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ABSTRACT

A total of 60 infants of 7 weeks of age were tested in a habituation-dishabituation looking procedure to determine if they could discriminate between infant-directed talk (IDT) and adult-directed talk (ADT) uttered by the same speaker. One group of 12 infants was habituated to a female speaker's ADT and dishabituated to the same speaker's IDT, while another group was treated in the reverse order. Two other groups were presented with auditory stimuli, but with a male speaker's voice. One control group was tested with the female IDT in habituation and dishabituation phases. Observers measured the amount of time infants looked at a visual stimulus, a black and white checkerboard pattern, which was presented simultaneously with the auditory stimuli. Results showed that babies of 7 weeks were able to discriminate between speech directed towards adults and that directed towards infants, whether it was delivered by a male or a female. Findings also indicated that 7-week-old infants preferred IDT over ADT, regardless of speaker's sex. Preferences, however, were not as robust as those found among 4-month-old infants. It is concluded that research can now move toward investigation of the effect of differential experiences with IDT on infant preference. Implications are discussed. (RH)

INFANTS DISCRIMINATE BETWEEN ADULT DIRECTED AND INFANT DIRECTED TALK IN BOTH MALES AND FEMALES

by

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ABSTRACT

Four groups of 7 week old infants were tested in an infant controlled habituation-dishabituation looking procedure to determine if they could discriminate between Infant Directed Talk (IDT) and Adult Directed Talk (ADT) when delivered by the same speaker. One group of 12 infants was habituated to a female speaker's (ADT) and dishabituated to the same female's (IDT) while another group received the reverse order of the female speaker's voice. Two other groups were presented with a male speaker's voice. One control group was tested with the female infant directed talk in both the habituation and the dishabituation phase of the experiment. Two trained observers measured the amount of time the infants looked at the visual stimulus (checkerboard), which was presented simultaneously with the auditory stimuli. Results show that when presented with both the female and the male speaker's voices, infants of 7 weeks were able to discriminate between the two speech styles, as measured by the recovery of looking time during dishabituation. However, preference for the female IDT was demonstrated by differential rates of recovery, and preference for the male IDT was evident in longer means of the first three looks. The implications of these results will be discussed.

INFANTS DISCRIMINATE BETWEEN ADULT DIRECTED AND INFANT DIRECTED TALK IN BOTH MALES AND FEMALES

Judith E. Pegg, Janet F. Werker, and Peter J. McLeod.

When talking to an infant, most people speak in a higher pitch or fundamental frequency, use broad intonation contours, and pause longer between utterances than they do when speaking to an adult.

Insert Figure 1 here.

To illustrate the differences between infant directed (IDT) and adult directed talk (ADT), I present here a figure of the pitch extractions or fundamental frequency (plotted against time) taken from a recording of a female speaker. She is speaking to an infant in the top figure and to an adult in the bottom graph. Notice the long pauses, segments of fairly high pitch, average fundamental frequency of about 200, and sweeping pitch contours of the infant directed speech.

The ADT on the other hand, has much shorter pauses between utterances, lower fundamental frequency of about 150 hertz, and far less variation in the pitch contours. See how flat it is compared to the infant directed talk?

Parents, non-parents, children, and people with little or no experience with infants, all use this kind of speech. For this

reason we advocate the use of the term Infant Directed Talk (IDT) although it has been referred to as baby talk by Ferguson (1964), motherese by Fernald (1984) and parentese by Werker (1987).

Because recent evidence from several labs, including those of Fernald, Kuhl, and the Papousek's, has shown these modifications to be universal, researchers have begun to ask if this style of speech plays an important role in either language or emotional development. For example, the prosody of infant directed talk may act as a scaffold to language acquisition by drawing the attention of infants. In Vygotskian terms, infant directed talk may provide a context in which language can be learned. Infant directed talk has been shown to accentuate the suprasegmental aspects of language such as turn taking, as described by Stern, et al, (1983; see also McKain and Stern, 1982). In addition, IDT emphasizes the segmental aspects of speech, as described by Hirsch-Pasek and Jusczyk. As well, several researchers have studied the affective component of infant directed talk and argue that it peaks at about 4 months.

In order to determine if IDT does play a role in language or emotional development, it is necessary to investigate the responses of infants of various ages to this style of speech. How do they react? Are they able to discriminate between IDT and ADT and do they show a preference for IDT?

In her work, Anne Fernald has shown that babies of 4 months chose to listen to female IDT (baby talk) over female ADT (adult directed talk), when tested in a 2 choice head-turn procedure.

Thus, infants of 4 months appear to prefer to listen to IDT.

In a recent study in Janet Werker's lab, we tested babies in a more naturalistic procedure. An actress and an actor were recorded speaking an identical script to either an adult or to an infant. These video recordings were presented to three age groups of infants.

Results indicate that infants of both 4 to 5.5 and 7.5 to 9 months of age were LESS attentive to the adult directed talk than they were when presented with the infant directed talk. This was true for both male and female speakers. Infants also smiled more and were more interactive when the female IDT was on the screen.

However, the infants between 6 and 8 weeks tested in this procedure, did not show any attentional or affective preferences for the infant directed over the adult directed talk. We wanted to understand why the 6-8 week old infants did not show a preference.

One hypotheses that we entertained was that the task we asked them to perform in the study as too difficult or the measure was not sensitive enough. An alternative hypothesis is that infants of this age do not <u>yet</u> prefer IDT, and they learn to prefer it as a function of interacting with their parents. Even more critical, it is possible that at this age, they cannot even discriminate between IDT and ADT when delivered by the same speaker.

Some recent evidence presented by Cooper and Aslin (in

press) suggests that infants of 1 month display preference for female IDT over ADT when tested in an alternating stimulus presentation. In their task, a female spoke a series of short phrases in both infant directed and adult directed speech styles. After dropping the first look, analyses showed that the 1 month old infants looked more at the visual display when the audio portion was infant directed talk. From these results discrimination and preference were inferred in one month olds.

This would suggest that either our previous measure was not sensitive enough for testing young infants or that infants slightly older than one month loose the ability to discriminate IDT from ADT. Or perhaps their preference disappears. As demonstrated by Muir, Clifton, and Clarkson (in press), neonates have the ability to turn towards sound but it drops out after about one month and does not return until around 4 months. Perhaps such a "U" shaped function is present in infants with relation to discrimination and/or preference for infant directed talk.

In addition, the question of how infants respond to male speakers remains unanswered. Do infants under 4 months show discrimination and/or preference for different speech styles from the same speaker whether the speaker is male or female?

In order to answer these questions, we used a different procedure that is well suited for young infants. This procedure is called the Infant-controlled habituation-dishabituation looking procedure.

Insert Figure 2 here.

Our 60 subjects were all healthy 7 week old infants, born within 2 weeks of due date. In the experimental conditions, 24 of these infants listened to a female voice and 24 listened to a male voice. Half of each group were habituated to Adult directed talk and dishabituated to infant directed talk and the other half were tested in the reverse order. An additional control group of 12 babies was tested in the female speaker condition and infants in this group received ADT for both the habitation and the dishabituation phases. The sixth group, which you can see at the bottom of the slide, has not yet been run but will be a control group for the male speaker groups. Thus, we had 5 groups with 12 infants in each group.

Stimuli

The visual stimulus was a black and white checkerboard with 1 3/4 inch squares, presented on a T.V. monitor at a distance of about 3 feet from the infants. The visual stimulus was the same for both the habituation and the dishabituation phases.

The auditory stimuli were repetitions of a 15 second segment taken from recorded speech samples. The four stimuli were female IDT and ADT or male IDT and ADT.

Insert Figure 3 here.

Procedure

In this schematic drawing of the lab, on the left is an overhead view with the observation screen in the middle and to the right is a side view. In the lab, which was draped with black curtains, the infants were held by their seated parent and looked at a TV monitor over the parent's shoulder. Two observers on the other side of the screen monitored the infants looking behaviour through peep holes. The parent and the two observers wore headphones with music that masked the sound to prevent possible bias. The observers pressed buttons to signal the computer when the babies were looking toward the target.

In the infant-controlled habituation/dishabituation procedure, the stimuli are presented only when the baby is looking at the TV monitor. When the baby looks away from the monitor, the observers lift their fingers off the buttons and the computer stops both the audio and the video presentation. Thus, the baby's looking behaviour controls the length of each trial.

Habituation involves the repeated presentation of a stimulus, until the subject's responsiveness to the stimuli decreases.

In this study, our criterion for habituation was based on a minimal 50% decrement of the average of the two highest of the first three looks. An infant must have had two consecutive looks both of which must be below this criterion before habituation was

deemed to have been reached.

Once this criterion had been reached, dishabituation trials commenced. The auditory stimuli changed to the other talking style, when the infant next looked at the screen and looking time continued to be assessed.

Results

It was expected that if infants of 7 weeks are able to discriminate between IDT and ADT, discrimination would be evident by a recovery in looking time during the dishabituation phase of the experiment. In addition, evidence for preference for IDT would be provided if infants looked longer during the two highest of the first three habituation trials, or if there was a differential recovery in looking time during the dishabituation phase.

Female speaker group

Insert Figure 4 here.

A 2x2 mixed Anova (group x trial type) was run to determine if infants could discriminate the female speaker's IDT from her ADT. This analysis revealed a significant main effect for trial type. ($P=.03$) $F_{1,22} = 5.63$

That is, the infants' mean looking times were significantly different between the mean of the last 2 habituation trials and

the mean of the 2 dishabituation trials. A Dunn's planned multiple comparison revealed that when infants were presented with ADT first, their recovery during dishabituation was significant. Yet, when presented with the IDT first, their recovery to the ADT was not significant. ($P < .05$)

This differential recovery can be explained in two ways. The first explanation is that their preference for IDT is strong enough to cause an increase in looking time even after becoming bored with another similar stimulus, but that ADT does not have the same attention getting qualities. This is the explanation that we prefer - in fact, an a priori hypothesis was that such differential recovery would be evidence of preference.

A second explanation for the differential recovery rates is spontaneous recovery in looking time. This is a problem in all habituation/dishabituation procedures because habituation, by definition, is reached at below average looking times. Therefore, an increase in looking time is the next most likely event. If recovery occurred, one could be inferring dishabituation when in fact it was only spontaneous recovery.

For this reason we ran a control group in a female speaker condition. As has been explained, this control group received female adult directed talk in both the habituation and the dishabituation phases.

Insert figure 5 here.

Control group results

The significant 2x2 anova, comparing the control group to the group of infants who received ADT during the habituation phase and IDT during the dishabituation phase (P= .007), was followed up with a Dunn comparison. Although, there appears to be spontaneous recovery in the control condition, the control group means are not significantly different from each other. However, as was just mentioned, the recovery in the experimental condition is significant.

This provides support for the hypothesis that infants of 7 weeks can discriminate IDT from ADT as they did significantly dishabituate in one condition (the ADT to IDT). However, since they did not significantly dishabituate in the other experimental condition or in the control condition, this suggests that they prefer infant directed over adult directed talk.

Male speaker groups

Insert figure 6 here.

But what about the male speaker groups? Did infants show a preference for the male speaker's IDT also? A significant main effect in the 2x2 anova was followed up with a Dunn's comparison. This analysis revealed that in both groups of infants there was a significant increase in looking time during the dishabituation phase. (P = .0000; F=26.11) Infants were, therefore, able to

discriminate between the male's two speaking styles. However, the results do not indicate a differential recovery rate.

Another hypothesized preference measure was that the criterion setting trials would be longer for those infants being presented with IDT than for those presented with ADT during habituation. That is, looking times during the two highest of the first three trials would be longer for IDT than for ADT.

Insert figure 7 here.

This figure shows the means of the criterion setting trials for infants in all five groups. When comparing these trials in the male speaker conditions, we found that infants showed significantly more looking time during the male infant directed talk over the male adult directed talk (P=.01). Thus, by this measure, infants did demonstrate a preference for the male IDT.

CAP= 24.11**	CPA= 50.37**	FAP= 52.31	FPA= 78.75
S= 7.64	S= 31.26	S= 33.40	S= 57.63

Although the means from the female speaker appear to be different from each other, the differences are not statistically significant

Discussion

In conclusion, the questions we asked were: first, can infants of 7 weeks discriminate between IDT and ADT when delivered by the same speaker? And second, if so, do they show a preference for the IDT?

The data I have presented suggest that babies of 7 weeks are able to discriminate between the speech directed towards adults and that directed towards infants whether it is delivered by a male or a female. As well, there is some indication that infants of 7 weeks have a preference for IDT over ADT whether it is delivered by a male or a female.

These data are consistent with Cooper's reports of one 1 month old infants' preference for female IDT. Note however, that her procedure differed from ours in that she used a alternating stimulus presentation paradigm and we used an infant controlled habituation/dishabituation paradigm. In addition, her stimuli were a series of short phrases spoken by a female only. Our stimuli were 15 second segments of natural speech and also included a male speaker.

These data clarify the results from the previous study in our lab (Werker, 1987; Werker and McLeod, in press.) in which the infants of 4 to 5.5 and 7.5 to 9 months of age responded differentially to IDT and ADT but the younger infants did not. The present study indicates that infants of 7 weeks are able to discriminate between the two speech styles but we need to use more sensitive and/or appropriate procedures to view their abilities.

Whereas the evidence for discrimination is quite strong, the evidence for preference is weaker. In this study, evidence for a preference for female IDT was inferred by differential recovery rates during dishabituation, and preference for the male

speaker's IDT was inferred from longer mean looks during the two longest of the first three habituation trials. While these measures were significant, only one measure was significant in each condition. Furthermore, I would suggest that the preference for the female IDT, evident in Cooper's study with 1 month old infants, was, like our evidence, not as convincing as that found with older infants.

Taken together these results imply that infants of 7 weeks do show some rudimentary preferences for IDT, but their preferences are not as robust as those of four month old infants. By four months, the preferences are demonstrated by longer looks and also with increased affective responsiveness.

Infant's preferences may develop as a function of interacting with their caretakers. The near universality of IDT has led to the suggestion that infants have a perceptual predisposition to attend to IDT. However, infant preferences may be enhanced or facilitated by exposure to this speech style. We find the question of enhancement of preferences provocative and suggest that research can now move towards a investigation of the effect of differential experiences with IDT on infant preferences.

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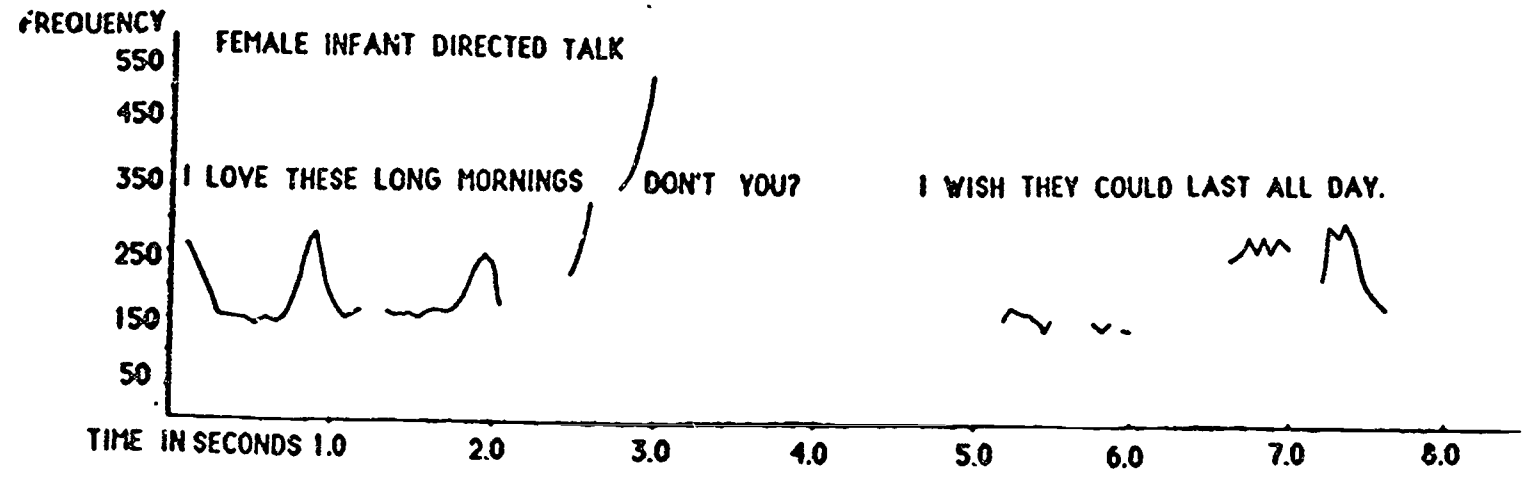

FREQUENCY
FEMALE INFANT DIRECTED TALK
550
450
350
250
150
50
I LOVE THESE LONG MORNINGS
DON'T YOU?
I WISH THEY COULD LAST ALL DAY.
TIME IN SECONDS 1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0

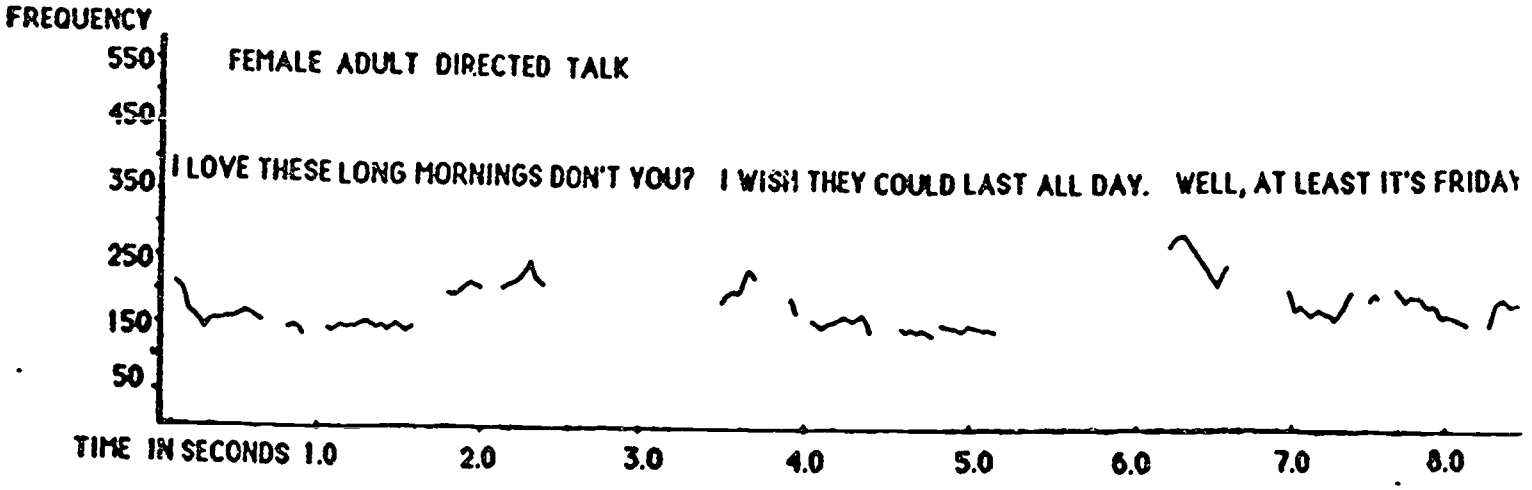

FREQUENCY
FEMALE ADULT DIRECTED TALK
550
450
350
250
150
50
I LOVE THESE LONG MORNINGS DON'T YOU?
I WISH THEY COULD LAST ALL DAY.
WELL, AT LEAST IT'S FRIDAY
TIME IN SECONDS 1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0

FIGURE 1

EXPERIMENTAL DESIGN

		HABITUATION	DISHABITUATION	NO.
EXPERIMENTAL CONDITIONS	FEMALE	IDT	ADT	12
	MALE			12
	FEMALE	ADT	IDT	12
	MALE			12
CONTROLS	FEMALE	ADT	ADT	12
	MALE	IDT	IDT	12

N=72

FIGURE 2

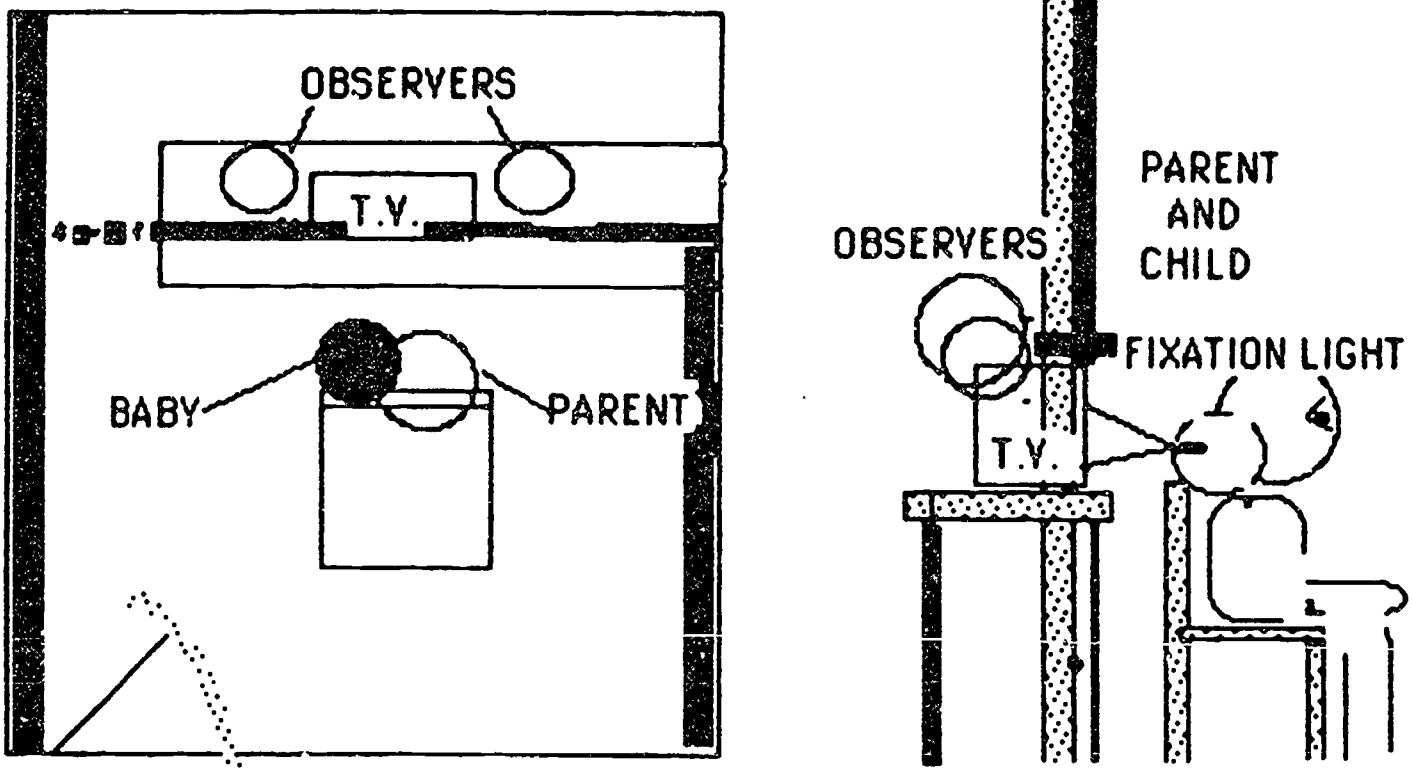

OBSERVERS
T.V.
BABY
PARENT
OBSERVERS
PARENT
AND
CHILD
FIXATION LIGHT
T.V.

FIGURE 3

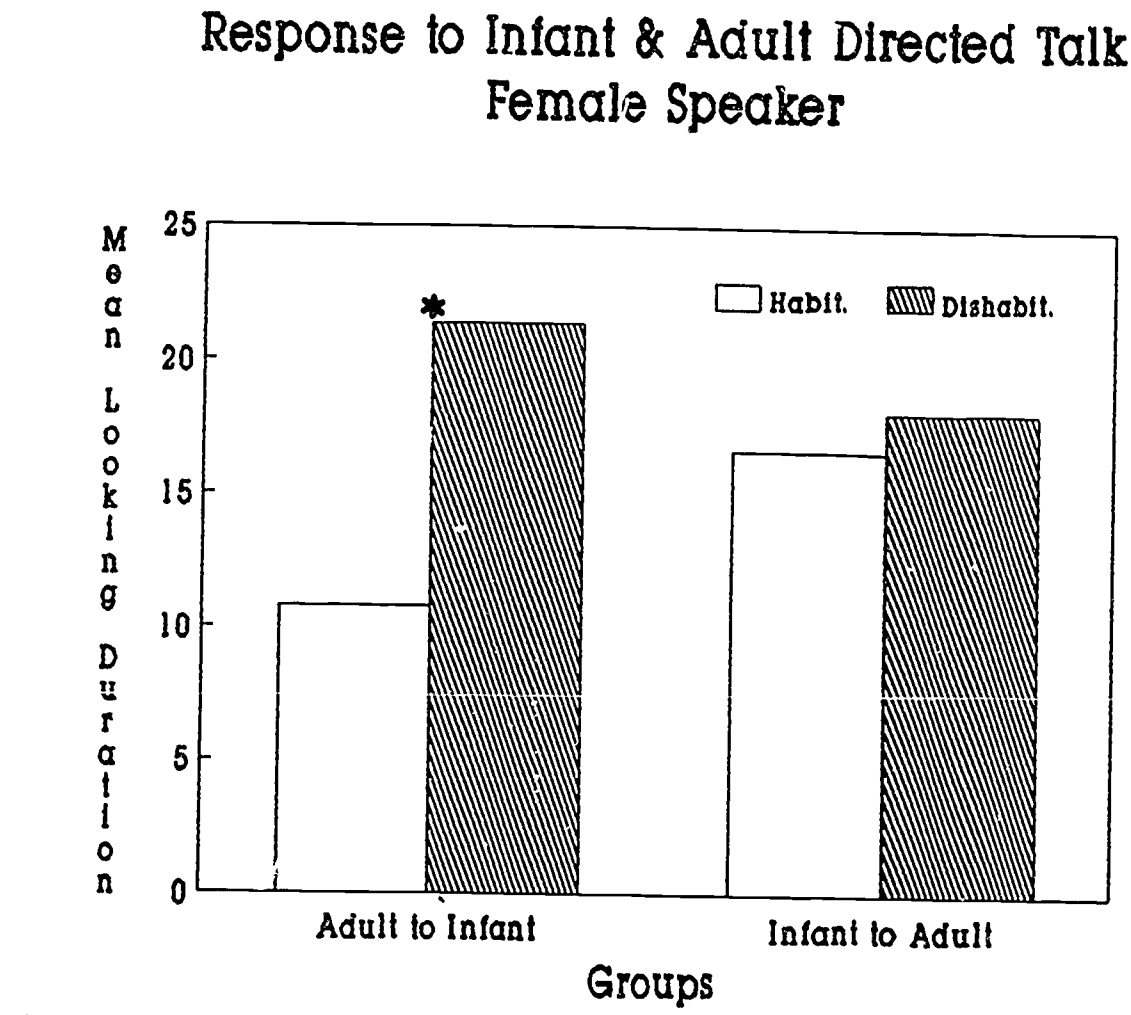
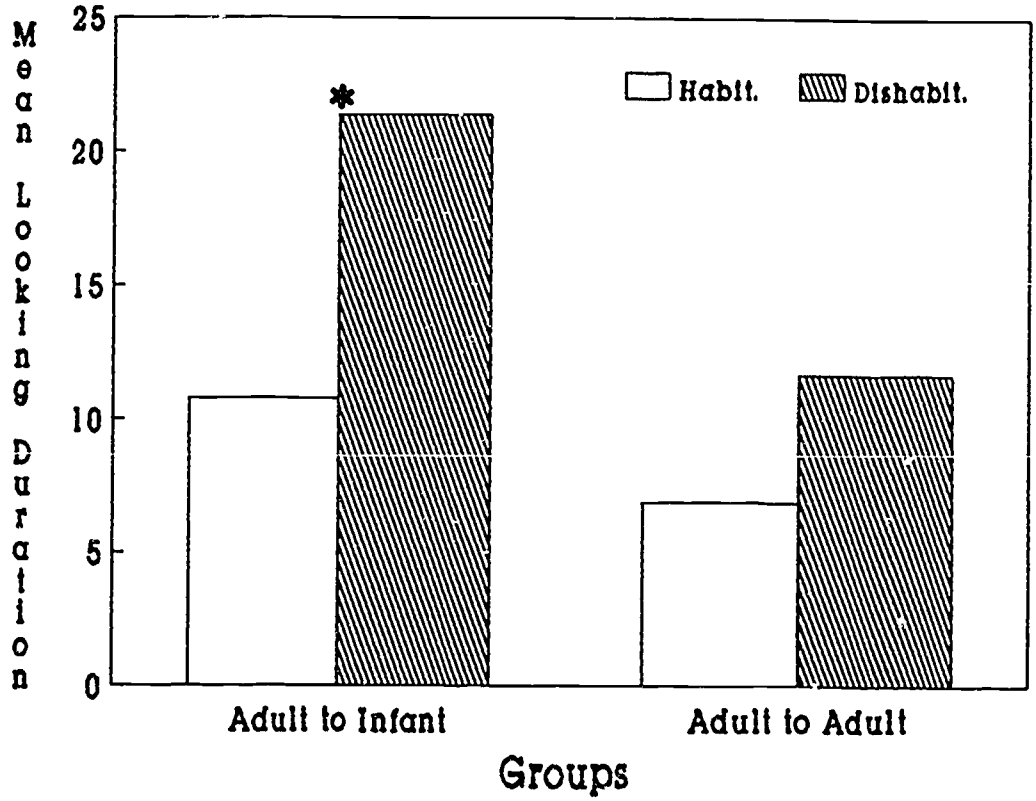

Response to Infant & Adult Directed Talk
Female Speaker
Mean Looking Duration
25
20
15
10
5
0
*
Habit.
Dishabit.
Adult to Infant
Infant to Adult
Groups
*p < 0.05

FIGURE 4

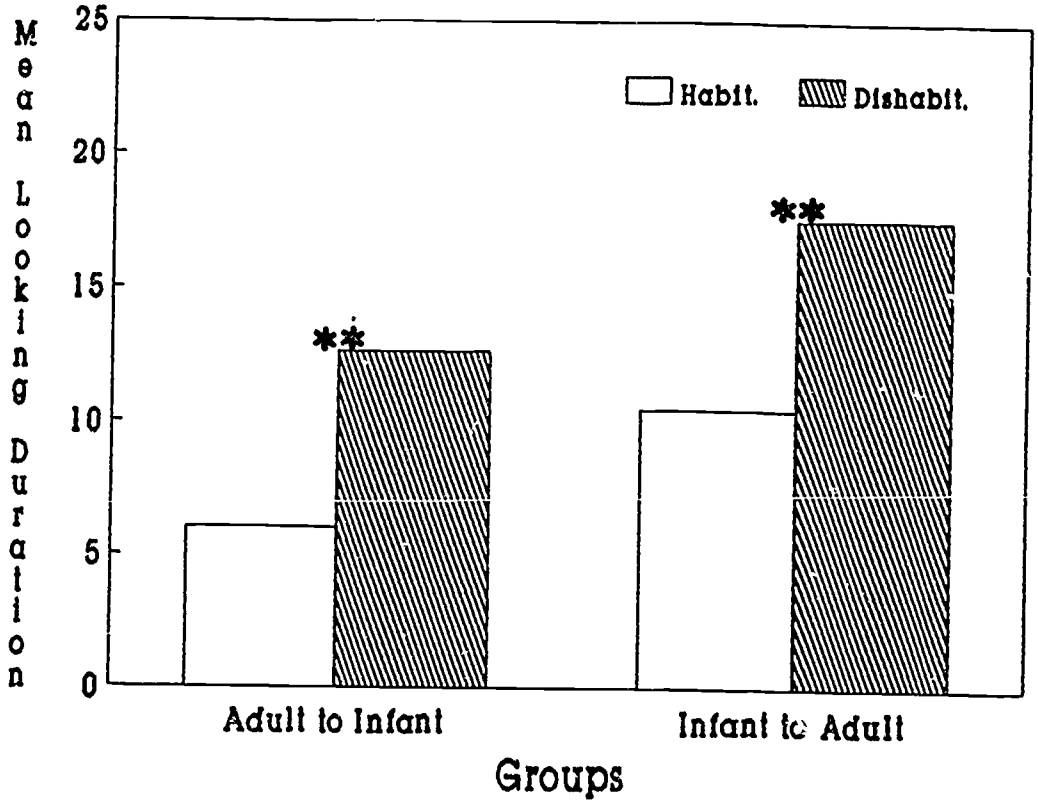
Response to Infant & Adult Directed Talk
Female Speaker: Control Group



*$p < 0.05$

FIGURE 5

Response to Infant & Adult Directed Talk
Male Speaker



**$p < 0.01$

FIGURE 6

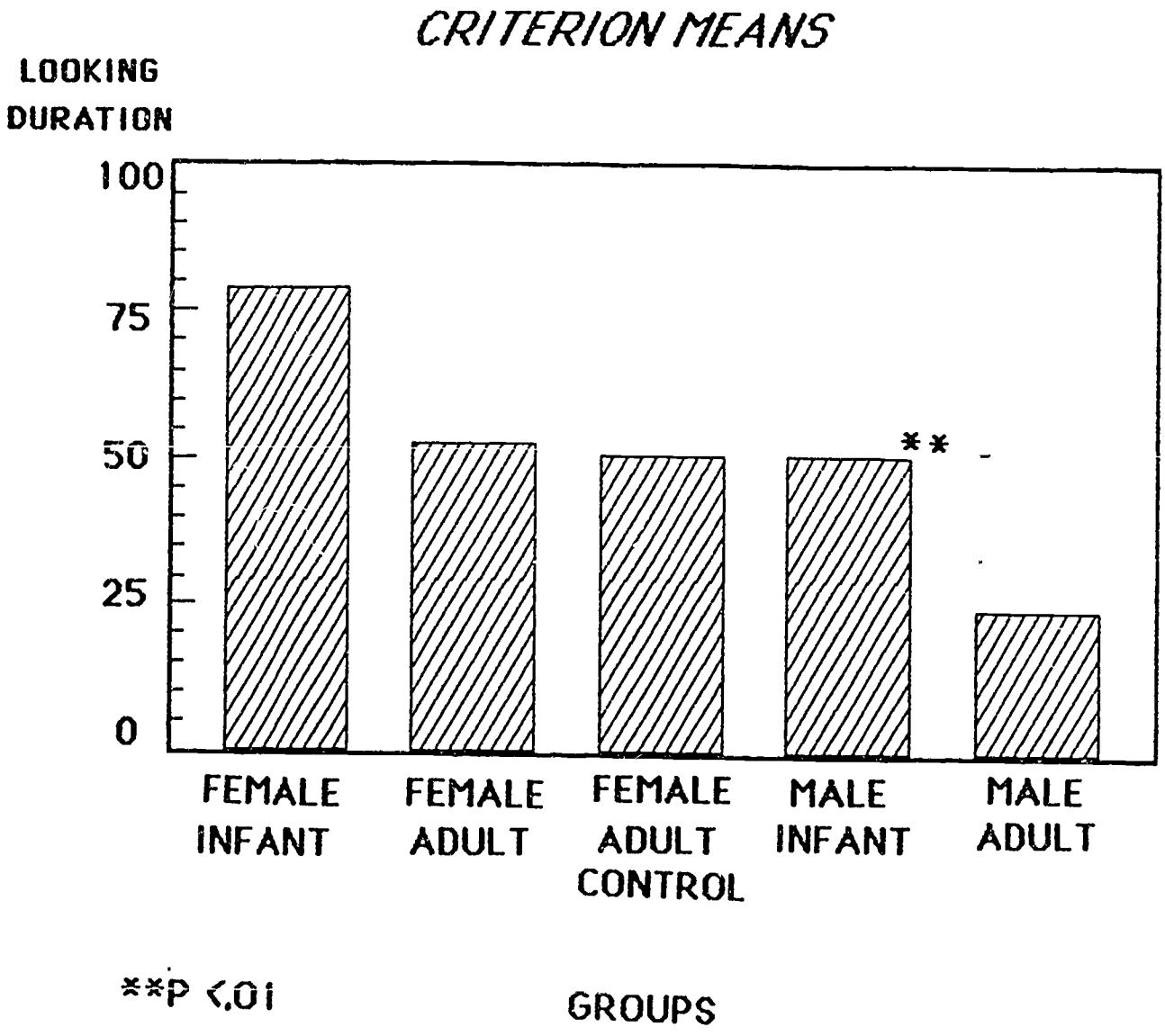

CRITERION MEANS
LOOKING DURATION
100
75
50
25
0
**
FEMALE INFANT
FEMALE ADULT
FEMALE ADULT CONTROL
MALE INFANT
MALE ADULT
**P <.01
GROUPS

FIGURE 7