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**Taking the "Mother" Out of "Motherese": Young Infants' Preference  
for Mothers' Use of Infant-Directed Speech**

by

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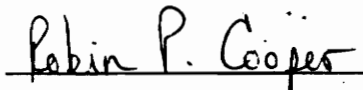
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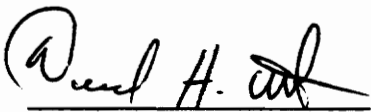
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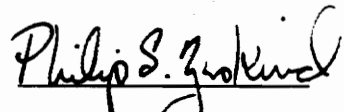


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TAKING THE "MOTHER" OUT OF "MOTHERESE": YOUNG INFANTS' PREFERENCE FOR  
MOTHERS' USE OF INFANT-DIRECTED SPEECH

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Psychology

(ABSTRACT)

Previous research on infant perception of speech has shown that infants prefer their mother's voice over the voice of an unfamiliar female. Additionally, infants show a preference for the type of speech that is normally directed towards infants, known as infant-directed (ID) speech. The linguistic and prosodic features of ID speech are typically exaggerated in comparison to speech that is used amongst adults (adult-directed or AD speech). Most previous studies investigating infant preference for ID speech have used the voice of a woman unfamiliar to the infants tested. The only study to use the maternal voice in testing ID speech preferences employed 9 and 16-month-old infants. Knowledge of how the maternal voice impacts speech preferences in younger infants is unknown. The current study examined 1-month-old infants' preference for maternal ID speech, when the alternative was maternal AD speech. Samples of individual mothers' ID and AD speech were obtained during home visits, and selected utterances were subsequently presented to the infants in a visually based preference procedure. One-month-olds showed no preference for either maternal speech type, although acoustic analyses showed that the ID speech did differ significantly from the AD speech on all prosodic parameters examined. This lack of preference for maternal ID speech in young infants is discussed in a developmental model that depends on experience with maternal speech from prenatal to postnatal life with regard to the formation of infant speech preferences.

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## Introduction

Mother-infant interactions appear to have many components that parallel those found in adult conversational interactions. That is, the mother may use visual, auditory, and/or tactile cues to elicit and maintain the interaction with her infant, just as she might when talking to another adult. However, when the mother speaks to her infant she tends to exaggerate facial, as well as vocal features (Brazelton, Koslowski, & Main, 1974; Schaffer, 1977; Stern, 1977). This exaggeration appears to be an important component in both elicitation and maintenance of a positive social interaction. Specifically, whereas mothers typically use an exaggerated rising pitch contour in their speech when they are trying to gain the attention of their infants, they typically use rising-falling pitch contours when they are trying to maintain the attention of their infants (Stern, Spieker, & MacKain, 1982). In this way it has been shown that the mother is attentive to her infant, and may modify the way in which she acts dependent upon her infant's state.

The examination of mothers' speech to their infants has also revealed a more general tendency to use lengthened pauses between utterances (Fernald, 1985; Fernald & Simon, 1984). The elongated pauses probably serve to maintain a sense of conversational dialogue between the participants. That is, although the mother is actually conducting a monologue (especially with younger infants who may not vocalize much), her pausal structure is more similar to a dialogue with a fully conversational partner, as if she is giving the infant a chance to respond (Beebe, Jaffe, Feldstein, Mays, & Alson, 1985; Stern, 1977). And in fact, she may be: If an adult's speech is made contingent upon the infant's vocalizations there are much more "speech-like" vocalizations from the infant than if the adult's speech is not contingent upon the infant's behavior (Bloom, Russell, & Wassenberg, 1987). Therefore, the mother may actually be timing her speech in such a way as to allow the infant time to respond, regardless of whether the infant responds vocally. Thus, the mother-infant interaction is a rich one, whereby the actions of the mother can play a significant role in influencing the behavior of the infant, as well as in maintaining

the interaction. Though it is impossible to entirely separate the actions of one interactive partner from the other, the role of the mother in these interactions has thus far been the focus. The role that the infant plays in the elicitation and maintenance of adult-infant interactions also merits study.

Infant behaviors, such as crying, cooing, smiling, and gazing are all potential elicitors of increased maternal attention. These behaviors may be either self-initiated or responses to the mother's (or any sensitive caregiver's) actions, and can therefore serve as information to the mother as to how well she is eliciting and/or maintaining her infant's attention (Fernald, 1984; Papousek & Papousek, 1977; Stern, 1977). Mothers who are sensitive to their infants' behaviors are able to pick up on subtle cues that can signal a wide range of internal states. It is important, therefore, to identify aspects of the mother's stimulative input to which the infant is sensitive and to which the infant will pay attention.

In this regard, some evidence suggests that young infants show preferences for specific speakers and types of speech. A few days after birth the newborn shows a preference for the mother's voice over an unfamiliar female's voice (DeCasper & Fifer, 1980; Fifer & Moon, in press). Additionally, when the mother (or any adult) speaks to an infant, they do so in a characteristic manner that includes intonational exaggerations. Interestingly, infants from birth through the first year show a preference for this speech type (known as infant-directed or ID speech) when the alternative is the same unfamiliar speaker talking to another adult (known as adult-directed or AD speech) (Cooper & Aslin, 1990; Fernald, 1985; Werker & McLeod, 1989). Moreover, adult usage of ID speech has been shown to increase adult ratings of the infant's positive affect (Werker & McLeod, 1989). In conjunction with the above discussion, the infant's increased positive affect while listening to infant-directed speech may ensure continued use of this speech type by the participating adult. Thus, the infant is not a passive partner in adult-infant interactions, and the infant's behavior can act to "color" the interactional mood.

Investigation of infant preferences for specific speech types may ultimately aid in the elucidation of the origins of mother-infant interactions. That is, infant preference for certain interactional styles may influence the caregiver's use of that style of interaction. In turn, infant preference for certain aspects of that interactional style may be mediated through increased experience with the concurrent stimuli associated with that style of interaction. The present study examines a single aspect of the typical mother-infant interaction, that of maternal ID speech.

### Prosodic Features of Infant-Directed Speech

Although adult-infant interactions may have undertones of adult conversational style, the speaker usually makes both linguistic and prosodic modifications to their speech when they are speaking to an infant. This speech style was initially termed "motherese" in investigations of maternal speech to young children (Newport, Gleitman & Gleitman, 1977). However, subsequent investigations revealed that "motherese" is too restrictive a label for this speech type. The same types of speech modifications are used by fathers and non-parents of both sexes, in their speech to both older and younger infants (Ferguson, 1977; Fernald & Simon, 1984; Fernald, Taeschner, Dunn, Papousek, de Boysson-Bardies, & Fukui, 1989; Jacobsen, Boersma, Fields, & Olson, 1983; Stern et al., 1982). Additionally, because it is unlikely that an infant of less than 6-months of age is processing the semantic components of speech, research on speech to younger infants has concentrated on elucidation of the prosodic modifications found in speech directed to infants. ID speech is currently used to refer to speech that is directed to a young infant, and is differentiated from AD speech primarily by its prosodic features (Cooper & Aslin, 1990; Pegg, Werker, & McLeod, 1989; Werker & McLeod, 1989).

The set of prosodic modifications that appear to be the identifying characteristics of ID speech include increases in mean fundamental frequency ( $F_0$ ) or pitch, increases in  $F_0$ -variability, wider  $F_0$ -excursions (i.e., an  $F_0$  contour elongated over time) and longer pauses between



utterances (Ferguson, 1977; Fernald & Simon, 1984; Jacobsen et al., 1983; Stern et al., 1982). Previously conducted acoustic analyses of ID and AD speech have found significant differences on the acoustic parameters discussed above (Cooper & Aslin, 1990; Fernald & Simon, 1984; Fernald et al., 1989). Also, when identical utterances are spoken by the same speaker to an infant and an adult, the ID utterance is seen to be of longer duration (Cooper & Aslin, 1990; Pegg et al., 1989). However, in naturally occurring speech to infants and adults, ID utterances are of significantly shorter durations (Fernald & Simon, 1984; Fernald et al., 1989; Grieser & Kuhl, 1988). The shorter durations found in utterances to infants are thought to be reflective of the simplification of adults' speech to infants.

Although initial interest in ID speech arose from observational studies of English speaking mothers and their infants, maternal and paternal usage of ID speech has been documented in an array of languages (Fernald & Simon, 1984; Fernald et al., 1989; Grieser & Kuhl, 1988; Papousek, Papousek, & Haekel, 1987). Fernald et al. (1989) recorded both mothers and fathers speaking their native languages of Italian, German, French, British English, American English or Japanese to their 12-month-old infants and to an adult. In order to allow for comparisons across cultures, these authors maintained a high level of consistency during the recording of the parental speech samples. Acoustic analyses were conducted on mean  $F_0$ ,  $F_0$ -minimum,  $F_0$ -maximum,  $F_0$ -range,  $F_0$ -variability, utterance duration, and pause duration. Comparisons between ID and AD samples showed a high degree of cross-gender, as well as cross-language consistency in the typical prosodic expansions seen in ID speech, with two notable exceptions. First, across languages, although both mothers and fathers modified their speech to their infants, only mothers used a wider  $F_0$ -range. One possible explanation for this finding is that differences between males and females in the larynx, throat, and other structures involved with speech production hinders the expansion of the  $F_0$ -range that males are capable of making. Second, American English speaking parents showed the most extreme usage of intonational exaggerations. Although this may reflect

a cultural difference, there also may have been differential reactivity of the American parents to the method of speech sample collection. That is, whereas American mothers speak more to their infants when they know that they are being observed (Bronfenbrenner, 1979), parents in other cultures may actually speak less to their infants, and in a less exaggerated fashion when there is a visitor present.

As discussed above, both fathers (Fernald et al., 1989; Papousek et al., 1987) and mothers modify their speech in characteristic ways when they interact with their infant. However, the use of ID speech by adults is not limited only to parents. Jacobsen et al. (1983) analyzed the speech of both male and female parents and nonparents in three conditions: (a) when speaking to an adult, (b) when imagining they were speaking to an infant, and (c) when actually speaking to an infant. They found that the mean  $F_0$  and  $F_0$ -variability increased significantly for all groups during the role playing session, and that both measures increased significantly again when the infant was actually present. Additionally, they found no significant effect of parenting experience on the use of ID speech modifications. In a subsequent study by Fernald and Simon (1984), German mothers' speech to their newborn infants was recorded. They also found that prosody was more exaggerated when the mother actually spoke to her infant than when she imagined speaking to her infant.

Not only are there qualitative changes in adult speech that are attributed to the presence of an infant, but changes in ID speech patterns have been shown to be dependent on the infant's age. In a longitudinal study, Stern, Spieker, Barnett, and MacKain (1983) recorded maternal speech to their infants when they were newborn, 4-, 12-, and 24-months old. They found that although ID modifications were being made at all ages, the use of pitch contouring was particularly pronounced when the infants were about 4 months of age. Stern et al. (1983) speculated that this change occurs in congruence with changes in interactional style. The newborns were held during the taping sessions, and during later recording times (i.e., 12- and 24-months) the older

infants were free to roam about the room. However, at 4-months the recordings were made with the infant sitting in a semi-upright infant seat. The increased use of pitch contouring at 4-months may facilitate this type of face-to-face mother-infant interaction. A parallel result of the change in context may be that the mother changes the way in which she interacts with her infant, adopting different methods of interaction dependent on the context, which of course can be dependent on the age of the infant.

In addition to the changes made in pitch contouring across the development of the infant, there are other instances of specific context related changes being made in mothers' speech to their infants. Stern et al. (1982) analyzed the interactional and motivational context of mothers speaking to their 2-, 4- and 6-month-old infants. They found that mothers used rising pitch contours more often when they were trying to elicit eye contact and attention, but used rising-falling pitch contours (bell or sinusoidal shaped) to maintain the infant's positive affect and gaze, once attention had been elicited. Thus, it appears that mothers are sensitive to the actions of their infant and respond in a way that they feel may differentially affect the infants' attentional states.

Although maternal use of specific interactional contours appears to be context specific, there is little empirical evidence as to whether infants actually respond differentially to specific contour types. There is, however, evidence of infant preference for the generalized form of ID speech throughout the first months after birth.

#### Infant preference for infant-directed speech

As the wide availability of ID speech to the young infant was recognized, experimentation focused on whether infants show preferences for this speech style. Individual studies have examined infant preference for ID speech at 2 days, 1 month, 4 months, 4-5, and 7-9 months (Cooper & Aslin, 1990; Fernald, 1985; Werker & McLeod, 1989). The first examination of infant

preference for ID speech was made by Fernald (1985), who assessed the preference for non-maternal ID speech in 4-month-old infants. The ID and AD speech samples were of mothers speaking to the experimenter or to their infants, but the mothers who recorded the samples were unfamiliar to the babies tested. An operant auditory preference procedure was used, in which infants' head turns were reinforced with 8 sec presentations of either ID or AD speech. In this procedure, the infant had to first learn the contingency that turning of the head to one side would lead to presentation of one speech stimulus, whereas turning of the head to the opposite side would produce the other. After completion of four training trials, Fernald found that 4-month-old infants made significantly more head turns to the side that would produce ID speech. Although this study showed that 4-month-old infants will elicit presentation of the ID speech more often than AD speech, it is unclear whether 4-month-olds will maintain the presentation of ID speech longer than AD speech if given the opportunity. As discussed earlier, mothers use different pitch contours to maintain versus elicit the infant's attention (Stern et al., 1983). With that consideration, it would be interesting to examine whether 4-month-old infants would act to maintain as well as elicit presentation of ID speech, in order to ascertain whether the characteristics of ID speech are sufficient to maintain the infant's attention as well as elicit it.

In addition to addressing the question of maintenance, Werker and McLeod (1989) expanded the examination of preference to the concomitant facial and vocal aspects of ID speech in 4-5 and 7-9 month old infants. This is an important consideration since typical caregiver-infant interactions are multi-modal in nature. Infants were shown a video of a woman or man speaking the same script addressing either an adult or an infant. This presentation allowed the infants to experience both the audio and the visual input of ID and AD speech. At both ages, infants attended for a longer period of time to the ID videotapes when either a male or female was the speaker. These experiments alone do not allow us to determine whether either the facial input, or vocal input, was sufficient to elicit and maintain the infants' attention. Therefore, subsequent

experiments were conducted to examine the relative contributions of the face and voice in determining the infant's preference. In these experiments 4-5 month old infants were presented with either a) the original ID and AD speech samples paired with a nodding, neutral female face or b) a musical pattern paired with the original tapes of ID and AD facial features. These authors found that there was no preference for either the vocal or facial features alone, when the other component was held constant. In contrast, Fernald (1985) found that portions of speech alone (with no concurrent visual stimulus) were sufficient to elicit a preference for ID speech in 4-month-olds. Kuhl and Meltzoff (1984) in an investigation of intermodal matching in infancy found that 4-5 month old infants attended longer to a face when the speech track matched the facial movements of the videotape than when mismatched pairings of face and speech track were presented. Thus, Werker and McLeod's (1989) lack of preference may have been representative of infants' relative inattention to mismatched visual and auditory pairings, rather than signifying an actual lack of preference for either the visual or auditory components of ID speech presented alone. However, Fernald (1985) did show that the auditory components of ID speech, when presented alone, are sufficient to elicit a preference in 4-month-old infants.

Although the preference for ID speech has been identified in infants of 4-9 months of age (Fernald, 1985; Werker & McLeod, 1989), it is unclear as to whether this preference extends to younger infants. Cooper and Aslin (1990) therefore examined the preference for ID speech during the first month after birth. The auditory stimuli were constructed by recording a woman unfamiliar to the infants reading a script as if speaking to another adult (AD) or the same script as if speaking to an infant (ID). A modification of Colombo and Bundy's (1981) auditory preference procedure was used. In this procedure, the recordings of ID or AD speech remained on as long as the infant fixated a visual stimulus (a black and white checkerboard). Presentation of the speech recordings were alternated across trials, with initial order of presentation randomized across infants. Both newborns and 1-month-old infants looked longer to the checkerboard when looking

produced the ID speech. Thus, it appears that very little direct postnatal experience with ID speech is necessary for a preference for ID speech to be shown. However, mothers of newborns do use ID speech when talking to their infants, such that it is difficult to examine directly the role of specific experience in the development of the early preference for ID speech.

Pegg et al. (1989) examined 7-week-old infants ability to discriminate between ID and AD speech when spoken by either a male or female speaker. Using a visually based habituation-dishabituation paradigm, they found that infants were able to discriminate ID from AD speech when spoken by either a male or female. In this procedure, infants are allowed to habituate to one auditory stimulus, at which time the second stimulus is presented. If the stimuli are discriminable, increased looking (or dishabituation) is expected. In the female speech group half of the infants were presented with ID speech first, whereas the other half received AD speech first. Infants that received AD speech first dishabituated, that is, they showed longer looking times when the ID speech was presented following habituation to the AD speech. However, infants who received the ID speech first did not dishabituate when the AD speech was presented. Pegg et al. interpret this differential recovery of looking time during dishabituation as a preference for female ID speech over female AD speech. In conjunction with the previous research showing preferences for female ID speech at 2-days, 1-month, 4-months, and 7-9 months (Cooper & Aslin, 1990; Fernald, 1985; Werker & McLeod, 1989) this conclusion seems to be fitting.

In sum, the preference for generalized ID speech has been demonstrated across the first 9-months after birth. Continued investigation of infant auditory preferences for speech types is important for our understanding of the infant's role in mother-infant interactions. In addition to the infant's ability to discriminate and show preferences for ID speech, another important ability of the infant that may influence the development of mother-infant interactions is the infant's ability to discriminate and show a preference for his/her mother's voice over an unfamiliar woman's voice.

### Preference for the maternal voice

In addition to the young infant's preference for a specific speech type young infants also show preferences for their mothers' voices (DeCasper & Fifer, 1980; Fifer & Moon, in press). DeCasper and Fifer (1980) conducted a study in which they examined neonates' preference for their mother's voice over that of an unfamiliar woman's voice. In their first experiment, newborns were differentially reinforced for either lengthening or shortening the amount of time between their non-nutritive sucking bursts (called the interburst interval or IBI) as compared to their median baseline IBI (mIBI). For half of the infants IBIs shorter than the mIBI were reinforced with presentation of the maternal voice, whereas IBIs greater than the mIBI led to presentation of another woman's voice (some other infant's mother). For the other half of the infants the contingency was reversed. That is, by either lengthening or shortening the length of the IBI the infants could obtain the speech of either their mother or an unfamiliar woman. Eight of 10 infants showed a preference for their mother's voice, producing their mother's voice more often and for a longer total period of time. In the second experiment, using a different preference procedure, DeCasper and Fifer (1980) again found evidence for the newborn's preference for the maternal voice. In this procedure, during the IBIs the infants heard either silence or a tone signalling the availability of either the mother's or another woman's voice reading the same story. For half of the infants the tone signalled the availability of the maternal voice, whereas silence signalled availability of the other woman's voice. For the other half of the infants the signal-voice contingency was reversed. During the final third of the 18 minute session, after the contingency had been learned, the infants sucked 24% more during the stimulus (either tone or silence) that signalled the mother's voice. Taken together these results show that the newborn infant prefers the voice of the mother over the voice of an unfamiliar woman.

In a similar study also designed to examine infant preference for the maternal voice, Fifer and Moon (in press) recently replicated DeCasper and Fifer's findings. Fifer and Moon, using a

signal discrimination paradigm, examined the preferences for (a) the mother's voice over silence, (b) an unfamiliar woman's voice over silence, and (c) the maternal voice over another woman's voice. In all three experiments the first of the pair of contrasts was the preferred auditory stimulus. That is, the mother's or another woman's voice was preferred over silence, and the mother's voice was preferred over an unfamiliar woman's. In this trio of experiments, the speech samples were created by having the women speak to another adult. Thus, in DeCasper and Fifer (1980) the speech samples were created by having the women read a children's story, whereas in Fifer and Moon (in press) the speech samples were adult-directed. In both studies a preference for the mother's voice was shown, indicating that young infants show a preference for the mother's voice whether mother is speaking ID or AD speech.

Although it is now clear that infants do show a preference for, and therefore discriminate their mother's voice when compared to another woman's voice, it remains unclear what aspect(s) of the mother's voice is important in the manifestation of this preference. Mehler, Bertoncini, Barriere, and Jassik-Gerschenfeld (1978) examined the effect of intonation on 1-month-old infants' ability to discriminate their mother's voice from an unfamiliar woman's. Infants were asked to discriminate the maternal voice from a non-maternal voice under normally intonated and monotone conditions. Using a nonnutritive sucking task, infants were presented with one stimulus for five consecutive trials, with the stimulus being changed on the sixth. Discrimination was said to have been shown if infant sucking rate changed significantly between the fifth and sixth trials. The stimuli were either the infant's mother or another woman reading a segment of text backwards ("monotone" condition), or "as if talking to an infant" (normally intonated condition). Each infant received either both women in monotone, or both normally intonated, with half in each group receiving the mother's voice first. Under the monotone conditions the infants showed no discrimination of the women's voices, whereas in the normally intonated condition the infants sucked more for the mother's voice whether her voice was presented first or second. The lack of



discrimination seen in the monotone condition may have resulted from the fact that more than just the normal intonation of speech was disrupted in these speech segments. Tempo and the normal rhythmicity of speech was altered as well, such that the infants' ability to react to the samples as 'speech' may have been eliminated. Nevertheless, it appears that one or more intonational components of the mother's voice may be important in the infant's ability to identify her voice. Additionally, Mehler et al. (1978) felt that the finding of increased responding to the mother's voice, whether presented first or second, offers evidence of infant 'preference' for the mother's over an unfamiliar woman's voice.

To summarize, young infants show a preference for the maternal voice over an unfamiliar woman's voice whether the women are speaking ID speech (DeCasper & Fifer, 1980; Mehler et al., 1978) or AD speech (Fifer & Moon, in press). Additionally, infants from birth to 9 months show a preference for ID speech over AD speech when both are presented by an unfamiliar speaker (Cooper & Aslin, 1990; Fernald, 1985; Werker & McLeod, 1989). However, the question of preference for maternal ID speech over maternal AD speech in the young infant remains unanswered. Although no previous study has examined this issue in younger infants, one study has investigated 9- and 16-month-old infants' preference for maternal ID speech over maternal AD speech (Glenn & Cunningham, 1983). In this study, infants at each age were presented with 2 square manipulandi, each of which contained a tape recorder. When a button on either box was pressed the tape within was activated. One of the boxes played maternal AD speech whereas the other played maternal ID speech. During free play sessions with the 2 boxes, infants at both ages activated the tape that played the maternal ID speech significantly more often and for longer total durations than they activated the tape that played the maternal AD speech. This was interpreted as showing a listening preference for the maternal ID speech.

The current study was designed to determine whether younger infants (1-month-olds) show the same pattern of preference for maternal ID speech as that shown by older infants. Since

previous investigations have shown that 1-month-old infants prefer both the maternal voice and ID speech, it is expected that infants will show a preference for the combination of the two: maternal ID speech. The question of early infant preference for maternal ID speech is a compelling one because of the role this preference may ultimately play in the development of a positive mother-infant interaction.

## Method

### Subjects

Twenty 1-month-old infants comprised the final sample ( $M$  age = 38.7 days,  $SD$  = 5.5 days; 12 males and 8 females). An additional 22 infants failed to complete testing due to excessive crying or fussiness (12), sleeping (5), difficulty in observing infant's eyes (2) or experimenter/ equipment error (3). Subjects were recruited from the community through birth announcements published in local newspapers. Parents were contacted initially by mail (see Appendix A) and subsequently by phone. All infants were healthy full-term infants with no maternally reported prenatal or postnatal complications. At the time of testing, mothers reported that their infants were in good health.

### Maternal Voice Recordings

The voice of each mother was recorded during a 30-45 minute home visit approximately one week prior to the scheduled laboratory session. In order to obtain clear voice samples with a minimum of extraneous noise and distraction to the mother, a lightweight, professional lapel microphone (Sony, Model ECM-011) was clipped to the mother's shirt and fed into a portable, high-quality audio cassette recorder (Sony, Model WM-D6C). The microphone was attached at the beginning of the session and the tape remained running throughout the visit.

To facilitate the mother speaking in a natural manner during the home visit, the experimenter casually conversed with the mother, unless she began to interact with her infant, at which time the experimenter would quietly listen. In this way naturalistic AD samples were obtained from the mother's speech directed towards the experimenter and naturalistic ID samples were obtained from the mother's speech to her infant. If the mother did not direct her attention to the infant (i.e., she did not vocalize) within the first 15-20 minutes of the interaction, the experimenter specifically asked the mother to engage the infant's attention to a toy, or the mother's attention was directed to the infant by the experimenter. During the entire visit, the experimenter did not directly interact with the infant, so as not to model the characteristics of ID speech for the mother. Only 2 mothers did not vocally interact with their infants within the first 15 minutes of the session. These mothers were then gently prompted to attend to their infant's behavior, and ID speech was facilitated.

From each mother's home session a complete written transcript was made and ID and AD utterances were selected according to the following criteria: a) good overall recording quality; b) the absence of background noise (including infant or experimenter vocalizations); c) easily understood linguistic content and d) bounded by at least 300 msec of silence. In this way 'utterances' were defined acoustically rather than linguistically, and follow the segmentation procedures used by both Fernald and Simon (1984) and Fernald et al. (1989).

In order to equate for varying lengths of individual utterances, a total of 20 s of maternal ID [M(ID)] and maternal AD [M(AD)] speech were randomly selected from those deemed to be of good quality. The selected samples were then used to construct a 20-second continuous cassette tape, by recording the M(ID) and M(AD) samples independently onto separate channels of a multichannel cassette recorder (TASCAM, Model Port 05), with approximately 500 msec between each utterance. This procedure resulted in the construction of a single 20-second loop tape for each mother-infant pair, with M(ID) on one channel and M(AD) on the other .

### Apparatus

An infant seat was positioned within a grey-colored, 3-sided enclosure with the infant seat facing the front panel. A 12.7 cm black-and-white checkerboard (with 2.5 cm square checks) was located on the front panel, offset from midline 7.6 cm to the right. The infant seat was positioned approximately 40.6 cm from this front panel so that the checkerboard subtends a visual angle of approximately  $17^{\circ}$ . A smaller grey panel was used to cover the checkerboard between trials. Two small, high-quality loudspeakers (Jamo, Compact 60) were located at the corners of the front panel. A 1.3 cm observation hole was located at the center of the front panel. The room lights were turned off, and the front panel was illuminated from behind the infant via a 47 cm long fluorescent light.

The observer had access to the keyboard of a Macintosh SE computer that was connected to a custom-built interface which controls independent access to the channels of the cassette recorder. The audio output from the interface was amplified (Harman/Kardon integrated amplifier Model PM635) and presented via loudspeakers at 63-65 dB SPL. In order to prevent clicks at the onset and offset of the speech during presentation, the tape recording was ramped on and off with a rise-fall time of 30 msec.

### Procedure

Testing of the infants took place in an infant speech laboratory at Virginia Polytechnic Institute and State University. The procedure used was a modification of an auditory preference procedure originally designed by Colombo and Bundy (1981). In the present study, the amount of time an infant spent looking at the checkerboard while listening to different auditory stimuli was the dependent measure. "Preference" was operationally defined as significantly longer mean looking times to the visual stimulus when looking was associated with a particular speech recording.

If the infant was awake, alert and non-fussy, he/she was placed in the infant seat within the enclosure. If the infant was asleep upon arrival, the parents and/or experimenter attempted to awaken the infant. Gentle massage, speech, turning off of overhead lights, or undressing the infant have all been found to gently awaken a sleeping infant and were attempted in such instances. If the baby was fussy, a diaper change, feeding, or rocking was used in an attempt to soothe the infant. If the infant could not be calmed, the session was terminated. If the infant could be brought to an awake, alert, non-fussy state, the procedure continued. During this adjustment period, the procedure was fully explained to each mother, and she then signed an informed consent form (see Appendix B).

After placing the infant in the infant seat, one observer looked through the observation hole at the infant's face. Prior to the start of the session, the observer donned earphones over which continuous music was played in order to mask the speech sounds being presented. The checkerboard remained covered until the start of the first trial. When the infant looked towards midline, the second experimenter removed the grey panel covering the checkerboard. When the observer judged that the infant was looking at the checkerboard, s/he depressed a key on the keyboard to signal the onset of a look. The computer then accessed Channel 1 (or 2) of the tape recorder and either M(ID) [or M(AD)] was played over the loudspeakers. The speech remained on for the duration of the look. When the infant looked away from the checkerboard, the observer pressed another key signalling the end of the look. The speech stimulus was then terminated by the computer, and the grey panel was placed back over the checkerboard. This sequence was considered to be one trial, with trial length being determined by the infant's looking time and recorded by the computer.

The second trial accessed channel 2 (or 1), with the subsequent presentation of the speech type that was not played in Trial 1. The subjects were randomly assigned to receive either the M(ID) or M(AD) speech first, with the remainder of the session continuing with the

presentation of M(ID) and M(AD) speech being alternated across trials. Trials continued until a total of 10 trials (5 each of M(ID) and M(AD)) had been completed, with the contingency that each trial must be at least 2 seconds in duration. In addition, if the infant closed it's eyes or cried for more than approximately 20 consecutive seconds the session was discontinued and the data for that session were not included in any analyses.

### Acoustic Analyses

Because the speech samples from each mother were collected in naturalistic situations, acoustic analyses were conducted to insure that the selected samples did indeed vary on those parameters previously discussed as being important in the discrimination of ID from AD speech (e.g., pitch, pitch variability, duration, etc.). It was also considered important to determine the comparability of these prosodic features with previously reported analyses of the prosodic features of maternal ID and maternal AD speech (Fernald & Simon, 1984; Fernald et al., 1989; Grieser & Kuhl, 1988; Jacobsen et al., 1983; Stern et al., 1983).

The maternal speech samples were processed on a Micro Speech Lab II (MSL) system for the IBM computer, which allows measurement of fundamental frequency, amplitude, and duration of speech. By using the MSL program the following acoustic parameters could be identified for each selected M(ID) and M(AD) utterance:

- 1) Mean fundamental frequency (Fo): Calculated in hertz (Hz)
- 2) Fo-maximum (the highest Fo peak in the utterance);
- 3) Fo-minimum (the lowest Fo value in the utterance);
- 4) Fo-range (Fo maximum - Fo minimum);
- 5) utterance duration: measured in msec.

## Results

### Preference Data

To determine whether infants looked longer to the checkerboard during either presentation of M(ID) or M(AD) speech, mean looking times to both speech types were calculated by dividing the sum of time spent looking during the presentation of each speech type by 5 (the number of trials of that speech type). A mixed 2 X 2 analysis of variance (ANOVA) was computed on the infants' mean looking times, with order [M(ID)-first, M(AD)-first] as the between-subjects factor and speech type [M(ID), M(AD)] as the within-subjects factor. There was no significant main effect of speech type [ $F(1, 18) = 1.61, p = .22$ ], or order by speech type interaction [ $F(1, 18) = .36, p = .55$ ]. However, there was a marginally significant main effect of order [ $F(1, 18) = 4.27, p = .053$ ], with the overall mean looking times being greater when M(AD) speech was presented first [ $M = 38.7$  sec] than when M(ID) speech was presented first [ $M = 28.2$  sec]. The overall means for speech types and their standard errors are shown in Figure 1.

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Insert Figure 1 Here

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It is possible that the main effect of order occurred due to an initial arousing effect of the M(AD) speech. That is, when infants are presented with M(AD) speech first, the infant's attention is aroused such that the first look, as well as the subsequent looks are all longer than those observed when M(ID) speech is presented first. Alternatively, it is possible that dependent on which speech type is presented first there is differential attention on the first look, but that this effect is not carried throughout the session. Previous studies utilizing an identical methodology to that used here have shown a significant difference in looking times on the first trial dependent on which stimulus was presented first (Cooper & Aslin, under review; Cooper & Aslin, 1990). In order to determine if a similar pattern of initial looking times were shown in the present study, an

analysis of the first looks was conducted. There was a statistically significant difference between the mean looking times on the first trial [ $t(18) = 2.35, p = .03$ ], with longer looking times occurring when M(AD) speech was presented first. The mean looking times on first trials and their standard errors are shown in Figure 2.

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Insert Figure 2 Here

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In order to examine the possibility that the longer looking time on first trials that produced M(AD) speech was a determining factor in the order effect initially found, a second ANOVA, with the same design as above, was conducted with the length of the first trial being omitted from the calculations of the mean looking times. Once again, there was no significant main effect of speech type [ $F(1, 18) = .54, p = .18$ ], or order by speech type interaction [ $F(1, 18) = .1, p = .76$ ]. Moreover, there was no significant main effect of order [ $F(1, 18) = 1.99, p = .18$ ]. Therefore, it appears that the order effect for the overall data was carried significantly by the differential initial looking times dependent on which speech type was presented first. That is, there were not significantly longer looking times across the sessions which started with the M(AD) speech. Rather, when M(AD) speech was presented first only the first look was significantly longer than when M(ID) speech was presented first. The overall mean looking times (minus the first look) for speech types and their standard errors are shown in Figure 3.

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Insert Figure 3 Here

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### Acoustic Analyses

To verify that the collected M(ID) and M(AD) speech samples were significantly different from each other on mean  $F_0$ ,  $F_0$ -maximum,  $F_0$ -minimum,  $F_0$ -range,  $F_0$ -variability and duration, acoustic analyses using Micro Speech Lab software were conducted. Utterances were analyzed



at 20,000 samples per second with a frame size of 20 msec. Fo-contours, as well as the above parameters, can be determined from the MSL program. Two selected contours, of the same woman speaking an ID and an AD utterance, are shown in Figure 1. The differences in the Fo-contours between the ID and AD utterances are easily discernible, with the ID utterance containing greater mean-Fo, Fo-range, and Fo-variability.

Mean values for each of the above 6 parameters were calculated for each mother's ID and AD utterances. The mean value of each parameter was then calculated for M(ID) utterances and M(AD) utterances across mothers. Paired t-tests comparing M(ID) to M(AD) speech were then calculated using the means across subjects. In order to adjust for multiple comparisons an alpha level of .01 was adopted for these analyses. The mean value and standard deviation for each parameter are presented in Table 1. Significant differences were found on all parameters with mean Fo, Fo-minimum, Fo-maximum, Fo-range and Fo-variability being greater in the ID samples, and the duration of the AD utterances being longer. These findings are consistent with the direction of effects previously reported by researchers of infant-directed speech (Cooper & Aslin, 1990; Fernald & Simon, 1984; Fernald et al., 1989; Grieser & Kuhl, 1988; Jacobsen et al., 1983; Stern et al., 1983).

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Insert Figure 4 & Table 1 Here

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## Discussion

The results of this study revealed that 1-month-old infants did not look at a visual stimulus (a checkerboard) significantly longer during the presentation of maternal ID speech as compared to the presentation of maternal AD speech. Thus, young infants are not differentially attentive to ID speech as compared to AD speech when both are spoken by the infant's own mother. This finding is somewhat contrary to other studies showing that young infants prefer ID over AD

speech when spoken by unfamiliar females (Cooper & Aslin, 1990; Pegg et al., 1989). Although the average looking times of infants in the present study did not differ as a function of speech type, other measures have been shown to reflect differential responsiveness. For example, a recent study by Fernald (1989) showed that 5-month-old infants display more positive affect (e.g., smiling) when listening to adult approval vocalizations compared to prohibitive vocalizations. Perhaps the 1-month-olds in the present study also displayed more positive affect when listening to maternal ID speech. Unfortunately, these affective responses are not available for observation since no video recording of individual sessions was made. Although this may be a limitation of the present study, it should also be noted that the availability of positive affective displays (e.g., smiling) in such young infants is unlikely given that such responses emerge in most infants prior to after the age of 4 weeks (Izard & Malatesta, 1987).

Another measure that may reflect differential responsiveness is the length of attention (e.g., looking) upon initial exposure to one stimulus type (e.g., Cooper & Aslin, 1990; Pegg et al., 1989). In these studies, infants looked longer during the first trial of their sessions when looking produced ID speech. Although the present study also found a marginally significant order effect, in contrast to previous studies additional analyses showed that first looks were significantly longer when maternal AD speech was presented; when first looks were subsequently removed from the calculation of mean looking times, this order effect was eliminated. Thus, the only data to support differential responsiveness of infants in the present study were in the direction of maternal adult-directed speech.

One potential reason for the lack of preference for maternal ID speech over maternal AD speech is that the samples may not have differed enough on those prosodic parameters that differentiate ID from AD speech. There are several possibilities as to why the collected ID samples may not have differed sufficiently from the AD samples. First, the collected ID samples were of mothers' speech to their 1-month-old infants, and as discussed earlier, the prosodic features of ID

speech are not as pronounced in maternal speech to 1-month-olds as they are in ID speech to older infants (Stern et al., 1983). Second, in the collection of naturalistic speech there is always the possibility that the procedure may have affected the mothers' speech production. Although Bronfenbrenner (1979) reported that mothers speak more to their infants when they know that they are being observed, the opposite effect may have occurred here. Some mothers, after a period of vocal interaction with their infant would say something like "That's going to sound so silly on your tape". Comments of this sort did not occur often, but it is possible that mothers actually reduced the level of ID modifications they used when interacting with their infant, due to the presence of the experimenter. In this way the absolute differences between the collected ID and AD utterances may have been attenuated. Third, utterances were randomly selected from the collected utterances for each mother, with a total of only 20 secs each of ID and AD speech being selected. As a result of this process, those utterances with the most extreme ID modifications may not have been selected, again attenuating the difference between ID and AD speech .

Contrary to these interpretations, acoustic analyses of the selected ID and AD utterances showed that on all measures examined, the ID utterances significantly differed from the AD utterances in the predicted directions. The values for each of the parameters examined differed in the same direction as found in previous research of maternal speech to infants up to 24 months of age (see Cooper & Aslin, 1990; Fernald & Simon, 1984; Fernald et al., 1990; Grieser & Kuhl, 1988; Jacobsen et al., 1983; Stern et al., 1983). A cross-study comparison of acoustic analyses on ID and AD speech is provided in Table 2.

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Insert Table 2 Here

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Since the ID and AD utterances in the present study did differ significantly, it is surprising that the infants did not show a preference for the maternal ID speech. Since previous research has shown that 1-month-old infants prefer both non-maternal ID speech (Cooper & Aslin, 1990)

and the maternal voice (Mehler et al, 1978), it was expected that the combination of ID speech and maternal voice would be especially attractive to young infants. One interpretation of the lack of preference for maternal ID speech is that at 1-month, the maternal voice *per se* is such a powerful reinforcer that it overrides the preference for ID speech. This hypothesis could be tested by presenting the maternal ID and AD recordings used in the present study to 'naive' 1-month-olds. That is, infants unfamiliar with the women involved in these recordings could be tested in the preference procedure, with each infant randomly assigned to one of the mother voice tapes. It is predicted that these infants would show a preference for the ID speech since this study would be a partial replication of Cooper and Aslin (1990), in which 1-month-old infants were shown to prefer ID over AD speech. By conducting this preference study not only would the results of the maternal speech study be clarified but an important addition would be made to the existing literature. Cooper and Aslin (1990) found that 1-month-olds prefer non-maternal ID speech, however the ID and AD speech that was presented to the infants was contrived rather than naturalistic. These authors used a recording of a woman reading the same script "as if to a young infant" and to an adult. Therefore, rather than being naturalistic, the speech presented to the infants was most typical of both ID and of AD speech, as judged by other adults.

Independently of the results of this proposed experiment, we do know from the literature that young infants prefer their mothers' voices (DeCasper & Fifer, 1980; Mehler et al., 1978) and prefer exaggerated non-maternal ID speech (Cooper & Aslin, 1990). It remains unclear how these preferences interact in affecting infant attention. Previous studies have shown that newborns prefer their mothers' voices when both women (i.e., mother and stranger) were reading childrens' stories (comparable to ID speech; DeCasper & Fifer, 1980) and when they were conversing with another adult (Fifer & Moon, in press). However, 1-month-olds did not respond more to their mothers' voices when both she and the other woman were speaking in a monotone (Mehler et al., 1978). It appears that infant recognition of the maternal voice is not tied to a particular prosodic

style, within the bounds of their normal experience. The relative saliency of mother-specific vs. mother-general (e.g., infant-directed) speech features could be tested by giving 1-month-olds a choice between *maternal* adult-directed and *other* infant-directed speech. A direct investigation of the hierarchy of voice cues could then be made. If a preference for maternal AD speech is shown it can then be concluded that maternal voice cues are stronger elicitors of increased attention than are ID speech cues. The conclusion would then be that the cues signifying motherhood are more salient to the young infant than are the cues signifying ID speech. Since 9-month-old infants do prefer maternal ID speech over maternal AD speech (Glenn & Cunningham, 1983), it is of interest how the changing pattern of preference for maternal ID speech across the first year is mediated.

One possible hypothesis for the changing patterns of preference for maternal ID speech is that they are related to differences in experience with maternal speech across the first year. This hypothesis is based on two areas of recent research: prenatal experience with maternal speech, and the developmental changes in parents' use of ID speech modifications across the first year. The current literature on prenatal auditory experience suggests that fetuses are able to hear the maternal voice in the last months of pregnancy and that specific prenatal auditory experiences can produce postnatal preferences (DeCasper & Spence, 1986; Panneton, 1985; Spence & DeCasper, 1987). DeCasper and Spence (1986) had pregnant women read the same children's story aloud to their fetus every day during the final 6 weeks of their pregnancies. After birth, the newborns were tested for their preference for either the familiar story or an unfamiliar story. Infants were tested with the IBI procedure used by DeCasper and Fifer (1980), whereby the infants must either shorten or lengthen the duration of their IBI's relative to their baseline IBI in order to receive presentation of the preferred story. Infants showed a preference for the story that they had heard prenatally, even though during the test procedure the stories were read by the same unfamiliar woman. That is, the preference for a specific story heard prenatally was

independent of the speaker's voice. It is thought that the infants must have been processing some aspect of the story's rhythmic structure and/or intonation contours. Thus, the fetus can hear, and process, certain aspects of maternal speech input during the last weeks of pregnancy.

Moreover, there is evidence to suggest that the early preference (i.e., 2 days after birth) for the mother's voice arises out of prenatal experience. Spence and DeCasper (1987) gave newborns the opportunity to listen to their mother's voice when only the low-frequency features were maintained vs. a full-spectral version of her voice. The presentation of the low-pass filtered speech was intended to simulate the way the mother's voice would sound to the fetus in utero, due to attenuation of the mother's voice through tissue and fluid. A control group of newborns were also presented with the choice of hearing low-pass filtered or full-spectral speech, but the speech was from a woman unfamiliar to the newborn. Infants in the maternal group showed no preference for either the filtered or unfiltered version. However, infants in the control group preferred the unfiltered version of the non-maternal voice. This finding suggests that newborns do not differentially respond to either version of the maternal voice because they have had experience with both the maternal voice prenatally (filtered) and postnatally (unfiltered). However, infants have had little prenatal experience with the voices of other females although they have had experience with the voices of other women in the first postnatal days. Therefore, the infants in the control group show a preference for the more familiar, or unfiltered version of the non-maternal voice.

How does prenatal experience with maternal speech affect postnatal ID speech preferences? Although there is no empirical data to suggest that mothers do not use ID speech to their infants prenatally, it seems more likely that the majority of the fetus' experience with the maternal voice is with AD speech. That is, it is unlikely that mothers direct their speech to their fetuses using typical ID modifications of pitch, duration, etc. Additionally, during the first month after birth, infants are typically exposed to ID speech whose modifications are significantly less

pronounced in comparison with the ID speech modifications that infants may be exposed to at 4-months of age (Stern et al., 1983). A longitudinal study of infant preference for maternal speech types could be conducted in order to determine how early experience with maternal speech affects the preference for maternal ID and AD speech across the first year. Thus, newborns, with virtually no experience with maternal ID speech, yet with fairly extensive experience with maternal AD speech (prenatally) may well show a preference for maternal AD speech. By 1-month of age, infants have had some experience with both maternal ID (during the first month) and AD speech (prenatally, as well as during the first month), such that no preference is shown for either speech type. With the increased use of pitch contouring in ID speech by parents to their 4-month-old infants (Stern et al., 1983) it is likely that by 4-months of age (having experience with more modulated ID speech) infants may show a preference for maternal ID speech. By 9 months of age and with substantial experience with both maternal ID and AD speech types, a preference for maternal ID speech continues to be shown (Glenn & Cunningham, 1983). However, it has not been empirically shown that 9-month-old infants prefer the maternal voice over that of an unfamiliar female. Without such an examination it cannot be definitively determined whether Glenn and Cunningham have actually shown a preference for maternal ID speech. They may have simply extended the findings of Werker and McLeod (1990) to include a preference for ID speech in 9-month-olds based solely on the prosodic features.

This experiential model, however, is most likely not as direct as that outlined above. There are many other changes occurring within the infant, the mother, and the mother-infant interaction across the first 9 months of life. In the first weeks and months after birth the infant is dependent upon the mother (or other caregiver) for all of the essential aspects of survival. Thus, the mother's voice may become paired with availability of food, warmth, and nurturance to the infant such that mother's voice becomes reinforcing regardless of the speech patterns that she is using at that time. The preference for maternal ID speech may develop as the context of mother-

infant interaction changes across the first months after birth. That is, as discussed in reference to Stern et al.'s (1983) study, as infants become more interactive, the parental style of interaction changes as well. When ID speech is differentially attended to, it may be influencing aspects of the social, affective, and language development of the infant (see Fernald, 1984). For example, in Werker and McLeod's (1989) investigation of 4-5 and 7-9 month-old infants' preference for ID speech they also examined the affective level of infants who were listening to ID and AD speech. They found that infants who were listening to ID speech displayed greater levels of positive affect than infants who were listening to AD speech. This display of more positive affect by infants can then lead to displays of greater positive affect, and increased use of ID speech, by caregivers. In this way the infant-caregiver interaction can be seen to be mediated by both the adult usage of ID speech and the infant's preference for ID speech. Additionally, as previously discussed, Fernald (1989) found that 5-month-old infants respond more positively to adult approval vocalizations as compared to adult prohibitive vocalizations. Investigations such as these can be used as intermediate steps in the process elucidating how the changing patterns of interaction may affect the infant's development. Continuing research on the role of ID speech in general, and specifically, the role of maternal ID speech is necessary in order for a complete understanding of the development of mother-infant interactions to be realized.



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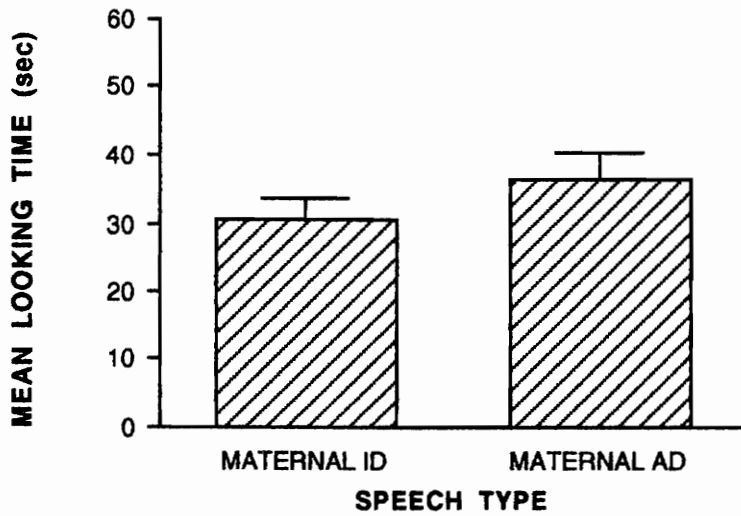
Table 1: PROSODIC FEATURES OF MATERNAL INFANT-DIRECTED (ID) AND MATERNAL ADULT-DIRECTED (AD) SPEECH TO 1-MONTH-OLDS

	MATERNAL ID	MATERNAL AD	
MEAN Fo (Hz)	219.3 (22.8)	184.3 (22.7)	**
MEAN Fo MINIMUM (Hz)	96.0 (18.6)	82.9 (15.2)	*
MEAN Fo MAXIMUM (Hz)	386.2 (45.3)	328.2 (58.0)	**
MEAN Fo RANGE (Hz)	291.6 (39.1)	251.3 (63.7)	*
MEAN SD (Hz)	74.5 (12.4)	49.1 (9.0)	**
MEAN DURATION (Hz)	2.3 (1.0)	3.5 (1.5)	**

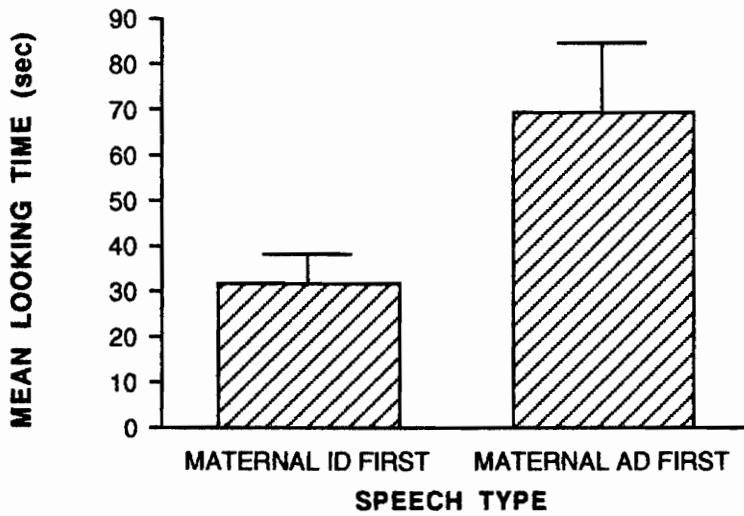
\*  $p < .01$

\*\*  $p < .001$



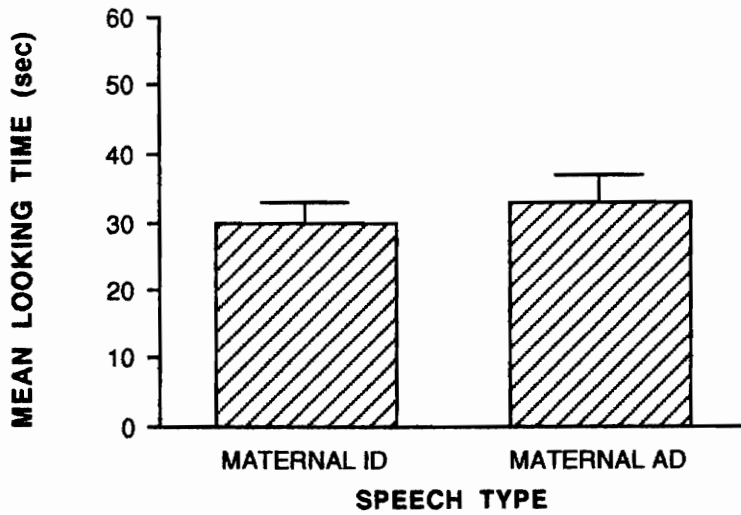


**Figure 1:** Mean looking times (in sec) of 1-month-old infants to maternal infant-directed (ID) speech ( $M = 30.6$ ,  $SE = 2.99$ ) and to maternal adult-directed (AD) speech ( $M = 36.3$ ,  $SE = 4.01$ ).



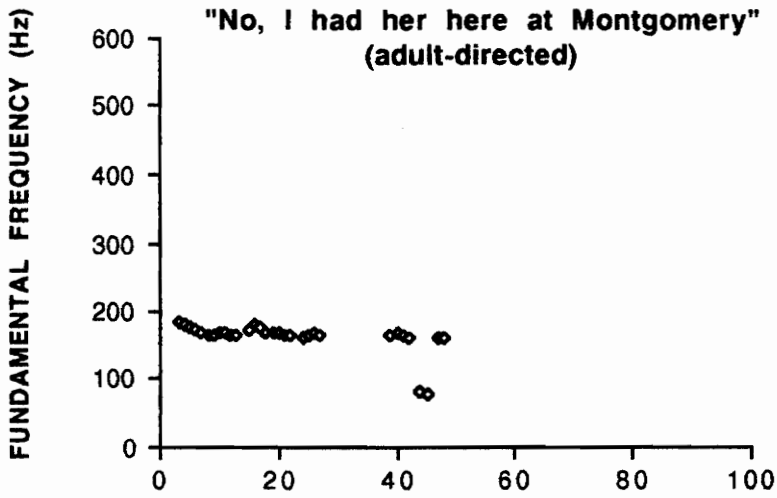
**Figure 2:** Mean looking times (in sec) of 1-month-old infants on initial trials, dependent on whether that first look produced maternal infant-directed (ID) speech ( $M = 31.49$ ,  $SE = 6.63$ ) or maternal adult-directed (AD) speech ( $M = 69.63$ ,  $SE = 14.85$ ).



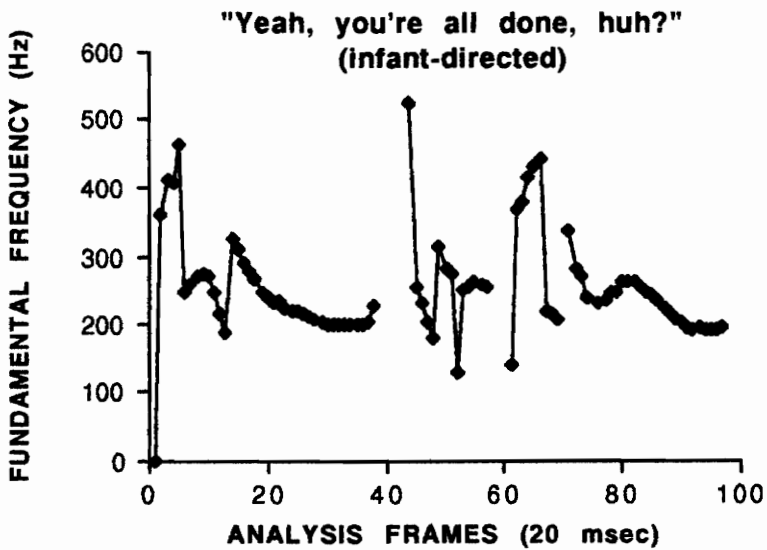


**Figure 3:** Mean looking times (in sec) of 1-month-old infants to maternal infant-directed (ID) speech ( $M = 29.9$ ,  $SE = 3.18$ ) and to maternal adult-directed (AD) speech ( $M = 32.99$ ,  $SE = 3.83$ ) when all first looks were removed from the analyses.

a)



b)



**Figure 4:** Fundamental frequency ( $F_0$ ) values plotted over successive 20-msec frames. These utterances were generated from a mother speaking to an adult (the experimenter) in (a) and to her 1-month-old infant in (b). The ID sample has a higher  $F_0$ -mean,  $F_0$ -variability, and  $F_0$ -range than the AD sample.

## Appendix A

Dear Parent:

Soon after infants are born, they can recognize many different sounds and voices. For instance, we now know that babies only a few days old would rather listen to their own mother's voice than to the voice of another woman. In the Department of Psychology at Virginia Tech, we are currently interested in exploring which aspects of mothers' voices young infants are most likely to pay attention to when they listen to their mothers talk. This information is very important for our understanding of how infants learn language.

We would like to invite you and your baby to participate in our mother-voice studies. Participation involves our meeting with you and your baby for 2 appointments, each lasting for 1 hour or less, at times that are most convenient for you. When your baby is 4 to 6 weeks old we would like to schedule a home visit during which one assistant will tape record a short sample of your voice. Within one week after the first appointment, we will schedule a time for you and your infant to come visit us at Virginia Tech so that we can observe your infant to see what aspects of your voice your baby is most interested in listening to. This session lasts for 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 when you visit Virginia Tech, we offer free babysitting for your convenience. We have a waiting room with toys for your older children that is located directly next to our observation room.

If you would like to schedule an appointment for your infant or find out more about our work, please feel free to call us at one of the following numbers: (703) 231-5938 or 231-3972. We hope to see you and your baby soon!

Sincerely,

Robin Cooper, Ph.D  
Assistant Professor

## Appendix B

ID # \_\_\_\_\_

## Infant Speech Preference Studies

## Consent Form

I understand that my infant son/daughter will participate in a study designed to tell Dr. Cooper and her co-workers which types of speech are most interesting to young infants. This study will be conducted in the Psychology Department at Virginia Tech. I have been informed of the testing procedure which involves placing my infant in an infant seat, presenting a checkerboard to the infant, and recording how long the infant will look at the checkerboard depending on what kind of speech the infant is hearing over a loudspeaker located in front of the baby. I understand that the sound level of the speech played to my infant is no louder than the sounds heard by infants in their typical home environment. I have been given an opportunity to ask further questions about this procedure and I understand I have the right to end this session for any reason if I so choose. Given these procedures, I give my permission to Dr. Cooper and her co-workers to test my son\daughter.

 \_\_\_\_\_  
 Signature of Parent

 \_\_\_\_\_  
 Date

 \_\_\_\_\_  
 Address

 \_\_\_\_\_  
 Infant's Name

 \_\_\_\_\_  
 Signature of Experimenter

 \_\_\_\_\_  
 Infant's Birthdate

## Curriculum Vita

Sheryl H. Berman

## Personal Information

Address	Office	Department of Psychology Virginia Polytechnic Institute & State University Blacksburg, Virginia 24061 (703) 231-3972
	Home	608 Center Street Blacksburg, Virginia 24060 (703) 552-8491
Birthdate		May 4, 1965
Marital Status		Single

## Education

M. S.	Virginia Polytechnic Institute and State University, 1990 Major field of study: Developmental Psychology Title of Thesis: "Taking the "Mother" out of "Motherese": Young infants' preference for mothers' use of infant-directed speech" Major Advisor: Dr. Robin Panneton Cooper
B. A.	State University of New York at Binghamton, 1986 Major field of Study: Psychology and Biology

## Professional Experience

## Research Experience

## At Virginia Polytechnic Institute and State University

9/89- 12/90	Auditory Perceptual Abilities and Preferences in Young Infants
1/89 - 5/89	The behavioral effects of non-nutritive sucking on infants of differential fetal growth
9/88 - 12/88	Auditory Stimulation in the Neonatal Intensive Care Unit

## At State University of New York at Binghamton

1/85 - 5/85	Gender Role Awareness in Preschool Age Children
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## Teaching Experience

## At Virginia Polytechnic Institute and State University

1/90 - present	Graduate Teaching Assistant, Personality Research,
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9/88 - 5/89 &  
1/90 - 5/90

Graduate Teaching Assistant, Introduction to Psychology

9/89 - 12/89 &  
9/90 - 12/90

Graduate Teaching Assistant, Advanced Developmental Psychology  
Laboratory

**Professional Presentation**

October, 1990

Taking the "mother" out of "motherese": Young infants' preference for mother's use of infant-directed speech. Paper presented at the Virginia Developmental Forum, Fairfax, Virginia.