or with their first infants. Their education ranged from high school to graduate degrees. Since the mothers did not represent outliers, I determined that the theme had some validity.

Next, I searched for researcher effects by examining
the transcripts to see how I had discussed the advice and if it had any effects on second interview answers. I found that I would ask them to explain what they meant by advice, and if they mentioned reading a book or watching a television program, I would ask them if they remembered the name of the book or program. I did not find evidence that I influenced this area in either the first or second interviews.

Finally, I triangulated data by referring to Fogel's (1993) information on culture of infancy. He states that childcare information is easily accessible and changes frequently so that parents become overwhelmed with often conflicting advice, much of which is difficult to put into action when the infant is crying. I thought this statement was reflected in mothers' data as they discussed advice and how they tried to follow it, and then, at some point, made their decision about how they would or would not incorporate it into their communication style.

**Theme 2: One pattern of communication between mothers and infants is similar to Fogel's (1993) notion of co-regulation.** As I did with the first theme, when I first noted that the descriptions mothers were making about their interactions reflected co-regulation, I wrote myself a memo about it (see Appendix G). This theme had more memos than the previous as it was more pervasive. My first
proposition, that co-regulation was universal to mother-infant communication, was written after the first interviews. This proposition was changed to the theme after some feedback and discussion with my advisor.

Co-regulation as described by Fogel (1993) seemed a plausible concept reflecting the coded behaviors and capturing the phenomena presented in this study. The mothers' descriptions of how they interacted with their infants and their infants interacted with them indicated that behaviors on the parts of both communicators would change and adjust depending on each other's behaviors. I clustered groups of coded behaviors and subsumed the separate scenarios that reflected both mothers' and infants' reciprocal behaviors into the general metaphor of "co-regulation". For example, a description of the feeding and playing situations which included adjusting behaviors would be clustered under the rubric of co-regulation.

I counted the frequency of mothers who discussed situations reflecting co-regulated behavior and found this included all mothers. I then compared the mothers and was not able to determine any differences among the mothers, except in the way they would talk about the scenarios and explain the changing behaviors. Focusing specifically on the relationship between maternal/infant interaction, situation, and baby's age, I built a chain of evidence
outlining the interactions between these (see Figure 2), with baby's age being included under "more responsive". I interpreted the relationship between the variables as co-regulation.

I looked for intervening variables. I found that in a couple of cases, I was an intervening variable causing mothers to try something new or to be more aware of their behaviors. Although I did not talk about co-regulation in any of the interviews, the questions I asked about how they interacted with their infants in different situations and how they talked to their infants facilitated new behavior or awareness on the mother's part, which then changed the maternal-infant interaction. During the second interview one mother said, "I've learned things from you...I have done some experimenting...and she's a much more responsive baby than the other two have been" (M41).

I started verifying this theme by checking for representativeness and found occurrences across all mothers. I reviewed the interviews to check for researcher effects and noting my interactions with participants. I especially noted those mothers (n=6) who specifically mentioned my effect on their behaviors, and confirmed that my questions during the first interview increased their awareness of their communication behaviors and caused some of them to try raising the pitch of their voices when speaking to their
infants.

I triangulated the coded data with Fogel's (1993) description of co-regulated activities and thought his description fit what mothers reported doing. I also weighted the evidence by examining the strength of the data. Since the theme of co-regulation was carried through all the interviews, reported directly from the mothers, and collected in an informal setting while the respondent was alone with the interviewer, I weighted the data as strong evidence for this theme.

In checking for outliers, I thought that the 14-year-old mother was an outlier for first interview because her interview answers were short, and I had been told by the nurse who referred her that she did not talk to her infant. However, after reviewing the transcript of her interview, I noted that she, too, mentioned co-regulated behaviors when describing her interactions in different scenarios when her infant was 2 months, and then during her second interview, answered directly how she and her infant had changed communicative behaviors as her infant aged.

When I looked for negative cases, I found that not all communication interactions reflect co-regulation. For example, there were times when mothers chose to ignore infants' signals, usually because they were trying to facilitate change in behavior. Therefore, I realized that
although mothers reported patterns of communicative behavior that were co-regulated, that co-regulated communication did not occur in every interaction with their infants.

I made the following if--then statements to attempt to be more conceptual in my thinking: if infants respond positively in an interaction, then mothers report increasing behaviors to maintain response; if mothers want infants to engage in less energetic activities such as sleeping or eating, then they will adjust their behavior so that there is less interaction; if infants begin responding verbally, then mothers talk to infants as if having a conversation; if mothers want to change a specific behavior, then they may choose to ignore infants' cues and not respond to infant. These statements, except for the last one, reinforced my belief that co-regulated behavior was occurring in mother-infant communication. The last statement made me aware that co-regulation was not the only pattern of communication.

Finally, I asked for feedback from participants during the second interview by directly questioning them about changes in how much they spoke and the manner of speaking as their infants aged. By the second interview, 69% (n=29) of the mothers reported changing the way they talked to their infants since the first interview (see Table 8). Forty-five percent (n=13) indicated a change in style of speaking which included using normal voice more often, making more sounds,
not using baby talk, having normal conversation (turn-taking), and speaking infant-directed (ID) speech. Another 45% (n=13) stated changes in content including: talking about what the infant was doing, explaining less, talking about more meaningful or a greater variety of topics, using a larger vocabulary, and saying the infant's name more. One mother each mentioned becoming more aware of the infant's response, reading to the infant, and a context change as the mother had gone back to work.

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Insert Table 8 here
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When asked why there had been a change in the way they spoke to their infants, 66% (n=19) answered that their infants had become more responsive. Other answers included infants being more alert, attentive, developed, and older. Two mothers thought their infants were learning and understanding more. One mother had made changes to involve an older sibling, and one mother found that her postnatal fatigue had finally disappeared. These changes again reflect the co-regulation process which is occurring in the mother-infant communication dynamic.

Theme 3: Maternal communication behaviors were consistent across ages and ethnicities of mothers. I noted that I was hearing the same information from teen mothers
that I was hearing from older mothers. I wrote memo when I first realized this, and wrote several more before forming the initial proposition that maternal communication behaviors are universal among all mothers in this area. After I received some feedback on the use of the term, "universal", I changed the proposition to the theme stated above. See Appendix G for my first memo and the original proposition.

I counted the frequency of teens and non-Caucasian mothers and noted their descriptions of their communicative behavior. Nineteen percent (n=9) were teens, and 19% (n=9) were ethnic minorities including 7 African-American, 1 Hispanic, and 1 South African mothers. However, there was a confound because five of the seven African-American mothers were also teens. However, when I made comparisons between them and the non-teen and Caucasian mothers, I found that all of them described their communicative behaviors in the same manner.

I examined the relationships between the variables of communication, infants, and teen/minority mothers and found that as the infants changed the mothers talked about changes in their communication, both changing together. That is, if one variable changed, there was a change in the other two variables. This change was also evident in the relationship between the variables of communication, infants, and the
Caucasian mothers. Thus, there was a consistency among these variables across all mothers.

I searched for intervening variables. In the case of all teen mothers and the two non-teen African-American mothers, a significant other female, either their mothers or aunts, were mentioned as role models for their communicative behaviors. This pointed to some consistency among generations. Finally, I made a logical chain of evidence (see Figure 3) to assist me in thinking through the consistency of behavior. Although it is simplistic, it helped me to clarify the consistency among mothers.

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Insert Figure 3 here

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I began verifying my conclusions by checking for representativeness. As mentioned earlier, I found that my sample was small and confounded by the fact that the teen mothers also constituted the majority of the African-American mothers. In spite of this, all reported common communicative behaviors.

I checked for researcher effects by reviewing interviews and noting my interactions with participants. I found that I stated questions of scenarios and changes in communication the same across these mothers, thus not biasing how they might answer. Then I weighted the evidence
by examining the strength of the data. Since the mothers directly reported same types of behaviors through all the interviews and the data were collected in an informal setting while the respondent was alone with the interviewer, I weighted the evidence as strong data.

When checking for outliers, I thought that the 14-year-old mother would be the extreme case, but found that she, too, mentioned communicative behaviors common to all mothers when describing her interactions in different scenarios when her infant was two and four months. These were more strongly expressed during her second interview. Finally, I looked for negative cases and found none.

Theme 4: Experience talking to pets influenced some new mothers' speaking styles. The first time I heard a mother tell me that she talked to her dogs like she did to her infant, I made note of it and wrote a memo. From that time I made a point of asking mothers if they had pets whenever they were answering how they learned to talk to infants. After a few more memos I formed my proposition. See Appendix G for my first memo and the original proposition.

I counted the frequency of mothers who mentioned experience with pets as the way they learned to talk to their infants, and it included 17% (n=8) of the mothers. When I made contrasts/comparisons between mothers, I found
that six out of the eight were first-time mothers. The other two mothers identified having pets as contributing how they learned to talk to their first infants.

I examined the relationship between the variables of pet ownership and communication. I found that many thought of their pets as their first children, therefore found it easier to talk to their infants from practice with pets.

The two main ways I verified my conclusion was by checking for representativeness and researcher effects. I found that mothers represented a variety of incomes and age levels, and showed no differences from other mothers without pets. In reviewing the interviews and noting my interactions with participants, I found that I was consistent in asking about pets when I asked how mothers learned to talk to infants.

Results and Discussion: Thematic Data

The first theme was that expert advice influenced some mother-infant communication. Although only 21% of the mothers brought up this issue, each of these mothers was quite affected by the advice on talking to infants. All of the mothers considered the advice, especially with first infants. Mothers with less experience, especially teen mothers, were more likely to follow the advice. Older, educated mothers evaluated the advice by trying it and making a determination of whether they wanted to follow it.
Thus, there was a continuum of how the mothers resolved the issue of advice from ignoring it to following it faithfully.

Surprisingly, for one mother the advice she read brought on strong feelings of resentment. She had three children and thought that the book she had read was critical of how much she talked to her infant. Fogel (1993) states that advice can be overwhelming at times and not relevant when in the midst of a situation when an infant is crying. Marshall (1991) reviewed seven different British child care manuals and found that the manuals construct motherhood as crucial to women and a wholly positive experience. The language of these books places the responsibility for "normal development" (p.83) primarily on the mothers, thus implying that if a problem develops, it is the mother's fault. This would make it difficult for a mother, especially a first-time mother, to totally dismiss advice coming from a pediatrician or psychologist. Perhaps it is this attitude that made the above mother resentful.

The question that needs to be further pursued is what makes some mothers turn to advice and other mothers not? It is not just lack of experience, as not all the mothers were first-time mothers. Do these same mothers look for advice in other areas as well, such as pet training? It may be that in the pursuit of being a "good" mother, some women look to outside sources for suggestions and reinforcement.
The second theme that was identified was that one pattern of communication between mothers and infants is similar to Fogel's (1993) notion of co-regulation. Mothers reported adjusting their behavior to the situation and infants' reactions. They also described how their infants responded to their behaviors and adjusted their own actions. Over time both mothers and infants demonstrated changes as the infants age. More responsiveness on the part of the infants as they increased alertness, smiling, and cooing, facilitated more talking and responsiveness on the part of the mothers. Some infants began initiating conversations through vocalizations.

However, there are problems verbalizing a dynamic process. If change is ongoing while the interaction occurs, it is difficult to put such changes into words, especially since much of the changes are nonverbal. Overall the language mothers used indicated their awareness of change and adjustment. For example, one mother stated, "When I laugh for him, he'll laugh back. And if I'm doing things with his legs, he'll push back and have a facial expression" (M36).

Although co-regulated behavior accounted for most of the communication which was reported, it was not the only type that mothers shared. Some mothers talked about ignoring behaviors, therefore choosing not to co-regulate.
This will be furthered discussed in the general discussion.

The third theme that emerged was that maternal communication behaviors were consistent across ages and ethnicities of mothers. Although the number of teen and minority subjects was small and most of the African-American mothers were teens, mothers spoke of same communication behaviors, indicated that they believed that talking was important, and communicated often with their infants.

These findings do not support observational research done previously. Field (1981) and Osofsky and Osofsky (1970) found that teen mothers vocalize less to their children than do older parents. However, teen mothers may not have been comfortable while being observed. The teen mothers in study one were not as prolific in their answers as older mothers were indicating they may have been more reserved with an adult experimenter. The fact that researchers are usually adults may affect the behavior of teen mothers. Williams (1991) found that the African-American teen mothers she interviewed thought of themselves as responsible mothers. Teen mothers' self-perceptions of child care behaviors and observed behaviors may not be congruent because of experimenter effects, cultural differences, or the teens interviewed for this study were outliers because of their involvement in special school and health department programs through which they were
recruited.

As stated earlier, Heath (1983, 1989) found that African-American mothers living in a ghetto or small rural town in the Piedmont with a primarily African-American population also did not vocalize much with their infants. In the study she conducted in the Piedmonts, she lived with people over long period of time so was able to observe their behavior in more than one instance. It may be that the cultural backgrounds of the mothers are what is producing the differences in findings.

The African-American mothers in this study were in an integrated small town/small city culture. It may be that the culture of infancy (Fogel, 1993) may differ from that of the ghetto or Piedmont, Carolinas. The culture of infancy in this area may support talking to infants as a child care practice. Defining the culture of infancy for this area would be a first step in understanding these incongruencies.

The fourth theme was experience talking to pets influenced some new mothers' speaking style. In discussing how mothers learned how to talk to their infants, some mothers mentioned from talking to their pets. They noted that they spoke to their pets as if they were infants. Mothers fall back on experience, and if it works, continue with it. Pets have been overlooked as a source of experience for parenting.
The themes which emerged in this study provided some support for the concept of co-regulation, and brought up new issues for further study. The role of pets and advice in parenting has not been addressed in understanding the determinants of parenting styles. The incongruencies between self-reported communicative behaviors and previous studies of teen and African-American mothers need to furthered delineated to decrease the possibility of maintaining incorrect assumptions about these groups of mothers.

Study Two: Infant Preference for Maternal Adult-Directed Speech vs. Unfamiliar Female Infant-Directed Speech

Study one focused on mother's experiences with their infants. In study two, the infants of some of these mothers participated in an investigation of infant speech preferences.

Method

Design. This study was also longitudinal so that infant developmental changes could be assessed. Infants were tested between 6-8 weeks of age and again, at 16-18 weeks of age to examine their preferences for maternal AD speech or unfamiliar female ID speech.

Subjects. Thirty-five infants participated at age 6-8 weeks and 30 at age 16-18 weeks. They were recruited from
the Blacksburg, Christiansburg, and Radford areas through local birth announcements. Of the 35 6 to 8-week-olds, 21 (M age = 53.49 days, SD = 4.6) successfully completed their sessions. Fourteen infants were excluded due to experimenter error (5), fussiness (3), sleepiness (3), lack of interest in the visual stimulus (2), and multiple reasons (1). The infants were healthy at time of testing. Two had been 5 weeks premature. Almost all infants were Caucasian except for two African-American, one Hispanic, and one South African infants.

Of the 30 16 to 18-week-olds who were tested, 28 (M age = 121.4 days, SD = 4.1) successfully completed their sessions. One infant was excluded because of experimenter error and one due to fussiness. Five of the original infants did not return for the second session because they had not completed the first session (2), vacation (1), and moves (2). Of the 30 returning infants one was African-American and one was Hispanic.

Seventeen infants (M age = 53 days, SD = 4.9; M age = 121.3 days, SD = 4.3) were able to be included in the longitudinal analyses. Two of the infants from the original 21 who completed their sessions were excluded from analyses as their second session did not begin with the same speech type that they had heard at age 6–8 weeks (these infants were included in the cross-sectional analyses). Two of the
infants did not return due to moving (1) and vacation (1).

Procedure. The mothers of the infants were contacted by letter (see Appendix A) to inform them about the study. They were then contacted by phone to explain the study and ask them to participate. Once they agreed to participate, an appointment for an interview with the mother was scheduled. Interviews were conducted as explained above.

For those mothers whose infants participated, an appointment was made for them to bring their infants to the lab for testing after their interviews. For testing the infants, 20 seconds of maternal adult-directed (AD) utterances were selected from the interviews conducted in the study explained above. These utterances had minimal background noise and were statements mothers had said clearly. Using a multichannel cassette recorder (TASCAM, Model Port 5), the selected samples were taped onto a 20-second continuous cassette tape with the maternal AD speech sample on one channel and unfamiliar female infant-directed (ID) speech on the second channel. For the unfamiliar female ID speech, age-appropriate recordings from previous studies were used. That is, ID speech spoken to 6-8-week-olds was used for that age group, and ID speech spoken to 16-18-week-olds was used for that age group. Therefore, each tape contained 20-seconds each of maternal AD speech and unfamiliar female ID speech on separate channels.
When the infants came to the infant speech lab and were awake, alert, and not fussing, they sat on their mothers' laps in a 3-sided black enclosure containing a colored 13-inch video monitor (Mitsubishi, Model CS-1347R), a speaker (Realistic Model 40-2054, 8 ohms), and a video camera (Panasonic, AG-170). For those infants who were asleep, efforts were made to awaken them. Infants who were fussy were soothed before sitting with their mothers. The procedure was explained to parent(s) who then signed the consent form (See Appendix J).

When mother and infant were settled, the mother donned headphones over which vocal music played so that she was unable to hear the audio presentations. The infant was seated approximately 14 inches away from the video monitor.

An observer seated outside the enclosure watched the infant on a separate JVC Model TM-22U color video monitor which was connected to the movie camera. The observer controlled access to the visual and audio stimuli and wore headphones over which loud rock and roll music played in order to deafen him/her to the audio stimulus being presented. The observer presented the visual stimulus first. Infants who were 6-8 weeks old observed a black-and-white checkerboard, and 16-18-week-old infants saw red, yellow, blue, and white concentric circles. When the infant focused on the visual

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stimulus, the audio stimulus was presented. When the infant looked away, both stimuli were terminated. Length of infant's observation time was recorded on a Macintosh SE computer.

The infants listened to maternal AD speech and unfamiliar female ID speech alternating across trials, with order of presentation counterbalanced across infants. Each infant had to complete 10 successful trials (5 of each speech type) to be included in the sample. If the infant was unable to complete 10 trials, s/he was rescheduled for a second session, if possible. One infant was able to be rescheduled for the 6-8 week session and one for the 16-18 week session. For most of the mothers, it was too difficult to bring the infant in a second time. Infants who were unable to complete 10 trials were excluded from further analyses.

The above procedures were repeated when the infants reached 16 weeks of age. Another loop tape using maternal AD speech samples from the second interview and unfamiliar female ID speech samples from a previous study was made. Again, those infants who were unable to complete 10 successful trials were excluded from the final analyses.

Results and Discussion

A number of different analyses were conducted on the
data for this study. The dependent variable of primary interest was fixation time or the mean amount of looking time during the presentation of each type of speech. This was calculated by adding up the amount of looking time that occurred for each type of speech and dividing it by the total number of trials completed for that speech type. That is, if an infant listened to five trials of AD speech and six trials of ID speech the denominators for the means were five for AD speech and six for ID speech.

Longitudinal analyses. To analyze infants' preferences for maternal AD or unfamiliar female ID speech, a mixed 2 x 2 x 2 analysis of variance (ANOVA) was done with Order (maternal AD or unfamiliar female ID speech first) as the between-subjects factor, and Age (6-8 weeks and 16-18 weeks) and Speech Type (maternal AD or unfamiliar female ID speech) as the within-subjects factors.

The results of the ANOVA indicated an Order by Speech Type by Age interaction, F(1,15)=5.12, p<.04. Neuman Keuls post hoc test indicated this three-way interaction was carried across the two groups by 6 to 8-week-olds who heard maternal AD speech first and listened longer to AD speech (M(AD)=33.55 sec, SD=13.79; M(AD)=19.04 sec, SD=9.13), and 16 to 18-week-olds who
heard unfamiliar female ID speech first and listened longer to ID speech (M(ID)=21.29 sec, SD=10.65; M(ID)=11.85, SD=6.22). See Table 9 and Figure 4.

Insert Table 9 and Figure 4 here

These results partially supported the hypotheses stated in the introduction which were that 6-8-week-old infants would prefer maternal AD speech and 16-18-week-old infants would prefer unfamiliar female ID speech. However, these hypothesized preferences occurred only if the infants heard the corresponding speech type on the first trial. An examination of the individual subjects' data found only two infants who changed preference from maternal AD speech at 6-8-weeks to unfamiliar female ID speech at 16-18 weeks without the influence of order. Order effects have been reported previously (Cooper & Aslin, 1990; Cooper et al., 1995) due to the arousal effects of the first looks. That is, infants would look longer during the first trial depending on what type of speech was presented first.

There was also a significant main effect of Age, F(1,15)=11.25, p<.005 with 6-8-week-olds looking longer for both speech types (M=27.02 sec, SD=14.28) compared to 16-18-week-olds (M=15.59 sec, SD=8.57). There are three
possible explanations for this effect.

First, magnitude effects between different age groups have been reported in previous studies (Cooper & Aslin, 1990). The age effect might reflect a difference in magnitude of preference between the two ages. Second, the effect could be due to memory. Previous research has demonstrated that performing the same task within the same context activates memory in young infants (Rovee-Collier & Fagen, 1981). Because this study was longitudinal, older infants may have remembered previous participation, so their interest in the procedure might have waned. Third, physical growth of infants between ages two and four months was such that older infants had better neck and head control. This control would allow them to look away from the stimuli more easily.

Cross-sectional analyses. Because 21 6 to 8-week-olds and 28 16 to 18-week-olds had successfully completed their sessions, and this number of subjects was greater than that which could be included in the longitudinal analyses, cross-sectional analyses were also conducted. For the 6-8-week-olds, the results of a mixed 2 x 2 ANOVA with Order (maternal AD first, unfamiliar female ID first) as the between-subjects factor and Speech Type (maternal AD, unfamiliar female ID) supported the longitudinal results. However, the same ANOVA conducted
on the 16-18-week-old infants' data found nothing significant.

**Analyses without first looks.** Because there is a tendency for infants to look longer on the first trial which can affect the overall means of the speech type presented first (Cooper, 1993; Cooper & Aslin, 1990; Cooper et al., 1995), two more analyses were conducted on the cross-sectional data to examine the effects of the first trial. The first analysis examined whether there were significant differences between first looks. There was no statistically significant difference between mean looking times on the first trial for the 6-8-week-olds, \( t(19)=1.241, p>.05 \), although looking times were longer when maternal AD speech was presented first (\( M=51.36 \) sec, \( SD=44.038 \)) than when unfamiliar female ID speech was presented first (\( M=30.88 \) sec, \( SD=25.69 \)). There was also no statistically significant difference between mean looking time on the first trials for the 16-18-week-olds, \( t(26)=-.487, p>.05 \). Looking times were slightly longer when unfamiliar female ID speech was presented first (\( M=28.28 \) sec, \( SD=29.37 \)) than when maternal AD speech was first (\( M=22.66 \) sec, \( SD=31.38 \)).

Because there was a great difference between first looks for the 6-8-week-olds, a second ANOVA was conducted omitting the first trial from each session to determine
if the cross-sectional Order by Speech Type interaction was carried by first look. New means were calculated by subtracting the amount of seconds of the first look and dividing the total number of seconds remaining by the number of trials minus the first. For example, if an infant listened to unfamiliar female ID speech first and made it through six trials, the duration of the first look was subtracted from the total looking time and the remainder divided by five. A mixed 2 x 2 ANOVA with Order (maternal AD first, unfamiliar female ID first) as the between-subjects factor and Speech Type (maternal AD, unfamiliar female ID) showed an Order by Speech Type interaction, $F(1,19)=4.60, p<.05$. Therefore, the Order by Speech Type interaction in the complete data set was not carried by first looks, but was consistent over successive trials. Post hoc Neuman Keuls test showed no significant difference.

**Infant profiles.** To determine if there was a relationship between infant preferences demonstrated in the longitudinal data and infant and maternal characteristics, infant profiles were developed which listed the infant's speech preferences, gender, age, and birth order, and mother's age, income level, education, speech behaviors and frequency of speaking (see Table 10). Chi Square analyses were conducted between infants'
speech preferences and each of the other variables (see Table 11). The only significant results were between preferences and mothers' ages and incomes. However, this was due to most mothers of participating infants being in their 30s and in the median income range and over-represented in the subject pool.

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Insert Tables 10 and 11 here

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General Discussion

Two studies were conducted to explore the mother-infant communication process in the first months after birth, specifically when infants were 6 to 8 weeks and 16 to 18 weeks old. The first study focused on mothers and their self-perceptions of behaviors they use when communicating with their infants, their rationales for talking to infants, how they learned to talk to infants, and their beliefs about the relationship between talking to infants and infant development. Mothers shared their experiences and changes in these experiences as their infants aged.

The second study focused on infants of these mothers and their preferences for maternal adult-directed (AD) speech compared to unfamiliar female infant-directed (ID) speech. It was predicted that at 6 to 8 weeks of age,
infants would show preferences to maternal AD speech, whereas at 16 to 18 weeks of age, infants would prefer unfamiliar female ID speech. These hypothesized preferences did occur at both ages if infants heard that speech type on the first trial. That is, at 6-8-weeks of age, if they heard maternal AD speech first they listened significantly longer to maternal AD speech throughout all trials, and at 16-18-weeks of age, if they heard unfamiliar female ID speech on the first trial, they listened significantly longer to unfamiliar female ID speech throughout. No relationship could be found between infant preferences and maternal characteristics.

Mothers' Communication Process

There was support in the first study for Fogel's (1993) continuous process communication system with both sender and receiver concomitantly active and signals bidirectional. As discussed previously, most data supports co-regulation, i.e., social process in which individuals dynamically alter their actions with respect to the ongoing and anticipated actions of their partners (Fogel, 1993, p.34). However, there is difficulty in verbalizing a dynamic process because it is ongoing and changing. Mothers did share experiences indicating they adjust behavior in response to infant cues and infants adjust behavior in response to mothers' behaviors.
Maternal descriptions of mother-infant interaction in a variety of scenarios, i.e., feeding, changing diaper, comforting, etc., reflected Fogel's ideas of consensual frames. A consensual frame is a co-regulated agreement between both communicators about the scope of the discourse: its location, setting, significant vs. irrelevant acts, and main focus. Mothers' depictions related typical location, behaviors, focus, and co-regulated behaviors that usually occurred. For example, while changing her infant's diaper on diaper table near the window, one mother explained that if the baby was in a good mood, she would point at things out the window. But when the baby was fussy, the mother used toys to occupy her while changing her diaper. This example is typical of the general descriptions of scenarios by many mothers who explained them in terms of where they took place, what was usually the mothers' behaviors, and how those behaviors might change depending on infants' behaviors.

Not all communication was continuous. Discrete communication process occurred when mothers did not respond to cues in hopes of changing their infants' behaviors. For example, one mother was trying to train her infant to sleep. In this situation, the sender (infant) would transmit a signal (crying) to the receiver.
(mother) who listened to the signal. When the signal was received, the mother chose to ignore it. The infant transmitted the signal again. The mother continued to ignore it, and finally the infant cried himself to sleep.

Both continuous and discrete communication facilitate behavior change. Continuous process communication implies a sharing of power between both communicators. Both are alert and responding to cues while communicating. But, in discrete process, one communicator assumes more power over another and can choose to ignore signals. This puts the sender in a quandary about how to respond. As learning theory has demonstrated in the process of extinction, ignoring the signals can bring about distinguishing the behavior. If this is the mother's intention, then she is more likely to utilize the discrete communication process.

Fogel (1993) also explains that communication behaviors and concerns reflect common infancy culture. Infant care beliefs and practices are part of infancy culture. All the mothers in this study believed talking to their infants would help the infants' development. Infant care practices were consistent across groups of mothers, i.e., some breastfed whereas others bottlefed, some used cloth diapers whereas other used disposable.

Infant care beliefs and practices can affect whether
communication is continuous or discrete. If a mother believed that her infant "should" behave a certain way, such as fall asleep in crib on his/her own, then that mother would utilize discrete communication process to facilitate the behavior. If mothers were interested in establishing relationship with infant, then they would use a continuous communication process.

In summary, mothers primarily used continuous communication process with young infants. This was most likely due to the young age of the infants in the study. During this time the mothers' focus would be more in the area of relating to their infants. However, mothers also engage in discrete communication process at specific times if they think it will achieve a certain goal.

**Intuitive Parenting**

Parenting behaviors are somewhat universal as stated by Papousek & Papousek (1987). However, some mothers in this study reported not using ID speech which they identified as one of the universal behaviors. This finding does not support Papousek's and Papousek's (1987, 1991) idea that parent communication behaviors are innate. When asked, all mothers could identify how they had learned to talk to infants. Some first-time mothers were having difficulty with how to talk to their infants and were experimenting with different behaviors.
Communication behaviors were not intuitive as defined by Papousek and Papousek (1987), i.e., behaviors of which mothers are unaware and which are slower than reflexes and faster than conscious decisions. Mothers were able to report communicative behaviors (aware) and reported trying different behaviors to determine their efficacy (not always intuitive).

The longitudinal design of this study lends more support to Fogel's (1993) explanation of how intuitive behaviors develop through observation and experience. For those who lacked experience and previous modeling, the first months of motherhood were spent trying to learn as much as possible about how to interact with their infants.

Many of the first-time mothers' behaviors were not yet automatic. In the two months between interviews they were still learning what their infants liked and disliked and experimenting with communication behaviors. Even mothers who had previous children remarked about the individuality of each child, and thus, were still learning how to interact with their present infants. 

Beliefs about Communication

All mothers believed that it was important to talk to infants. These general beliefs led to the behavior of talking. This was also congruent with Sigel's (1985)
findings that when beliefs pertain to action, parental behavior can be predicted. Although mothers were not objectively measured for how much they talked to their infants during the day, their self-perceptions were that they spoke often or all the time. Individual variation was demonstrated in reasons mothers thought it important to talk to infants and how talking would affect their infants development.

Although mothers believed it important to talk to infants, they reflected co-regulation in that if talking aroused infants in situations requiring calming, they would decrease or modify talking behaviors. Therefore, the general belief about the importance of talking to infants would not necessarily predict behavior in specific situations as mothers and infants co-regulated communication and mothers may not demonstrate talking. Thus, although mothers believe talking is important, they adjust their vocalizations to situations and infants' cues.

**Mothers Communication to Infants**

As previously stated, not all mothers reported speaking ID speech, specifically higher pitch and exaggerated intonation (Fernald, 1985; Jacobson et al., 1983; Stern, Spieker, & MacKain, 1982). Some mothers lowered their voices and others spoke "normally".
Mothers who decreased pitch or stated no difference in voice included first-time mothers as well as mothers with previous infants. Their reasons ranged from the infant responded better to the fact that the mother, herself, was unsure know how to speak to the infant.

Some first-time mothers would experiment so that by second interview they were changing their voices because infants responded more positively. However, there was a problem because there were no recordings of mothers' voices to verify their self-reports. So it was possible for a mother to have not recognized the change in her pitch to a higher range or the intonation in her voice.

As infants aged, mothers reported talking to their infants as if having a conversation. This supports previous research (Beebe et al., 1985; Mayer & Tronick, 1985). Mothers acted as if their infants were actually talking during these exchanges by using the words "conversing" and "talking" in describing the interaction.

Stern et al. (1983) studied six mothers when their infants were a few days old and four months. They observed the mothers interacting with their infants and found that at four months mothers exhibited more exaggerated pitch and more repetition. Such changes were not reported by the mothers in the present study. Repetition and descriptions of pitch remained fairly
constant. What mothers did notice at four months was that they had increased how much they talked to their infants, they had changed the way they talked to their infants, and their infants had become more responsive and vocal. These findings do not contradict each other. Stern et al. were focusing on speech patterns. Mothers concentrated on changes related to their infants' development.

As stated previously, there was a lack of cultural differences demonstrated in study one. Mothers' communicative behaviors were consistent across ages and ethnicities (see discussion in study one thematic results/discussion section). However, the number of subjects who were teens and ethnic minorities was small. Therefore, this issue requires further study. It may be that the infancy culture of this rural area supports common communicative behaviors.

**Infants' Speech Preferences**

As mentioned previously, infants' speech preferences were influenced by the order that they heard the different speech types. This pattern was particularly evident for 6 to 8-week-old infants when listening to maternal AD speech and 16 to 18-week-olds when listening to unfamiliar female ID speech. These significant preferences in the longitudinal study did provide support
for the hypotheses that younger infants would prefer listening to their mothers' voices and older infants would prefer unfamiliar females speaking ID speech. However, in each of these cases the first looks primed the infant to listen longer throughout the session.

When examining the infants' individual data, 35% (N=6) of the infants did not exhibit an order by speech type interaction. As mentioned earlier, two of these infants demonstrated the hypothesized preferences. The other four preferred the alternative speech than the one they heard first at 6 to 8 weeks and again at 16 to 18 weeks. Therefore, not all infants were influenced by the first trial.

One explanation for the influence of order is that infants were presented with two salient auditory stimuli, mothers' voices speaking AD speech and unfamiliar female speaking ID speech. The first trial may have primed infants to listen longer throughout session. Priming is a process which retrieves a specific memory by identifying one of the strands that leads to it (Bower, 1986). Priming activates associations. Therefore, if infants were primed that their mothers were speaking then that association would have been activated, thus influencing infants to listen longer when hearing maternal speech, and if infants were primed with ID
speech, then that association would be activated, influencing infants to listen longer to unfamiliar female ID speech.

One limitation to the visual preference procedure is that it lends itself to order effects. That is, one auditory stimulus must start the procedure. Usually the first auditory stimulus is counterbalanced across infants, and when there is a strong preference such as that found in the Cooper et al. (1995) study of four-month-olds, the influence of order is negligible. However, in this study of infant preferences, the auditory stimuli had more equal valence, thus the order of presentation seemed to have a priming effect.

Another limitation of this study is that twelve to sixteen different samples of unfamiliar female ID speech was used per age. These samples came from previous studies of maternal AD and ID speech. Some were more exemplar that others. A lesser number (3-4) of exemplary voice samples should be used for all infants to maintain consistent quality.

Because the mothers of the infants who participated in the preference study had participated in study one, it was possible to examine the relationship between mothers' communicative behaviors and infant preferences. When a correlational analysis was conducted, however, there were
no real connections identified. One of the reasons for this is that all mothers of infants participating talked to their infants a lot. The majority of infants were used to hearing their mothers speak AD and ID speech, and used to hearing others speak ID speech to them. Therefore, both auditory stimuli could be relevant and attractive. In order to find a relationship, more variability in maternal communicative behavior would be needed to observe some differences in infant speech preferences.

Weaknesses and Needs for Further Study

One weakness has already been discussed. That is, that the infant preference procedure lends itself to an order effect. An alternative method to study infants' preferences that would eliminate the influence of first looks would be to repeat this study using simultaneous presentation. This procedure has been used before for examining temporal synchrony (Spelke, 1976, 1979). Two screens are positioned near one another with a speaker between them. The infant sees two visual stimuli and hears an audio stimulus that matches one of the stimuli. The infant is timed on how long s/he observes the stimuli that are in synchrony. This procedure would have to be adapted, however, since the variables of concern are auditory. Instead of one speaker, there would need to be
a speaker for each screen. Each screen would display the same visual stimulus. However, one speaker would play maternal AD speech and the other unfamiliar female ID speech. Infants would control what they heard by which screen they fixated.

A second weakness was that there was no measure of maternal characteristics besides demographics and no measure of infant characteristics. Because of this, it was difficult to know how factors such as personality, emotionality, sociability, etc., influence communication style and subsequent mother-infant communication. These factors are components of the descriptive model of mother-infant communication recounted previously. Besides these components, other pieces of the model need to be furthered studied, such as influence of social support, culture, and resources and effects on maternal and infant communication styles and patterns. Although these factors were identified in the present study, more information needs to gathered about them in order to understand their valence and use them to predict behavior. I think that interviews probing further into these various components would be the way to begin this process.

Another weakness to study one is that a small number of teens and ethnic minorities were interviewed. Because
of the findings of these interviews, further examination of the communicative behaviors of teens and ethnic minorities needs to be conducted to see if results are consistent. The findings of communicative behaviors consistent with non-teen and Caucasian maternal behaviors do not support observational studies. Self-reports would need to be supplemented with observations to determine whether participants in the study one are outliers or if the integrated rural/small city culture may contribute to more consistent behaviors.

Although the focus of this dissertation was mother and infant communication, interviews with mothers indicated that the larger family unit needs to be considered when examining mother and infant communication. Presence or absence of the infant's father, siblings, and extended family may impact the communication dynamics mothers have with their infants. This was hinted at when mothers would explain that they had less time with the present infant because of competition with other siblings.

Finally, mothers indicated future changes that would occur in communication as infant aged. Some mothers were planning to speak baby talk less as the infants began talking. The ideal study would be to continue to follow these mothers/infants through first year of life.
Because mother-infant communication is dynamic and changing, understanding mothers' experiences talking to their infants throughout the first year of life would make the current observational data during this period much richer and increase understanding of individual differences.
References


Spelke, E. S. (1976). Infants' intermodal perception of events. Cognition, 8, 53-60.


Table 1

Mothers' Demographic Data

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<th>age of infant</th>
<th>2 mos (N=47)</th>
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<th>4 mos (N=42)</th>
<th>%</th>
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<td></td>
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<td>20-29</td>
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<td>40-41</td>
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<td></td>
<td></td>
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<tr>
<td>Prima</td>
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<td></td>
<td></td>
</tr>
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</tr>
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<td>5</td>
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</tr>
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<td>6</td>
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</tr>
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<td>13%</td>
<td>6</td>
<td>14%</td>
</tr>
<tr>
<td>40-50,000</td>
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</tr>
<tr>
<td>50-60,000</td>
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<td>1</td>
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</tr>
<tr>
<td>not given</td>
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<td>4%</td>
<td>1</td>
<td>2%</td>
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</table>

103
Table 2

Mothers' Activities Allowing Interaction with Infants

<table>
<thead>
<tr>
<th>Activities</th>
<th>2 mos (N=47)</th>
<th>%</th>
<th>4 mos (N=42)</th>
<th>%</th>
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<tbody>
<tr>
<td>Type of feeding:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast only</td>
<td>32</td>
<td>68%</td>
<td>21</td>
<td>50%</td>
</tr>
<tr>
<td>Breast and solids</td>
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<td>5%</td>
</tr>
<tr>
<td>Bottle only</td>
<td>15</td>
<td>32%</td>
<td>6</td>
<td>14%</td>
</tr>
<tr>
<td>Bottle and solids</td>
<td>0</td>
<td>0%</td>
<td>13</td>
<td>31%</td>
</tr>
<tr>
<td>How often talk to infants:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>25</td>
<td>53%</td>
<td>35</td>
<td>83%</td>
</tr>
<tr>
<td>Frequently</td>
<td>13</td>
<td>28%</td>
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<tr>
<td>Situational</td>
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</tr>
<tr>
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<td>3</td>
<td>6%</td>
<td>0</td>
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</tr>
<tr>
<td>Sing:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Directly</td>
<td>36</td>
<td>77%</td>
<td>33</td>
<td>79%</td>
</tr>
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<td>Indirectly</td>
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<td>5%</td>
</tr>
<tr>
<td>Hum</td>
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<tr>
<td>No</td>
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<td>19%</td>
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<td>12%</td>
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<tr>
<td>Play music:</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Directly</td>
<td>42</td>
<td>89%</td>
<td>36</td>
<td>86%</td>
</tr>
<tr>
<td>Indirectly</td>
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<td>4</td>
<td>10%</td>
</tr>
<tr>
<td>No</td>
<td>1</td>
<td>2%</td>
<td>2</td>
<td>5%</td>
</tr>
<tr>
<td>Not stated</td>
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<td>2%</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Read:</td>
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<td></td>
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</tr>
<tr>
<td>Directly</td>
<td>20</td>
<td>43%</td>
<td>18</td>
<td>43%</td>
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<td>Indirectly</td>
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<td>10</td>
<td>24%</td>
</tr>
<tr>
<td>No</td>
<td>15</td>
<td>32%</td>
<td>14</td>
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</tr>
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</tbody>
</table>
Table 3

**Mothers' Estimation of When Infants Understand What Is Said to Them**

<table>
<thead>
<tr>
<th></th>
<th>age of infants</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>2 mos</td>
<td>4 mos</td>
<td></td>
</tr>
<tr>
<td><strong>In general:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1 mos.</td>
<td>5</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>2-3 mos.</td>
<td>1</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>4-5 mos.</td>
<td>4</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>6-7 mos.</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>8-9 mos.</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10-12 mos.</td>
<td>-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>other:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>real early</td>
<td>3</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>don't know</td>
<td>16</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Tone of voice:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1 mos.</td>
<td>17</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>2-3 mos.</td>
<td>-</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>4-5 mos.</td>
<td>1</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>6-7 mos.</td>
<td>1</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>8-9 mos.</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>10-12 mos.</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>other:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>very early</td>
<td>1</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>later</td>
<td>-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>don't know</td>
<td>-</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td><strong>Words:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-1 mos.</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>2-3 mos.</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4-5 mos.</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>6-7 mos.</td>
<td>8</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>8-9 mos.</td>
<td>-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10-12 mos.</td>
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<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>other:</strong></td>
<td></td>
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<td>soon</td>
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<td>1</td>
<td></td>
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<tr>
<td>don't know</td>
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Table 4
Mothers' Self-Description of Speech to Infants

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<th>Speech Features</th>
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<td>Higher</td>
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<td>Lower</td>
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<td>3</td>
</tr>
<tr>
<td>No change</td>
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<td>4</td>
</tr>
<tr>
<td>Smiling</td>
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<td>40</td>
</tr>
<tr>
<td>Repetition</td>
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<td>42</td>
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<td>Questions</td>
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<td>Shorter phrases,</td>
<td></td>
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<tr>
<td>sentences</td>
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Table 5

Maternal Rationales for Talking to Infants

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<tr>
<td>Emotion</td>
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Table 6

How Mothers Learned to Talk to Infants and What They Learned from Current Experience

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<tr>
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Table 7

How Talking Affects Mother's Infant's Development and Will Help Future Development

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### Table 9

**Means and Standard Errors for Order by Speech Type by Age Interaction**

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*Significant difference (AD)

**Significant difference (ID)
Table 10
Profile of Infant Preferences and Infant and Maternal Variables

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<th>Income When Began Speaking</th>
<th>Style 2 mos</th>
<th>Style 4 mos</th>
<th>How much 2 mos</th>
<th>How much 4 mos</th>
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<td>AD</td>
<td>2</td>
<td>32</td>
<td>5 Prebirth ID</td>
<td>ID</td>
<td>ID</td>
<td>Always Always</td>
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</table>

*ND=No difference in pitch; **DP=Decreases pitch; ***No answer given
Table 11

Chi-Square Analyses of Infant Speech Preferences and Infant Profile Variables

<table>
<thead>
<tr>
<th>Infant Preferences</th>
<th>Variable</th>
<th>Chi-Square</th>
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<tbody>
<tr>
<td>2 months</td>
<td>birth order</td>
<td>8.83</td>
</tr>
<tr>
<td></td>
<td>gender</td>
<td>6.5</td>
</tr>
<tr>
<td></td>
<td>maternal age</td>
<td>469.37*</td>
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<tr>
<td></td>
<td>income</td>
<td>28.03*</td>
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<tr>
<td></td>
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<tr>
<td></td>
<td>speaking style</td>
<td>8.83</td>
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<tr>
<td></td>
<td>how much spoken to</td>
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</tr>
<tr>
<td></td>
<td>day care</td>
<td>5.0</td>
</tr>
</tbody>
</table>

*p<.05
Figure 1: Descriptive model of communication process between mother and infant
Theme 1. Chain of evidence - Expert Advice

- Baby \(\xrightarrow{\text{communicate}}\) Mother
- Fussy \(\xrightarrow{\text{calming strategies}}\)
- Decreases
- To sleep \(\xrightarrow{\text{talks less}}\)
- Sleeps
- Playing \(\xrightarrow{\text{more excited behaviors}}\)
- Excited
- More responsive \(\xrightarrow{\text{increases amount of talk}}\)
- Responds

Theme 2. Chain of evidence - Co-regulated communication

Figure 2. Chains of evidence for themes 1 and 2
<table>
<thead>
<tr>
<th>Others</th>
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<th>Teens</th>
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<tbody>
<tr>
<td>talk to infants</td>
<td>= talk to infants</td>
<td>= talk to infants</td>
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<tr>
<td>increased as infants aged</td>
<td>= increased as infants aged</td>
<td>= increased as infants aged</td>
</tr>
<tr>
<td>demonstrated co-regulation in self-reports</td>
<td>= demonstrated co-regulation in self-reports</td>
<td>= demonstrated co-regulation in self-reports</td>
</tr>
<tr>
<td>believed important to talk to infants for their development</td>
<td>= believed important to talk to infants for their development</td>
<td>= believed important to talk to infants for their development</td>
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</table>

Figure 3. *Chain of evidence for theme 3*
Figure 4. **Order by Speech Type by Age Interaction**
Appendix A  
Infant Speech Study Program  
Virginia Polytechnic Institute and State University  
Department of Psychology  
Blacksburg, VA 24061-0436  

Dear Parent(s):  

Soon after infants are born, they can recognize many different sounds and voices. Even though they are not able to talk yet, they are listening to what is happening around them. In the Department of Psychology at Virginia Tech, we are studying the ways in which mothers and their infants communicate through sounds.  

We would like to invite you and your baby to participate in our mother-voice studies. Participation involves meeting with you for 2 home visits, and you bringing your baby to the infant speech lab for 2 visits, each lasting 1 hour or less, at times most convenient to you.  

When your baby is 6 to 8 weeks old and again when s/he is 16 to 18 weeks old, we would like to schedule a home visit during which one assistant will tape record a short interview with you about your experience communicating with your infant. Within one week after this appointment, we will schedule a time for you and your infant to visit the Infant Speech Study Program (located next to Bogen's restaurant; a map is attached for your convenience) so that we can observe how responsive your baby is to your voice. This session lasts approximately 15 minutes, but we schedule a full hour appointment with you to give you and your baby time to get settled without feeling rushed. If you have older children and would like to bring them along, we offer free babysitting for your convenience. We have a waiting room with toys for your older child(ren) that is located next to our observation room.  

You will be contacted by phone in the next week to see if you are interested in sharing your experiences or would like to find out more about our work. If you would like to contact us, please feel free to call us at either 231-3972 or 231-8143.  

Sincerely,  

Jane L. Abraham, M.S.  
Graduate Student  

Robin Panneton Cooper, Ph.D.  
Assistant Professor
Appendix B

Interview Questions - 6-8 Weeks

1. How many children do you have? What are their ages?

2. ____________________________ (name of child) is about 6 weeks old now. How often do you talk with him/her? (Probes: all the time, when changing diapers or feeding, when in the car, when alone, not very often)

3. What do you notice about how you interact with your baby when you are: changing his/her diaper, putting him/her to sleep, feeding him/her, playing with him/her, comforting him/her?

4. What do you notice that is different in the way you talk to your baby compared to how you are talking to me right now? (Probes: voice changes, more questions, smile more, repeat self)

5. Do you find yourself talking to others that way after you have been talking with your baby? What do you think when you notice this?

6. Why do you talk to your infant? What are some of your reasons or goals?

7. What do you notice when you are talking to your baby? Are you looking for certain responses from him/her? How does his/her responses affect your talking?

8. How do you feel when you talk to your baby? How does his/her responses affect how you feel?

9. How did you learn how to talk to babies? (Probes: what kinds of experiences did you have growing up around babies? Did you baby sit? Teach Sunday school?)

10. What is the easiest about talking to your baby?

11. What is the hardest about talking to your baby?

12. In general, do you think that it is important to talk to infants? Why or why not?

13. Do you think talking to your baby helps your baby to develop? Why?
14. Do you sing, play music or read to your baby?

15. Who else in your family talks to your baby? How do others talk to him/her?

16. Anything else that you would like to talk with me about or think is important?
Appendix C

1. Mother's age at child's birth ____

2. Type of delivery: vaginal ____ c-section ____

3. Type of feeding: breast ____ bottle ____

4. Number and ages of other children: ____
   Ages ____ ____ ____ ____ ____ ____

5. Highest level of education:
   Less than seventh grade ____
   Junior High School (9th grade) ____
   Partial high school (10th or 11th grade) ____
   High school graduate or GED ____
   Partial college (at least 1 year) or Specialized training ____
   College graduate ____
   Graduate degree ____

6. Number of persons living in household ____
   Relationship to you:
   ______________________________________________________
   ______________________________________________________

7. Your occupation______________________________
8. Net Yearly Income:

<table>
<thead>
<tr>
<th>$</th>
<th>0-10,000</th>
<th>$ 50,001-60,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>$10,001-20,000</td>
<td>$ 60,001-70,000</td>
<td></td>
</tr>
<tr>
<td>$20,001-30,000</td>
<td>$ 70,001-80,000</td>
<td></td>
</tr>
<tr>
<td>$30,001-40,000</td>
<td>$ 80,001-90,000</td>
<td></td>
</tr>
<tr>
<td>$40,001-50,000</td>
<td>$ 90,001 and above</td>
<td></td>
</tr>
</tbody>
</table>

9. Number of brothers, sisters, or other family members, such as cousins, who lived with you when you were growing up:

   ___________________________________________________________________

   How many were older than you? ____

   How many were younger than you? ____
APPENDIX D

Interview Questions (16-18 weeks)

1. ___________________________ (name of child) is about 16 weeks old now. How often do you talk with him/her now? (Probes: all the time, when changing diapers or feeding, when in the car, when alone, not very often)

2. What do you notice about how you interact with your baby when you are: changing his/her diaper, putting him/her to sleep, feeding him/her, playing with him/her, comforting him/her?

3. What do you notice that is different in the way you talk to your baby compared to how you are talking to me right now? (Probes: voice changes, more questions, smile more, repeat self)

4. Have you noticed any changes in how much you talk to your infant since I interviewed you last? What has prompted these changes?

5. Have you noticed any changes in the way you talk to your infant compared to when I interviewed you last? Would you describe these? What has prompted these changes?

6. Why do you talk to your infant? Have your reasons changed?

7. What response are you looking for?

8. How do you feel when you talk to your baby? Have your feelings changed? How do you feel when other people talk to your baby?

9. From your first interview you said you learned to talk to babies ...(state from first interview). Have you learned anything else through your experiences with your infant?

10. What has become easier about talking to your baby?

11. What has become harder about talking to your baby?
12. Do you still believe that it is important to talk to infants in general? Why or why not? Do you think that the baby's age makes a difference in how important it is?

13. At what age do infants understand what is said to them?

14. Do you think talking to your baby has helped your baby to develop? If so, how? How will it help your baby's future development?

15. Do you (still) sing, play music, or read to your infant?

16. (If mother is working now) what have you noticed about how your sitter or day care workers talk to your baby?

17. Is there anything else you would like to talk about or anything else you think is important?
APPENDIX E

INTERVIEW CODING SHEET (6-8 weeks)

Interview Number ______________ Coder ____________________

- Find the question on the transcript
- Highlight the answer to the question
- Place an "X" next to the code that coincides with the answer
- If the suggestion does not fit, then write what was said under "other:
- Add any comments you may have

1. How many children do you have? What are their ages?
   ___ no others
   ___ other(s) (list ages: )

1. _____________________________ (name of child) is about 6 weeks old now. At what age did you begin talking to him/her?
   Prebirth ______
   Birth ______
   Post birth ______

Other:

How often do you talk with him/her?
   Always _____
   Situational _____
   Frequently _____
   Infrequently _____

Other:
3. **How do you interact with your baby when you are changing his/her diaper?**

- Gestures ___
- Talk ___
- Limb movement ___
- Nonverbal ___
- Facial ___
- Noises ___
- Vis stim ___
- Toys ___
- Other: Mobile ___
- Play ___

**When putting him/her to sleep?**

- Gestures ___
- Talk ___
- Movement ___
- Quiet ___
- Facial ___
- Noises ___
- Sing/hum ___
- Feed ___
- Music ___
- Dark ___
- Position ___
- Other: ___

**When feeding him/her?**

- Gestures ___
- Talk ___
- Movement ___
- Nonverbal ___
- Facial ___
- Noises ___
- Position ___
- Phys contact ___
- Other: ___

**When playing with him/her?**

- Gestures ___
- Talk ___
- Limb movement ___
- Nonverbal ___
- Facial ___
- Noises ___
- Vis stim ___
- Toys ___
- Position ___
- Games ___
- Phys contact ___
- Other: ___

**When comforting him/her?**

- Gestures ___
- Talk ___
- Movement ___
- Quiet ___
- Facial ___
- Noises ___
- Sing/hum ___
- Feed ___
- Other: Position ___
4. What do you notice that is different in the way you talk to your baby compared to how you are talking to me right now?

No diff ____ Smiling ____ Repetition ____ Vol ____
Pitch ____ Questions ____ State ____ Balance ____
Rate ____ Baby talk ____
Other:

5. Do you find yourself talking to others that way after you have been talking with your baby?

Yes ____ No ____ Don't know ____ Other:

What do you think when you notice this?

Embarrassed____ Silly ____ Unaffected____
Other:

6. Why do you talk to your infant? What are some of your reasons or goals?

Bonding ____ Role ____ Presence ____ Language ______
Emotion ____ Communication ____ Socialization ____
Other: Don't know ____ Learn ____

7. Are you looking for certain responses from him/her?

Vocal ____ Movement ____ Smile ____ Attention ____
Other:
How do his/her responses affect your talking?
-Positive: Inc talk ___  -Negative: Dec talk ___
   Pitch change ___  Quieter ___
   More excited ___  Activity change ___
Other:

8. How do you feel when you talk to your baby?
Excited ____  Happy ____  Motherly ____  Good ____
Connected ____  Frustrated ____  Silly ____
Other:

How does his/her responses affect how you feel?
-Positive: More Excited ___  -Neg: Frustrated ___
   Happier ____  Uncomfortable ___
   Unaffected ____
Other:

9. How did you learn to talk to babies?
Instinct____  Modeling ____  Experience ____
Other:

10. What is the easiest thing about talking to your baby?
   Content ____  No infant response ___
   Facial expressions ____  Other:
11. What is the hardest thing about talking to your baby?
   Content ____  No infant response ____
   Facial expressions ____  Other:

12. In general, do you believe it is important to talk to infants?
   Important ____  Not important ____
   Why or why not?
   Language ____  Security ____  Development ____
   Stimulation ____  Socialization ____  Identity ____
   Connection ____
   Other:

13. At what age do you think infants begin to understand
   - what is said to them?  Age ____  Don't know ____
   - tone of your voice?  Age ____  Don't know ____
   - the words you say?  Age ____  Don't know ____

14. Do you believe that talking to your baby helps him/her to develop?
   Yes ____  No ____  Don't know ____
   How?
   Language ____  Security ____  Development ____
   Stimulation ____  Socialization ____  Identity ____
   Connection ____  Other:
15. Do you sing, play music, or read to your baby?

sing ___ music ___ read ___

Other:

16. Who else in your family talks to your baby?

Father ___ Siblings ___ Relatives ___ Friends ___

Other ___

How do others talk to him/her?

No diff ___ Smiling ___ Repetition ___ Volume ___

Pitch ___ Questions ___ Statements ___ Balance ___

Rate ___ Baby talk ___

Other:
APPENDIX F

INTERVIEW CODING SHEETS  (16-18 weeks)

Interview Number ________________  Coder____________________

1. ___________________________ (name of child) is about 16 weeks old now. How often do you talk with him/her?
   a) Always ______  c) Frequently _____
   b) Situational _____  d) Infrequently ____
   Other:

2. How do you interact with you baby when you are changing his/her diaper?
   Gestures ___ Talk ___ Limb movement ___ Nonverbal ___
   Facial ___ Noises ___ Vis stim ___ Toys ___
   Other: Mobile ___ Play____

   When putting him/her to sleep?
   Gestures ___ Talk ___ Movement ___ Quiet ___
   Facial ___ Noises ___ Sing/hum ___ Feed ___
   Music ___ Dark ___ Position ___
   Other:

   When feeding him/her?
   Gestures ___ Talk ___ Movement ___ Nonverbal ___
   Facial ___ Noises ___ Position ___
   Phys contact ___
   Other:
When playing with him/her?

Gestures ___ Talk ___ Limb movement ___ Nonverbal ___
Facial ___ Noises ___ Vis stim ___ Toys ___
   Position ___ Games ___ Phys contact ___
Other:

When comforting him/her?

Gestures ___ Talk ___ Movement ___ Quiet ___
Facial ___ Noises ___ Sing/hum ___ Feed ___
   Position ___
Other:

3. What do you notice that is different in the way you talk to your baby compared to how you are talking to me tight now?

No diff ___ Smiling ___ Repetition ___ Volume ___
Pitch ___ Questions ___ Statements ___ Balance ___
Rate ___ Baby talk ___
Other:

4. Have you noticed any changes in how much you talk to your infant since I interviewed last?

Yes ____ No ____ Don't know ____ More ____ Less ____

What has prompted these changes?

Awake more ____ Respond more ____ Working ____
Other:
5. Have you noticed any changes in the way you talk to your infant compared to when I talked to you last?

Yes _____ No _____ Don't know _____

Would you described these?

Style _____ Content _____ Length _____

What has prompted these changes?

Awake more ____ Respond more ____ Working ____

Other: More alert _____

6. Why do you talk to your infant? Have your reasons changed?

Yes _____ No _____ Don’t know _____

Bonding ____ Role ____ Presence ____ Language ____

Emotion ____ Communication ____ Socialization ____

Other: Learn _____

7. What responses are you looking for?

Same ____ Vocal ____ Movement ____ Laugh ____

Smile ____ Attention ____

Other:

8. How do you feel when you talk to your baby? Have your feelings changed?

Same ____ Excited ____ Happy ____ Motherly ____

Connected ____ Frustrated ____ Silly ____ Good____

Other:
How do you feel when other people talk to your baby?
Fine ____ Proud ____ Happy ____ Motherly ____
Connected ____ Silly ____ Good ____
Other:

9. From your first interview you said you learned to talk to babies .... Have you learned anything else from your experience with ________?
No ____ Yes ____ Individuality ____ Other:

10. What has become easier about talking to your baby?
Infant Response ____ (Physical ____ Verbal ____)
Content ____ Experience ____
Other:

11. What has become harder about talking to your baby?
Nothing ____ Baby movement ____ Time limitations ____
Not know understanding level ____ Other:

12. Do you still believe it is important to talk to infants?
Yes ____ No ____

Why or why not?
Language ____ Security ____ Development ____
Stimulation ____ Socialization ____ Identity ____
Connection ____
Other:

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Do you think the baby's age makes a difference?
Yes ____ No ____ Don't know ____ Other:

13. At what age do infants understand what is said to them?
   - tone Age ____ Don't know ____
   - words Age ____ Don't know ____

14. Do you believe that talking to your baby has helped him/her to develop?
Yes ____ No ____ Don't know ____
Language ____ Security ____ Development ____
Stimulation ____ Socialization ____ Identity ____
Connection ____
Other:

How will it help his/her future development?
Language ____ Security ____ Development ____
Stimulation ____ Socialization ____ Identity ____
Connection ____
Other:

15. Do you still... sing ____ music____ read ____

16. (If mother is working now) What have you noticed about how your sitter or day care worker talks to your infant?
No diff ____ Smiling ____ Repetition ____ Volume ____
Pitch ____ Questions ____ Statements ____ Balance ____
Rate ____ Baby talk ____
Other:

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APPENDIX G

Sample Memos and Propositions

Theme 1. Expert advice influenced some mother-infant communication

Memo: March 22, 1995

Mother 15A brought up issue of baby talk and "they" say not to use baby talk. When queried about what baby talk is, she said using burpie for burp and dwink for drink. I asked who "they" were and she said doctors. Doctors say that children have trouble with the Rs and Ws because parents talk babyish to them when they are small.

She also said "they" say to tell the infants what you're doing when you walk through the house. Earlier, mother 04A mentioned that she was uncomfortable doing that. This is mom 15A's first child, and she obviously had read a lot of books about what she should be doing.

Note if other mothers bring up this issue. I hadn't read baby books about this. I did ask one of these moms, and they said the only title they remembered was "What to Expect the First Year".

Proposition: First-time mothers consider advice from experts and significant others when learning how to talk to their infants.

Theme 2. Mothers co-regulated their style of communication to infants' responses

Memo: February 25, 1995

It is amazing to me that the first four mothers that I have interviewed describe their interactions with their infants in the co-regulated style that Fogel talks about. When I asked what they did in the different scenarios--feeding, putting to sleep, playing, calming--all adjust their behaviors to infants' cues. I didn't think about how pervasive this would be when I wrote my diss proposal. Note if this trend continues. There was even a teen mom in this group.

Proposition: Co-regulation is universal to mother-infant communication.
Theme 3. Maternal communication behaviors were consistent among ages and ethnicities.

Memo: March 18, 1995

I have interviewed 3 teens so far--2 Caucasian and 1 African-American, ages 19, 18, and 14. What I hear them saying is what I hear other mothers saying. The only one who doesn't seem to talk to her infant much is the youngest teen. She also had the shortest answers. However, when she talked about the scenarios she reported her behaviors in response to infant cues, meaning that she is co-regulating. All the teens expressed that they believed it was important to talk to their infants and that it would help their development. I was expecting more differences in their answers. It will be interesting to see if this pattern holds throughout the rest of the teen interviews.

Proposition: In this area, maternal communication behaviors are universal among all mothers.

Theme 4. Experience talking to pets influenced some new mothers' speaking styles.

Memo: February 25, 1995

When I interviewed mother 04A, she mentioned talking to her dogs the way she talks to her infant. I hadn't thought of pets as one way to learn to talk to infants. She said her dogs had been her children most of her life. I need to remember to ask other mothers when exploring the question of how they learned to talk to infants.

Proposition: Having pets can influence mothers' abilities to talk to their infants.
Appendix H

Tactics for Generating Meaning

1. **Counting**: Noting frequencies.

2. **Noting Patterns, Themes**: Noting any recurring patterns or themes which pull together many separate pieces of data.

3. **Seeing Plausibility**: Using an initial impression that some conclusion "makes sense" as an impetus for checking further using other tactics.

4. **Clustering**: Putting things into classes or categories; grouping phenomenon and then conceptualizing about the similar patterns or characteristics.

5. **Making Contrasts/Comparisons**: Examining differences and similarities.

6. **Subsuming Particulars into the General**: Combining specific information under a more general category (usually more conceptual and theoretical).

7. **Factoring**: Generating the common factor which holds disparate information together.

8. **Noting Relations Between Variables**: Trying to discover what sort of relationship, if any, exists between two or more variables.

9. **Finding Intervening Variables**: Identifying other variables which may tie two variables together.

10. **Building a Logical Chain of Evidence**: Plotting relationships among main factors; stringing together a series of "if-then" relationships.

11. **Making Conceptual/Theoretical Coherence**: Moving from metaphors and interrelationships to constructs and theories.
Appendix I

Tactics for Testing or Confirming Results

1. **Checking for Representativeness**: Looking purposefully for nonrepresentative cases.

2. **Checking for Researcher Effects**: Being aware of biases caused by presence of the researcher and stemming from the reaction of the researcher to the situation, and using tactics to avoid these.

3. **Triangulating**: Supporting a finding by showing that independent measures of it agree with it or do not contradict it.

4. **Weighting the Evidence**: Analyzing which data are stronger and which are weaker.

5. **Checking the Meaning of Outliers**: Using exceptions to test and strength findings.

6. **Using Extreme Cases**: Using outliers that represent extreme cases to verify and confirm conclusions.

7. **Making If-Then Tests**: Stating expected relationships.
Appendix J

Virginia Polytechnic Institute and State University
Department of Psychology
Blacksburg, VA 24061-0436

TITLE: Infant Preference for Maternal Voice (Ref. 95-030)
PRINCIPAL INVESTIGATOR: Jane L. Abraham, M.S.

I. RESEARCH PURPOSE AND BENEFIT
You and your infant are invited to participate in a study about infant's preferences for their mothers' voices. The purpose of this project is to test infants when they are 6-8 weeks old and 16-18 weeks old in order to determine if their preference changes as they get older.

II. PROCEDURES
Your infant will be tested for about 15 minutes, as long as s/he is in an awake, alert, and quiet mood. You will hold your infant on your lap facing a video screen and speaker. You will wear ear plugs and listen to music while your infant is being tested. The baby will see a black-and-white checkerboard if s/he is 6-8 weeks old or colored concentric circles if s/he is 16-18 weeks old on the video screen. When your baby looks at this, a recording of a female voice will start to play, either your voice talking to an adult or an unfamiliar female talking to an infant. Your infant can hear this voice as long as s/he looks at the screen. The loudness of the speech is about the same as that in the typical home environment (i.e., @ 65 dB). If your infant cries or falls asleep, testing will be stopped. Also, each infant will be videotaped during his/her session for later coding of their facial expressions. There are no known risks to your infant or to yourself for participation in this study. However, you have the right to stop this study at anytime and for any reason, if you so choose.

III. BENEFITS OF THIS RESEARCH
Your participation in this study increases understanding of how infants learn language. No guarantee of benefits has been made to encourage you to participate. If you would like, you will be sent a summary of this work when this project is completed.

IV. CONFIDENTIALITY
All of the information gathered in this study will be kept confidential and results will not be released without parental consent. The information your infant provides will have his/her name removed, and only a subject code will
identify him/her during analyses and any written reports. Your informed consent will be kept separate from your infants' information. However, the results of this project may be used for scientific and/or educational purposes, presented at scientific meetings, and/or published in a scientific journal.

The experiment will be videotaped. The videotape will be stored at the Infant Speech Lab and erased after five years. The tape will only be reviewed by trained undergraduate or graduate lab assistants and Dr. Cooper.

V. COMPENSATION

You and your infant will receive no monetary compensation for participation in this research.

VI. FREEDOM TO WITHDRAW

You are free to withdraw your infant from this study at any time without penalty.

VII. RESEARCH APPROVAL

This research project has been approved, as required, by the Human Subjects Committee of the Department of Psychology and the Institutional Review Board of Virginia Tech.

VIII. PARENT'S PERMISSION

I have read and understand the informed consent and condition of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent for my infant to participate in this project. I understand I have the right to end this session for any reason if I so choose. If I have any questions regarding this research and its conduct, I should contact one of the persons named below. Given these procedure and conditions, I give my permission to Jane Abraham and her co-workers to test my son/daughter.

Jane L. Abraham, Principal Investigator 231-3972
Dr. Robin Panneton Cooper, Faculty Advisor 231-5938
Dr. R. Eisler, Chair, Human Subjects Committee 231-7001
Dr. Ernest Stout, Chair, Institutional Review Board 231-9359

Signature of Parent (First visit) ________________________________ Date ________________

Signature of Parent (Second visit) ________________________________ Date ________________

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CURRICULUM VITAE

Jane L. Abraham
304 Royal Lane
Blacksburg, Virginia 24060
(540) 951-0343

EDUCATION

1995  PhD Developmental Psychology, Virginia Polytechnic Institute and State University, Blacksburg, VA
Dissertation: Mother and Infant Communication: Mothers' Experiences and Infants' Preferences

1989-90  Post Masters, Education Psychology, University of Washington, Seattle, WA

1979  M.S. Health Education, University of Washington
Thesis: An Evaluation of the Training, Performance, and Outcome Components of the Student Health Advocate Pilot Program, 1977-78

1971  B.A. English, University of Miami, Coral Gables, FL

RESEARCH EXPERIENCE

1995  Psychology Department, Virginia Tech, Blacksburg, VA. Mother and Infant Communication: Mothers' Experiences and Infants' Preferences, Dissertation supervised by Dr. Robin P. Cooper

1994  Psychology Department, Virginia Tech, Blacksburg, VA. One-Month-Old Infants' Preferences for Duration in Infant-Directed Speech, supervised by Dr. Robin Cooper

1992-93  Psychology Department, Virginia Tech, Blacksburg, VA. Developmental Changes in Preferences for Maternal Infant-Directed Speech, supervised by Dr. Robin P. Cooper

1990  Educational Psychology Department, University of Washington, Seattle, WA., supervised by Dr. Earl Butterfield.
1977-78  Health Education Division, University of Washington, Seattle, WA. An Evaluation of the Training, Performance, and Outcome Components of the Student Health Advocate Pilot Program, 1977-78, supervised by Dr. Betty Mathews.

TEACHING EXPERIENCE

1995  Instructor, Personality Psychology, Virginia Tech, Blacksburg, VA
1994-95  Instructor, Developmental Psychology, Virginia Tech, Blacksburg, VA
1994  Graduate Teaching Assistant, Advanced Developmental Psychology, Virginia Tech, Blacksburg VA
1993  Instructor, Laboratory for Advanced Developmental Psychology, Virginia Tech, Blacksburg, VA
1992  Instructor, Laboratory for Introduction to Psychology, Virginia Tech, Blacksburg, VA
1984-91  Trainer as Health Education Consultant, Seattle, WA. See attached list of programs.
1985-89  Instructor, Health Education in Community Health Advocate Program, North Seattle Community College, Seattle, WA.
1977-78  Instructor, Health Education in Student Health Advocate Program, University of Washington, Seattle, WA.
1977  Co-instructor, Group Dynamics, University of Washington, Seattle, WA.
1974-78  Instructor, Mountaineering-Oriented First Aid, Red Cross and Mountaineers, Seattle, WA.
1971  Student Teacher, English, Grades 7-9, University of Miami, Coral Gables, FL.

EMPLOYMENT EXPERIENCE

1984-1991  Health Education Consultant, Seattle, WA. See attached list of projects.
1985-86  Assistant Community Relations Planner, METRO, Seattle, WA.
1982-83  Health Education Specialist, King County Multiple Sclerosis Association, Seattle, WA.
1979-81  Health Education Specialist, Family Planning, Seattle-King County Health Department, Seattle, WA.
1973-75 Outdoor Recreation Specialist, Camp Long, Seattle Parks and Recreation Department, Seattle, WA.

AWARDS

1995 Award for Quality of Research as presented in Abstract – Society for Research in Child Development

1994 & 95 Travel Awards
- Graduate Student Assembly, Virginia Tech
- American Psychological Association

1994 Third prize winner in Humanities Division
- 10th Annual Graduate Research Symposium

PAPERS/POSTERS


PUBLICATIONS


MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

American Psychological Association
American Psychological Society
International Society for Infant Studies
Society for Research in Child Development
Better Beginnings Coalition of the New River Valley

Jane L. Abraham, PhD
EDUCATIONAL MATERIAL DEVELOPMENT/EDITING

Pamphlets and Brochures
University of Washington, MEDEX
Seattle-King County Health Department
Multiple Sclerosis Association of King County
Cascade Bicycle Club

Stress Management Self-Care Kit
Group Health Cooperative, Center for Health Promotion

Training Manuals:
Support Group Facilitator
Senior Information Line
Group Health Cooperative

Student Health Advocate
University of Washington

Child Support and Family Responsibility
Family Services

Editing:
Day Care Provider Handbook
Seattle-King County Health Department

Long-Term Care Insurance Buyers Guide
Group Health Cooperative

Curricula:
Anger Management School
Community Health Advocate Program, Health Education Component
Children's Discussion Series
Family Services

University of Washington, MEDEX, North Seattle Community College

Widow Information and Counseling Services

Telephone Protocols
Group Health Cooperative, Breast Cancer Screening Program

Downtown Accessibility Map
Paralyzed Veterans of America, Northwest Chapter
MARKETING

Community Health Advocate Program  University of Washington, MEDEX
Student Health Advocate Program  University of Washington
Family Planning  Seattle-King County Health Department

PROGRAM DEVELOPMENT

Bicycle Safety Education Program  Cascade Bicycle Club
Community Health Advocate Program, Health Education Component  University of Washington, MEDEX, North Seattle Community College
Self-Care Curriculum for Anger Management School
Child Support and Family Responsibility Seminars
Child Abuse and Neglect Curriculum  Family Services
Student Health Advocate Program  University of Washington
Weight Control  Holly Park Medical Clinic

PROJECT COORDINATION

Bicycle Helmet Safety Campaign  Harborview Injury Prevention Center, Cascade Bicycle Club
Bicycle Safety Education Program  Cascade Bicycle Club
Stress Management Self-Care Kit  Group Health Cooperative
Student Health Advocate Program  University of Washington
IBM's A Plan for Life Program (regional)  Johnson and Johnson Health Management Inc.
Ford's Total Health Program: Health Risk Appraisal (regional)
<table>
<thead>
<tr>
<th>Training Area</th>
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<tr>
<td>Implementing Bicycle Safety Courses</td>
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<td>Health Education in Foodborne Disease Control</td>
<td>Department of Social and Health Services</td>
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<tr>
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<td>University of Washington METRO Cascade Bicycle Club King County Nurses Association</td>
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<td>Patient Education: Effective Teaching</td>
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<td>Virginia Mason Medical Center</td>
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