THE ACTIVITY RESPONSE OF THE INFANT TO FAMILIARITY AND SEX OF VOICE

by

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Chapter I

INTRODUCTION AND LITERATURE REVIEW

Receptive language development, the precursor of language, is of critical importance to the development of the human being's intellectual abilities. Recognition of the importance of receptive language development has seemingly been neglected by linguists, child developmentalists, and others. Major reports of language development (Brown, 1965, Chaps. 6-7; Brown and Berko, 1960; Carroll, 1960; Ervin-Tripp, 1966; McNeill, 1966, 1970) describe the production of speech that begins at one and one-half to two years of age. However, McNeill (1966) reports that the organization of the basic processes of grammatical speech is completed by the time the child is three years old. Yet, even McNeill (1966, 1970) disregards one-half of the developmental time period in his major papers, a period which he acknowledges as remarkable for the rapidity within which language develops.

There is a definite paucity of research concerning receptive language development. Possible explanations for this lack of research are: lack of recognition of the importance of receptive language development; lack of strong theoretical frameworks; difficulty of operationally defining receptive language development; difficulty of accurately interpreting the behavioral responses; and other methodological problems.

Most researchers studying receptive language development (Eisenberg, 1967; Eisenberg, Griffin, Coursin, and Hunter, 1964; Kagan and Lewis, 1965; Moffitt, 1968, 1969) have employed arbitrary or synthetic sound stimuli. Friedlander and Turnure have recently conducted research in which the main

experimental variables consist of natural language and contrived modifications of natural language. The main concern of these studies is the determination of the infant's recognitive sensitivity to various configurations of normal voices.

Friedlander (1965, 1968, 1969, 1970) has developed a unique method of assessing the infant's interest in and recognition of natural language. He tests each infant in his own home with a toy, called a PLAYTEST. The apparatus consists of a pair of large response switches which can be operated by the child any time he desires, a loudspeaker, an electrical control and response recording unit, and a stereophonic tape player with a preprogrammed selection of two-channel audio tapes. The PLAYTEST operates any time the baby is awake in his playpen or crib and wishes to listen to the tapes. The child can select a tape from the two levels of the variable being studied and can determine the length of time the tape is played. His selection and the length of his listening are automatically recorded. The recording of the baby's responses on the two switches over an extended period of time gives an indication of his listening discriminations and listening preferences.

In a study of speaker identity, voice intonation, vocabulary, and message redundancy, three infants 11-13 months of age had no uniform preference for their own mother's natural speaking voice. A stranger speaking in a voice with bright intonation was selected by one 12-month old infant over the voice of his own mother speaking in a flat monotone. Intonation was apparently more important to the infant than speaker identity. A 14-month old baby showed great uncertainty when presented this choice. He selected an enormous burst of listening time for the monotonous

voice of his mother after a few days, and thereafter virtually ignored the switch of the strange voice with the bright intonation. Friedlander (1970) interpreted this as the "aha experience" or a discovery of recognitive familiarity at having recognized the invariant properties of the mother's voice despite the disguise.

Another baby was offered progressive comparisions between non-familiar, familiar, and disguised familiar voices. This baby initially exhibited a clear preference for his mother's voice with normally bright intonation and familiar vocabulary when it was paired with a stranger's voice with flat intonation and an unfamiliar vocabulary. He next made a significant selection of his mother's voice with flat intonation and unfamiliar vocabulary when it was paired with a stranger's voice speaking with bright intonation and familiar vocabulary. This study was further expanded when the baby was offered a choice between two different modes of the mother's voice: one with bright intonation and familiar vocabulary, the other with flat intonation and unfamiliar vocabulary. The baby first made a decisive selection for the natural, familiar mode of his mother's voice, then shifted to a preference for the incongruous version. Friedlander (1970) has suggested that the baby first sought to assimilate an aspect of information that he already knew, but then preferred to listen to a variant form of the known values in which some of the stimulus characteristics remained unresolved- or were resolved in a different way. This crossover from the familiar to the unfamiliar, appears to have significant implications for the role of receptive language processing in the organization of babies' schemata of auditory and linguistic experience. A substantial number of studies (Fantz, 1964; Kagan and Lewis, 1965; Lewis, 1969; Saayman,

Ames, and Moffitt, 1964; Schaffer, Greenwood, and Parry, 1972) utilizing the visual sensory modality have established that visual behavior is also sensitive to variations in familiarity from a fairly early age. Response decrement during familiarization, which is regarded as indicative of such sensitivity was clearly apparent by the age of six months.

Turnure (1971), in a carefully designed group study in the laboratory, reported systematic observations of babies' body movements as an indicator of attention in standard time periods. During these standard time periods, tape recordings of the mother's voice in three different modes (natural, slightly distorted, and grossly distorted) were presented. Changing the playback speed of the tape recorder created the voice distortions. There were 33 subjects in the study, 11 each at the median ages of three months, six months, and nine months. An analysis of variance was performed on the body movement data. Secondary experiments compared the infant's responses to presentations of the mother's voice, stranger's voice, and mother's voice passed through a frequency filter that clipped out various segments of the frequency range.

The results in the main experiment showed significant differences in the measure of presumed listening attention (as evidenced by less body movement) to all versions of the mother's voice and the stranger's voice as a function of age. There was a strong, though not significant, trend for the nine-month old babies to be less active, and presumably more attentive, during the natural presentation of the mother's voice, and progressively less attentive to the distortions.

Receptive language processing remains a major concern to the researcher of child development, for language development in infancy

is concerned with the primary stages of whay may be the most intricate growth process in the world of nature (Friedlander, 1970).

The present thesis research investigated the manner in which the infant develops the ability to discriminate between familiar and unfamiliar voices and his preference for familiar vs. unfamiliar voices. In a controlled laboratory group situation, four stimuli were presented to each infant: the mother's voice, the father's voice, a female stranger's voice, and a male stranger's voice. Nash (1965) suggested there is a critical period in relation to the father's entry into the psychological development of the child. Therefore, the father's voice is included in the research because no data are available to assess the recognitive sensitivity of the infant to the father's voice. Likewise, no data were available to assess the response of the infant to the voice of the male stranger.

Thus, this research was designed to investigate the variables of age, sex, male vs. female voice, and strange vs. familiar voice upon the infant's body movements.

Chapter II

METHOD

Experimental design

Five male and five female infants at four age levels (3 months, 6 months, 9 months, and 12 months) were presented with the following four tape-recorded auditory stimuli: mother's voice, father's voice, female stranger's voice, and male stranger's voice. The female and male strangers voices were the same for all children. A 4 (Age) X 2 (Sex) X 4 (Stimulus condition) factorial design was used. The order of stimulus presentation was counterbalanced within each age group. A two-minute baseline period preceded the first stimulus presentation. Each stimulus consisted of normal conversational monolog, as described in a following section. Thirty-second control periods occurred between each stimulus period. Each stimulus presentation period lasted one minute. Figure 1 shows the detailed design of the experiment.

Subjects

The subjects were middle-class, family-reared Caucasian infants from Blacksburg, Virginia. Subjects were selected from the birth announcements in the local newspapers and from referrals of participating parents. Telephone calls were made to parents of infants who met the following criteria: middle class and age within two weeks of the specified age group.

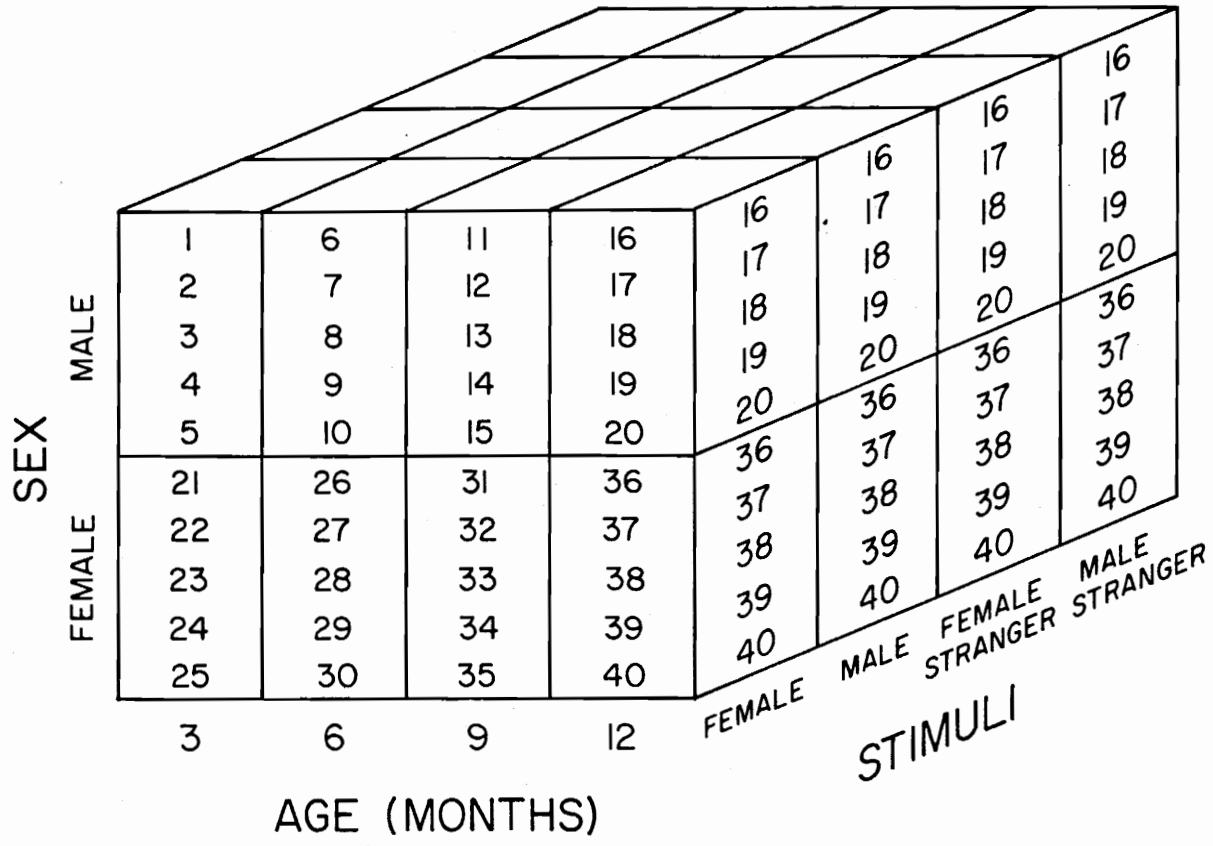

Figure 1. Design of the Experiment

The parents were told that the study was an attempt to determine how children learn to talk. Both parents of each child agreed to bring the baby to the laboratory for the first visit. One of the parents of each child agreed to bring the baby to the laboratory for a second session. The parents were not reimbursed for their participation, although on several occasions a baby sitter was provided at the laboratory for older siblings of the subjects. The testing was conducted in two sessions to help acquaint the baby with the strange environment. Also, a master tape-recording for the experimental session had to be prepared between the two sessions.

The mean ages of the groups are shown in Table 1. Of the 40 subjects, 14 were first-born; 17 had one older sibling, seven had two older siblings, and two had three older siblings. All 40 infants were living with only two adults -- their parents -- at the time of the testing. Twenty-four of the fathers held doctorate degrees, four had master degrees, seven had a bachelor's degree, three had some college, and two were high school graduates.

Subjects were observed if they were awake and remained in the testing chair. Nine subjects were omitted from the study due to equipment failures. One subject did not remain in the testing chair and was replaced by another subject in the experiment.

Table 1

Mean Ages of Groups

Group	Mean Age (Months)	Mean Age (Days)	Range
3 months (N = 10)	3.09	95.9	74-118
6 months (N = 10)	6.04	187.4	169-228
9 months (N = 10)	9.14	283.2	255-309
12 months (N = 10)	11.68	362.1	347-382

Apparatus

The stimuli were recorded on a Wollensak monophonic magnetic tape recorder, Model 150SS, and the master tape-recording was recorded on a Wollensak stereophonic magnetic tape recorder, Model T 1.515-4. The recordings were made at a speed of 3.75 inches per second. The stimulus conditions were presented to the infant at 3.75 ips via the stereophonic tape recorder. A Magnavox speaker system, with a frequency response from 20 Hz to 18 kHz (-3dB) was located above and in front of the crib. The tape recorders were assessed for accoustical qualities and components using an Impulse Precision Sound Level Meter, Bruel and Kjar Type 2204, and inputs were provided through a Bruel and Kjar model 4145 microphone.

During the experimental sessions, all of the stimuli were played at 60± 5 dBA (sound pressure level measured at the position of the baby's head by the sound level meter noted above).

The experiment was conducted in a sound-proof room (ambient noise level= 35 dBA) located in an engineering laboratory. A padded portable crib containing a reclining infant seat was placed in the sound-proofed room. A table, holding a tape recorder and a sound level meter, was present in the room, although not in the direct visual range of the infant. The room was equipped with a muffled ventilating fan and an exposed 60-watt incandescent light. The infant seat faced a window which was about 30^{o} above the eye-level of the subject. The outer room was darkened, thus preventing the infant from seeing outside the room.

Photographs of the entire experimental session were taken at the rate of one frame per second. A Bolex 8mm. variable speed motion picture camera was located next to the window of the sound-proofed room.

Kodak Tri-X negative film was used. The camera was equipped with a 5-40 mm. zoom lens set at a constant focal length such that the infant (including extremeties) subtended most of the field of view. The angle of the camera to the infant seat remained constant throughout the experiment (approximately 35°). A filming speed of one frame per second was obtained through a timing circuit controlling a solenoid connected to the camera's cable release.

The tape recorder which presented the stimuli to the infant was located next to the camera and the sound was transmitted through a shielded coaxial cable to the speaker located in the sound-proofed room.

The mother or father was allowed to watch the infant from outside the sound-proofed room. The parent was not visible to the infant.

Procedure

On the first visit to the laboratory, the experimenter (E) met each mother and father at the main entrance to the building, and escorted them to the basement laboratory. The experimenter and the parents generally chatted about the baby during this time. Upon arrival at the laboratory, E explained the procedure and then answered any questions the parents asked. The experimenter and one parent, holding the baby, entered the sound-proofed room. The parent, with the baby on his lap, was seated next to the monophonic tape recorder. The parent held the microphone after being instructed not to touch the head of it or to let the infant touch it.

The experimenter then gave the following instructions to the parent: "I want you to talk to your baby the way you usually do when you take

him into a strange room and want him to notice the things in the room. Do not call him by name or mention the names of other family members which he may know. The recording is only for one minute. Just talk to him in your normal manner. If your baby cries, or you accidentally call him by name, we can remake the tape, so try to relax."

When the parent indicated that he was ready to begin, the recorder was started. The recording was ended after 60 seconds. The experimenter asked the parent to leave the room with the child while E played back the recording to determine its appropriateness. The same procedure was then followed for the other parent. An appointment was made for the parent or parents to return with the infant for the filming session. This first visit usually lasted 10-15 minutes. Before the filming session, E prepared the master tape-recording, according to the counter-balanced design in Figure 1.

In most cases, the mother alone came for the second session, although occasionally both parents came and the father alone came on one occasion. The experimenter met the parent and child at the same entrance for the filming session and again escorted them to the laboratory. The tape recorder and camera were positioned prior to the subject's arrival. The parent was instructed to undress the baby except for his undershirt and diaper, to place him in the infant seat, and to secure the safety strap. The experimenter and the parent left the infant alone in the sound-proofed room. The parent was shown where to stand in order to view the infant in an unnoticed manner.

Each filming session lasted for eight minutes, at the beginning of which E simultaneously switched on the camera and a stop-watch to

start the session. The initial two minutes was defined as a baseline period with no stimulus. The tape recorder was activated after this period. The first stimulus was played for 60 seconds, followed in order by a 30-second control period, the second 60-second stimulus period, a 30-second control period, the third 60-second stimulus period, a 30-second control period, the fourth 60-second stimulus period, and a 30-second control period. One-frame-per-second films were made during the entire eight minutes, for a total of 480 frames per subject.

After the last control period, the equipment was turned off and the parent removed the infant from the room. The parent dressed the infant while E answered any questions concerning the experiment. The experimenter then accompanied the parent and infant to the door of the building. The second visit usually lasted 15 minutes.

Measurement of Body Activity

The 8-mm photographs of the infants were analyzed to ascertain the amount of body activity occurring during the experiment. The activity measure used was calculated according to the extent to which the baby's head, hands, and feet moved in the two dimensions of the film frame during the interval of six seconds (six frames of film, one second apart). The photographs of one subject were scored at several different elapsed intervals between scored frames to determine a time interval sensitive to activity change and not requiring excessive scorer time. A 6-second interval analysis of total limb movement was judged to reflect adequately the changes of activity occurring during the experiment.

The scoring technique involved the projection of each frame to be scored onto graph paper of 10 blocks per inch. The projector magnification was set such that one block of this graph paper corresponded to one inch of displacement of the child in the infant seat. A Sears Du-All Eight Editor Viewer Model 3.9381 was used. The linear displacement of the head, hands, and feet between two successive scored frames of film was considered as the amount of movement of that body part during the specified period of time between scored frames. The arithmetic mean of the movement of both feet produced an index of foot movement, the mean of both hands an index of hand movement, and the mean of hand, foot, and head movement an index of total body activity.

Each of the four dependent measures -- hand, foot, and total body movement -- was further subdivided into uncorrected, onset, and offset scores. The uncorrected movement was simply the mean of the 10 scores (10 frames of film or every 6th frame over 60 seconds) during the stimulus period. To obtain the mean onset body movement measure for each dependent variable of each subject, the mean of the first five scores of the stimulus condition was subtracted from the mean of the preceding five control scores. For each dependent variable of each subject, the mean of the five control scores immediately following the final five stimulus scores was subtracted from the mean of the final five stimulus scores to obtain the mean offset body movement measure.

Although trigonometric transformations could have been used to reference these movements to vertical and horizontal orientations, such was not done because all data were recorded from the same camera position and with a constant field of view. Thus, all data are relative movements in a fixed, though tilted, plane.

Chapter III

RESULTS AND DISCUSSION

Results

Mean uncorrected body movement. The mean scores of each dependent variable (head, hand, foot, and the total body movement) were analyzed using a factorial analysis of variance without considering the preceding or following level of activity to determine the mean uncorrected body movement measure. For this and subsequent analysis, in addition to the independent variables of Sex, Familiarity of Voice, Sex of Voice, and Age, there is included a Trials variable which refers to the first vs. the second five scores of the stimulus condition. Trial 1, contains the first 5 frames of film at 6 second intervals for a total of 30 seconds, and Trial 2 contains the next five scores of the stimulus condition, also 5 frames of film at 6 second intervals for a total of 30 seconds.

An analysis of variance (Table 2) performed on the mean uncorrected head movement revealed a significant main effect for the Sex variable ($p < .05$). The mean uncorrected head movement for female subjects was 1.63, while the males' mean uncorrected head movement was 1.12. A significant Trial X Sex of Voice interaction ($p < .01$) was also indicated by the analysis of the mean uncorrected head movement. In an attempt to isolate the specific differences contributing to this interaction, a simple effect analysis (Neuman-Keuls as given in Kirk, 1968) was performed. The simple effects analysis further revealed that during the presentation of the male voices, there was greater activity on Trial 1 than on Trial 2 ($p < .01$), whereas there was greater activity

Table 2

Summary of analysis of variance performed on mean uncorrected head movement

Source	S.S.	df	M.S.	F
Age (A)	32.08	3	10.69	2.63
Sex (S)	20.45	1	20.45	5.03*
S x A	7.55	3	2.52	.62
Subjects within A,S (Ss/A,S)	121.92	30	4.06	
Familiarity of Voice(FV)	.73	1	.73	.74
FV x A	2.39	3	.80	.81
FV x S	.50	1	.50	.51
FV x A x S	1.64	3	.55	.55
FV x Ss/A,S	29.58	30	.99	
Sex of Voice(SV)	8.57	1	8.57	.16
SV x A	4.19	3	1.40	2.69
SV x S	.10	1	.10	.20
SV x A x S	.13	3	4.38	.09
SV x Ss/A,S	15.54	30	.52	
SV x FV	58.24	1	58.24	.01
SV x FV x A	4.84	3	1.61	3.35
SV x FV x S	.21	1	.21	.43
SV x FV x A x S	2.51	3	.84	1.74
SV x FV x Ss/A,S	14.44	30	.48	

Table 2 (continued)

Summary of analysis of variance performed

on mean uncorrected head movement

Source	S.S.	df	M.S.	F
Trials(T)	4.18	1	4.18	.09
T x A	2.24	3	.75	1.68
T x S	.23	1	.23	.53
T x A x S	.93	3	.31	.70
T x Ss/A,S	13.34	30	.45	
T x FV	1.27	1	1.27	2.43
T x FV x A	1.48	3	.49	.94
T x FV x S	1.43	1	1.43	.03
T x FV x A x S	.66	3	.22	.42
T x FV x Ss/A,S	15.74	30	.53	
T x SV	4.24	1	4.24	8.01**
T x SV x A	.95	3	.32	.60
T x SV x S	.36	1	.36	.68
T x SV x A x S	.11	3	3.72	.07
T x SV x Ss/A,S	15.86	30	.53	
T x SV x FV	.26	1	.26	.36
T x SV x FV x A	.88	3	.29	.42
T x SV x FV x S	.31	1	.31	.44
T x SV x FV x A x S	.76	3	.25	.36
T x SV x FV x Ss/A,S	21.26	30	.71	

*p < .05; **p < .01

on Trial 2 than on Trial 1 for the female voices ($p < .01$). This finding may be seen in Table 3 and Figure 2.

An analysis of variance performed on the mean uncorrected hand movement indicated no significant differences, as documented by Table 4.

For the mean uncorrected foot movement, there was a significant Trial X Familiarity of Voice X Sex interaction ($p < .05$, Table 5). Figure 3 presents the mean uncorrected foot movement as a function of Trials, Familiarity of Voice and Sex of the subject. A simple effects analysis disclosed two significant differences. On Trial 1 the female subjects exhibited more activity to the unfamiliar voice than did the male subjects ($F = 5.20$; $df = 1.30$; $p < .05$). On Trial 2 the female subjects showed greater activity to the familiar voice than did the male subjects ($F = 6.13$; $df = 1.30$; $p < .05$).

The analysis of variance computed on the mean uncorrected total body movement (Table 6) disclosed a Sex of Voice X Familiarity of Voice X Age interaction ($p < .01$). At ages three, six, and nine months, the Familiarity of Voice X Sex of Voice interaction failed to achieve significance ($p > .05$). At 12 months, however, the Familiarity of Voice X Sex of Voice interaction was significant at the .01 level ($F = 10.09$; $df = 1.30$). As seen in Table 7, the Neuman-Keuls test revealed that 12-month-old subjects showed more activity to the father's voice than to the male stranger's voice ($p < .01$) or to the mother's voice ($p < .10$). The 12-month-old subjects also showed more activity to the female stranger's voice than to the male stranger's voice ($p < .10$), Figure 4.

Table 3

Neuman-Keuls comparisons of mean differences

of mean uncorrected head movement

	Male Voice Trial 2	Female Voice Trial 1	Male Voice Trial 1	Female Voice Trial 2
Means:	2.50	2.52	2.92	3.04
MV-T2	-	.02	.42**	.54***
FV-T1		-	.40**	.52**
MV-T1			-	.12
FV-T2				-

***$p < .01$; $q = .38$, $df = 30$

**$p < .01$; $q = .36$, $df = 30$

*$p < .01$; $q = .29$, $df = 30$

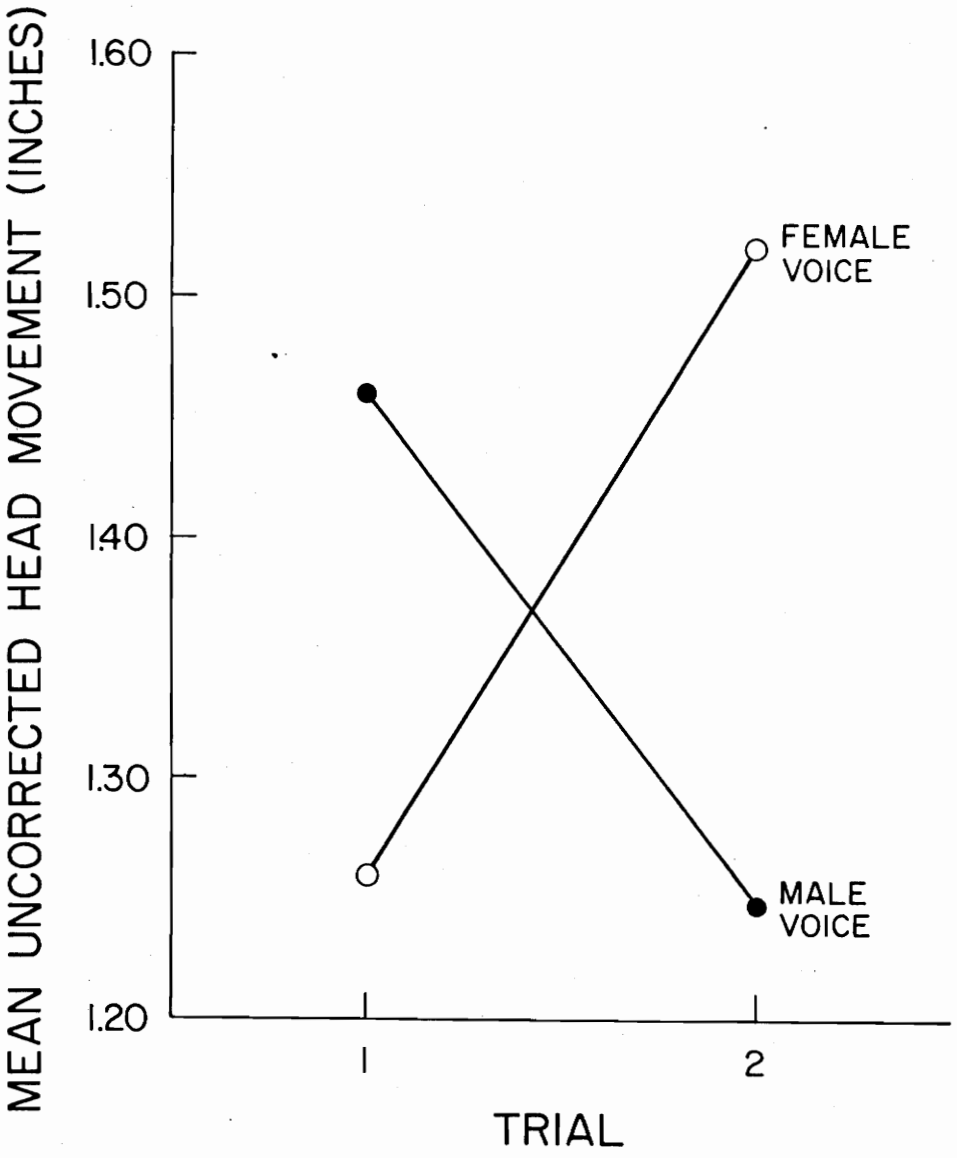

Figure 2. Sex of Voice by Trials Interaction for Mean Uncorrected Head Movement

Table 4

Summary of analysis of variance performed on mean uncorrected hand movement

Source	S.S.	df	M.S.	F
Age (A)	199.28	3	66.43	3.76
Sex (S)	2.44	1	2.44	.14
S x A	72.48	3	24.16	1.37
Subjects within A,S (Ss/A,S)	530.66	30	17.69	
Familiarity of Voice(FV)	1.74	1	1.74	.20
FV x A	52.87	3	17.62	1.98
FV x S	9.88	1	9.88	1.11
FV x A x S	26.15	3	8.72	.98
FV x Ss/A,S	266.86	30	8.90	
Sex of Voice(SV)	.25	1	.25	.04
SV x A	22.90	3	7.63	1.20
SV x S	2.49	1	2.49	.39
SV x A x S	14.48	3	4.82	.76
SV x Ss/A,S	191.22	30	6.37	
SV x FV	.00	1	.00	.00
SV x FV x A	47.85	3	15.95	1.94
SV x FV x S	13.88	1	13.88	1.69
FV x FV x A x S	44.35	3	14.78	1.80
SV x FV x Ss/A,S	246.90	30	8.23	

Table 4 (continued)

Summary of analysis of variance performed

on mean uncorrected hand movement

Source	S.S.	df	M.S.	F
Trials (T)	4.88	1	4.88	1.28
T x A	.83	3	.28	.07
T x S	.21	1	.21	.06
T x A x S	17.93	3	5.98	1.57
T x Ss/A,S	114.17	30	3.81	
T x FV	.42	1	.42	.12
T x FV x A	22.77	3	7.59	2.08
T x FV x S	5.86	1	5.86	1.61
T x FV x A x S	.92	3	.31	.08
T x FV x Ss/A,S	109.32	30	3.64	
T x SV	4.14	1	4.14	.95
T x SV x A	12.26	3	4.09	.94
T x SV x S	3.03	1	3.03	.90
T x SV x A x S	8.41	3	2.80	.65
T x SV x Ss/A,S	130.46	30	4.35	
T x SV x FV	10.07	1	10.07	3.98
T x SV x FV x A	4.50	3	1.50	.59
T x SV x FV x S	.14	1	.14	.06
T x SV x FV x A x S	11.51	3	3.84	1.52
T x SV x FV x Ss/A,S	75.89	30	2.53	

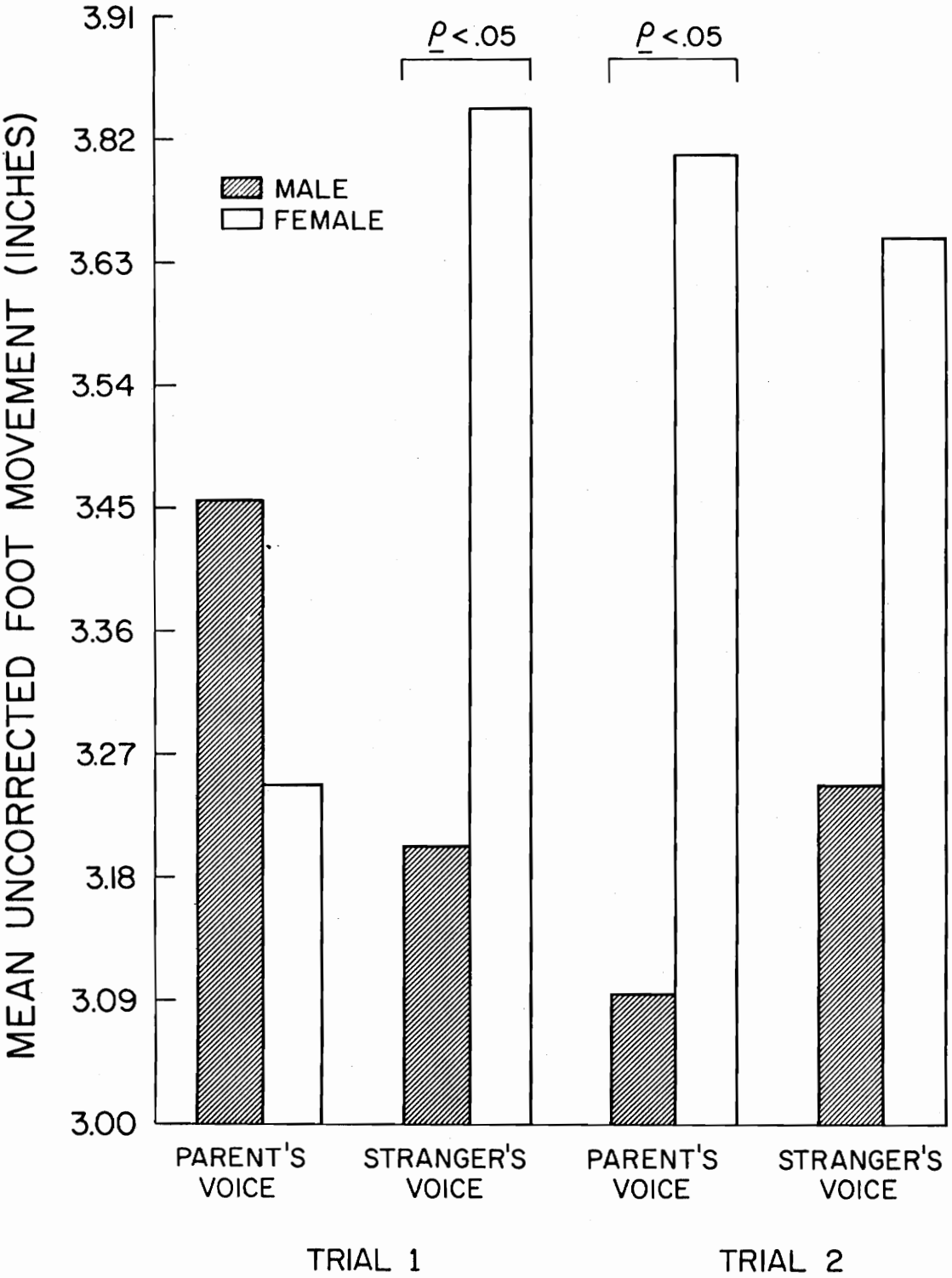

Figure 3. Trials by Familiarity of Voice by Sex of Subject Interaction for Mean Uncorrected Foot Movement

Table 5

Summary of analysis of variance performed on mean uncorrected foot movement

Source	S.S.	df	M.S.	F
Age (A)	194.43	3	64.81	2.05
Sex (S)	12.03	1	12.03	.38
S x A	135.97	3	45.32	1.43
Subject within A,S (Ss/A,S)	950.39	30	31.68	
Familiarity of Voice(FV)	.57	1	.57	.08
FV x A	2.38	3	.79	.11
FV x S	1.25	1	1.25	.18
FV x A x S	.32	3	.11	.02
FV x Ss/A,S	214.62	30	7.15	
Sex of Voice(SV)	7.41	1	7.41	1.12
SV x A	12.74	3	4.24	.64
SV x S	.39	1	.39	.06
SV x A x S	13.68	3	4.56	.69
SV x Ss/A,S	197.79	30	6.59	
SV x FV	2.05	1	2.05	.00
SV x FV x A	48.60	3	16.20	3.35
SV x FV x S	17.74	1	17.74	3.67
SV x FV x A x S	8.61	3	2.87	.59
SV x FV x Ss/A,S	145.07	30	4.84	

Table 5 (continued)

Summary of analysis of variance performed on mean uncorrected foot movement

Source	S.S.	df	M.S.	F
Trials(T)	1.17	1	1.17	.00
T x A	3.06	3	1.02	.28
T x S	2.47	1	2.47	.67
T x A x S	1.78	3	.59	.16
T x Ss/A,S	110.01	30	3.67	
T x FV	.62	1	.62	.39
T x FV x A	11.42	3	3.81	2.40
T x FV x S	6.83	1	6.83	4.32*
T x FV x A x S	11.05	3	3.68	2.33
T x FV x Ss/A,S	47.48	30	1.58	
T x SV	9.84	1	9.84	.04
T x SV x A	2.80	3	.93	.38
T x SV x S	1.30	1	1.30	.53
T x SV x A x S	4.49	3	1.50	.61
T x SV x Ss/A,S	73.17	30	2.44	
T x SV x FV	1.20	1	1.20	.47
T x SV x FV x A	25.14	3	8.38	3.30
T x SV x FV x S	.20	1	.20	.08
T x SV x Fv x A x S	14.53	3	4.84	1.91
T x SV x Fv x Ss/A,S	76.21	30	2.54	

*$p < .05$;

Table 6

Summary of analysis of variance performed on mean uncorrected total body movement

Source	S.S.	df	M.S.	F
Age (A)	876.46	3	292.15	3.43
Sex (S)	41.30	1	41.30	.49
S x A	441.62	3	147.21	1.73
Subjects within A,S (Ss/A,S)	2554.56	30	85.15	
Familiarity of Voice(FV)	2.02	1	2.02	.06
FV x A	85.31	3	28.44	.90
FV x S	7.46	1	7.46	.24
FV x A x S	14.41	3	4.80	.15
FV x Ss/A,S	946.67	30	31.56	
Sex of Voice(SV)	6.33	1	6.33	.39
SV x A	25.23	3	8.51	.52
SV x S	3.55	1	3.55	.21
SV x A x S	43.57	3	14.52	.89
SV x Ss/A,S	491.53	30	16.38	
SV x FV	.05	1	.05	.00
SV x FV x A	253.14	3	84.38	4.89**
SV x FV x S	70.40	1	70.40	4.08
SV x FV x A x S	111.56	3	37.19	2.16
SV x FV x Ss/A,S	517.51	30	17.25	

Table 6 (continued)

Summary of analysis of variance performed on mean uncorrected total body movement

Source	S.S.	df	M.S.	F
Trials(T)	3.60	1	3.60	.31
T x A	15.70	3	5.23	.45
T x S	2.55	1	2.55	.22
T x A x S	30.68	3	10.23	.87
T x Ss/A,S	351.90	30	11.73	
T x FV	.09	1	.09	.01
T x FV x A	72.15	3	24.05	3.60
T x FV x S	24.13	1	24.13	3.61
T x FV x A x S	10.88	3	3.63	.54
T x FV x Ss/A,S	200.54	30	6.69	
T x SV	19.42	1	19.42	1.42
T x SV x A	36.68	3	12.23	.89
T x SV x S	.01	1	.01	.00
T x SV x A x S	14.43	3	4.80	.35
T x SV x Ss/A,S	411.56	30	13.72	
T x SV x FV	22.82	1	22.82	2.86
T x SV x FV x A	57.32	3	19.11	2.40
T x SV x FV x S	.24	1	.24	.03
T x SV x FV x A x S	49.48	3	16.49	2.07
T x SV x FV x Ss/A,S	238.66	30	7.96	

*p < .05; **p < .01

Table 7

Neuman-Keuls comparisons of mean differences of uncorrected total body movement for 12 month old Ss

	Male Stranger(MS)	Mother(M)	Female Stranger(FS)	Father(F)
Means:	7.77	9.60	10.92	12.35
MS	-	1.83	3.15*	4.58**
M		-	1.32	2.75*
FS			-	1.43
F				-

*$p < .10$, $q = 2.36$, $df = 30$

**$p < .01$, $q = 4.46$, $df = 30$

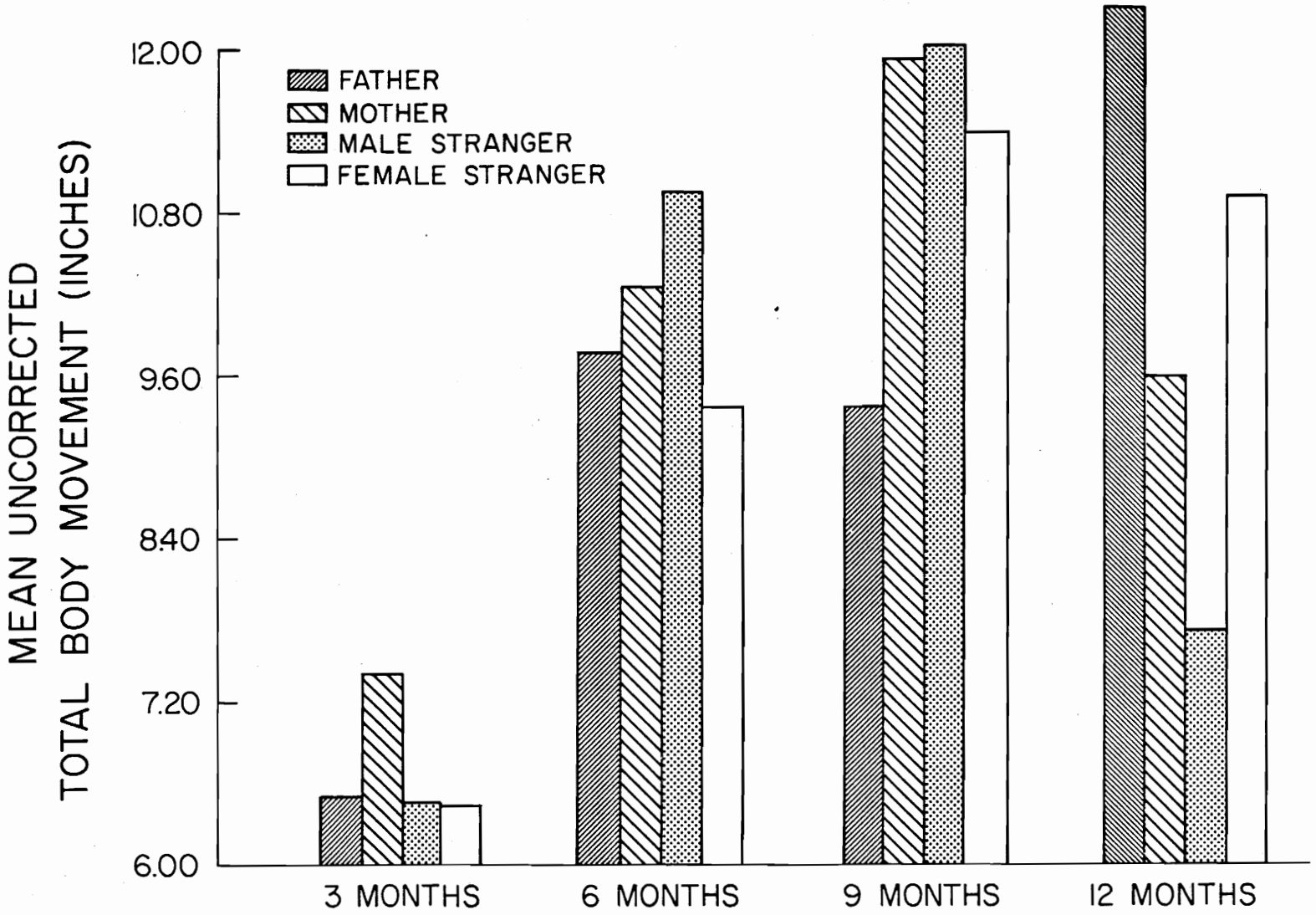

Figure 4. Sex of Voice by Familiarity of Voice by Age

Interaction for Mean Uncorrected Total Body Movement

Mean onset body movement. The onset measure was determined for each subject for each dependent variable (head, hand, foot, and total body movement) by subtracting the mean of the first five scores of the stimulus condition from the mean of the preceding five control scores to obtain a mean onset body movement measure.

Analysis of variance of the head, hand, and total body movement revealed no statistically significant findings (Tables 8, 9, and 10).

For the mean onset foot movement, there was a significant Sex of Voice X Familiarity of Voice X Sex interaction ($p < .05$), as seen in Table 11 and Figure 5. Simple effects analyses of onset data for foot movement indicated that the Sex of Voice X Familiarity of Voice X Sex interaction was the result of males having a significantly greater amount of activity than females when their father's voice was initiated ($F = 4.59$; $df = 1.30$; $p < .05$). No sex differences were found to be statistically reliable for onset presentation of the mother's voice or the stranger's voice ($p > .05$).

Mean offset body movement. The offset measure was determined for each subject for each dependent variable (head, hand, foot, and total body movement) by subtracting the mean of the five control scores immediately following the final five stimulus scores from the mean of the final five stimulus scores.

As seen in Tables 12, 13, and 14, analyses of variance of the offset data for head, foot, and total body movement resulted in no significant findings.

A statistically significant Sex of Voice X Sex interaction ($p < .05$; Table 15) was found for the hand movement data. Simple effects analyses

Table 8

Summary of analysis of variance performed on mean onset head movement

Source	S.S.	df	M.S.	F
Age (A)	4.64	3	1.55	1.79
Sex (S)	.46	1	.46	.53
A x S	.27	3	.09	.10
Subjects within A,S (Ss/A,S)	25.89	30	.86	
Familiarity of Voice(FV)	.34	1	.34	.32
FV x A	.70	3	.23	.22
FV x S	.85	1	.85	.80
FV x A x S	2.75	3	.92	.86
FV x Ss/A,S	31.85	30	1.06	
Sex of Voice(SV)	2.99	1	2.99	1.96
SV x A	3.71	3	1.24	.81
SV x S	.55	1	.55	.36
SV x A x S	.23	3	.08	.05
SV x Ss/A,S	45.79	30	1.53	
SV x FV	2.65	1	2.65	2.10
SV x FV x A	7.74	3	2.58	2.04
SV x FV x S	.07	1	.07	.06
SV x FV x A x S	1.04	3	.35	.27
SV x FV x Ss/A,S	37.91	30	1.26	

Table 9

Summary of analysis of variance performed on mean onset hand movement

Source	S.S.	df	M.S.	F
Age (A)	16.24	3	5.41	.94
Sex (S)	10.28	1	10.23	1.79
A x S	13.17	3	4.39	.77
Subject within A,S (Ss/A,S)	171.93	30	5.73	
Familiarity of Voice(FV)	2.99	1	2.99	.27
FV x A	73.94	3	24.65	2.21
FV x S	3.86	1	3.86	.35
FV x A x S	11.24	3	3.75	.34
FV x Ss/A,S	334.50	30	11.15	
Sex of Voice(SV)	11.29	1	11.29	1.03
SV x A	2.94	3	.98	.09
SV x S	1.77	1	1.77	.16
SV x A x S	22.42	3	7.47	.68
SV x Ss/A,S	329.62	30	10.99	
SV x FV	3.59	1	3.59	.54
SV x FV x A	16.24	3	5.41	.82
SV x FV x S	6.06	1	6.06	.92
SV x FV x A x S	4.99	3	1.66	.25
SV x FV x Ss/A,S	197.91	30	6.60	

Table 10

Summary of analysis of variance performed on mean onset total body movement

Source	S.S.	df	M.S.	F
Age (A)	49.39	3	16.46	1.11
Sex (S)	6.38	1	6.38	.43
A x S	34.23	3	11.41	.77
Subject within A,S (Ss/A,S)	446.84	30	14.89	
Familiarity of Voice(FV)	6.33	1	6.33	.23
FV x A	87.12	3	29.04	1.06
FV x S	.15	1	.15	.01
FV x A x S	31.78	3	10.59	.39
FV x Ss/A,S	818.73	30	27.29	
Sex of Voice(SV)	2.00	1	2.00	.06
SV x A	25.03	3	8.34	.23
SV x S	.01	1	.01	.00
SV x A x S	16.92	3	5.64	.15
SV x Ss/A,S	1098.54	30	36.62	
FV x SV	55.20	1	55.20	4.14
FV x SV x A	72.34	3	24.11	1.81
FV x SV x S	54.98	1	54.98	4.13
FV x SV x A x S	27.30	3	9.10	.68
FV x SV x Ss/A,S	339.61	30	13.32	

Table 11

Summary of analysis of variance performed on mean onset foot movement

Source	S.S.	df	M.S.	F
Age (A)	.89	3	.30	.09
Sex (S)	1.82	1	1.82	.57
A x S	11.88	3	3.96	1.24
Subject within A,S (Ss/A,S)	95.59	30	3.19	
Familiarity of Voice(FV)	.04	1	.04	.01
FV x A	3.12	3	1.04	.19
FV x S	10.69	1	10.69	1.90
FV x A x S	6.81	3	2.27	.40
FV x Ss/A,S	169.20	30	5.64	
Sex of Voice(SV)	13.50	1	13.50	1.77
SV x A	6.73	3	2.24	.29
SV x S	.22	1	.22	.03
SV x A x S	6.59	3	2.20	.29
SV x Ss/A,S	228.76	30	7.63	
SV x FV	15.26	1	15.26	3.59
SV x FV x A	5.58	3	1.86	.44
SV x FV x S	21.95	1	21.95	5.16*
SV x FV x A x S	9.70	3	3.23	.76
SV x FV x Ss/A,S	127.52	30	4.25	

*$p < .05$

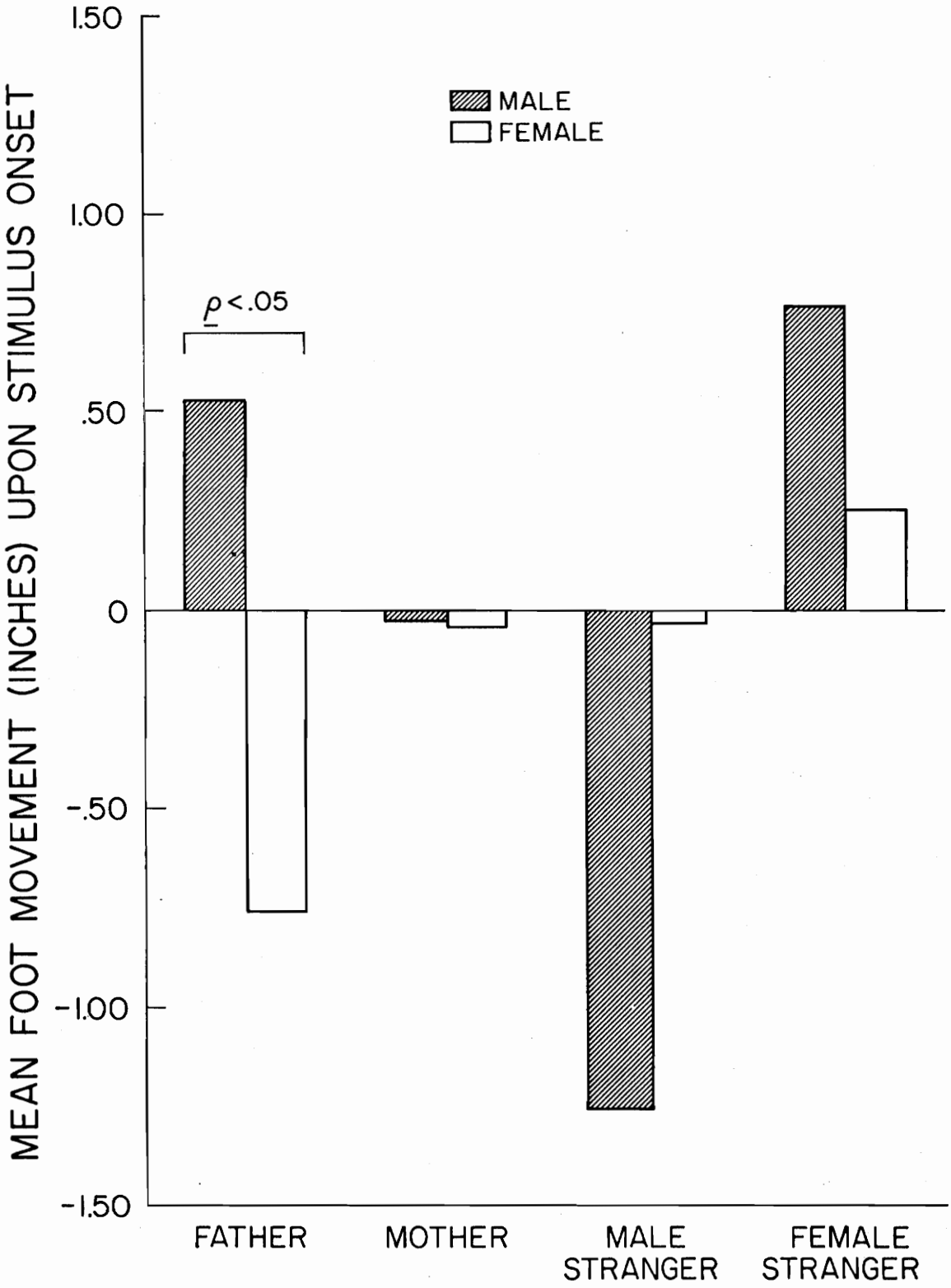

Figure 5. Sex of Voice by Familiarity of Voice by Sex of Subject Interaction for Mean Onset Foot Movement

Table 12

Summary of analysis of variance performed on mean offset head movement

Source	S.S.	df	M.S.	F
Age (A)	2.71	3	.90	1.28
Sex (S)	1.69	1	1.69	2.41
A x S	.40	3	.13	.19
Subject within A,S (Ss/A,S)	21.11	30	.70	
Familiarity of Voice(FV)	.58	1	.58	.39
FV x A	6.42	3	2.14	1.44
FV x S	.01	1	.01	.01
FV x A x S	3.08	3	1.03	.69
FV x Ss/A,S	44.53	30	1.48	
Sex of Voice(SV)	3.39	1	3.39	3.03
SV x A	.84	3	.28	.25
SV x S	.44	1	.44	.39
SV x A x S	2.66	3	.89	.79
SV x Ss/A,S	33.67	30	1.12	
SV x FV	.53	1	.53	.57
SV x FV x A	5.46	3	1.82	1.98
SV x FV x S	.40	1	.40	.43
SV x FV x A x S	2.69	3	.90	.97
SV x FV x Ss/A,S	27.64	30	.92	

Table 13

Summary of analysis of variance performed on mean offset foot movement

Source	S.S.	df	M.S.	F
Age (A)	6.48	3	2.09	.42
Sex (S)	.23	1	.23	.05
A x S	30.43	3	10.14	2.05
Subject within A,S (Ss/A,S)	148.28	30	4.94	
Familiarity of Voice(FV)	12.39	1	12.39	3.13
FV x A	22.68	3	7.56	1.91
FV x S	4.97	1	4.97	1.26
FV x A x S	17.04	3	5.68	1.44
FV x Ss/A,S	118.79	30	3.96	
Sex of Voice(SV)	1.77	1	1.77	.26
SV x A	5.26	3	1.75	.26
SV x S	2.39	1	2.39	.36
SV x A x S	34.84	3	11.61	1.73
SV x Ss/A,S	200.97	30	6.70	
SV x FV	6.27	1	6.27	1.20
SV x FV x A	14.71	3	4.90	.94
SV x FV x S	.37	1	.37	.07
SV x FV x A x S	2.79	3	.93	.18
SV x FV x Ss/A,S	156.97	30	5.23	

Table 14

Summary of analysis of variance performed on mean offset total body movement

Source	S.S.	df	M.S.	F
Age (A)	12.01	3	4.00	.16
Sex (S)	6.55	1	6.55	.27
A x S	114.93	3	38.31	1.56
Subject within A,S (Ss/A,S)	737.30	30	24.58	
Familiarity of Voice(FV)	.72	1	.72	.03
FV x A	153.67	3	51.22	1.91
FV x S	1.76	1	1.76	.07
FV x A x S	57.35	3	19.12	.71
FV x Ss/A,S	804.11	30	26.80	
Sex of Voice(SV)	25.81	1	25.81	1.30
SV x A	58.55	3	19.52	.98
SV x S	28.71	1	28.71	1.45
SV x A x S	82.93	3	27.64	1.39
SV x Ss/A,S	594.72	30	19.82	
FV x SV	.66	1	.66	.04
FV x SV x A	26.82	3	8.94	.54
FV x SV x S	.82	1	.82	.05
FV x SV x A x S	29.57	3	9.86	.60
FV x SV x Ss/A,S	496.96	30	16.57	

Table 15

Summary of analysis of variance performed on mean offset hand movement

Source	S.S.	df	M.S.	F
Age (A)	9.00	3	3.00	.28
Sex (S)	3.02	1	3.02	.29
A x S	27.79	3	9.26	.87
Subject within A,S (Ss/A,S)	317.88	30	10.59	
Familiarity of Voice(FV)	3.65	1	3.65	.33
FV x A	98.76	3	32.92	3.00
FV x S	.99	1	.99	.09
FV x A x S	21.00	3	.70	.64
FV x Ss/A,S	329.63	30	10.99	
Sex of Voice(SV)	3.64	1	3.64	.50
SV x A	63.13	3	21.04	2.89
SV x S	38.98	1	38.98	5.35*
SV x A x S	12.66	3	4.22	.58
SV x Ss/A,S	218.70	30	7.29	
SV x FV	5.83	1	5.83	.52
SV x FV x A	2.46	3	.82	.07
SV x FV x S	.11	1	.11	.01
SV x FV x A x S	49.64	3	16.55	1.46
SV x FV x Ss/A,S	339.00	30	11.30	

*$p < .05$

of these offset data showed that the activity of the females was not different from the male subjects upon termination of a male voice ($p > .05$). Male subjects were significantly more active to cessation of the female voice than were female subjects ($F = 4.36$; $df = 1.30$; $p < .05$). The nature of the interaction is depicted in Figure 6.

Discussion

The most interesting findings of this study are reflective of the cross-over effect found by Friedlander (1970). The Sex of Voice X Familiarity of Voice X Age interaction for total uncorrected body movement showed no significant differences for the three-, six-, and nine-month old age groups. However, the 12-month-old infants showed greater activity to their father's voice than to either the male stranger's voice or their mother's voice. These same subjects showed more activity to the female stranger's voice than to the male stranger's voice. This finding appears to be in agreement with the cross-over effect found by Friedlander (1970); i.e., the subjects in his study first preferred to listen to a familiar stimulus condition, but later in the experimental session preferred to listen to a variant form of the known values in which some of the stimulus characteristics remained unresolved -- or were resolved in a different way. As suggested by Berlyne (1960), there is some evidence that a decrease in an on-going response such as activity may be a correlate of attention. Therefore, a significant increase in activity should indicate a decrease in attention. It then follows that 12-month-old infants in the present study were less attentive to their father's voice than to either the male stranger's voice or their mother's voice.

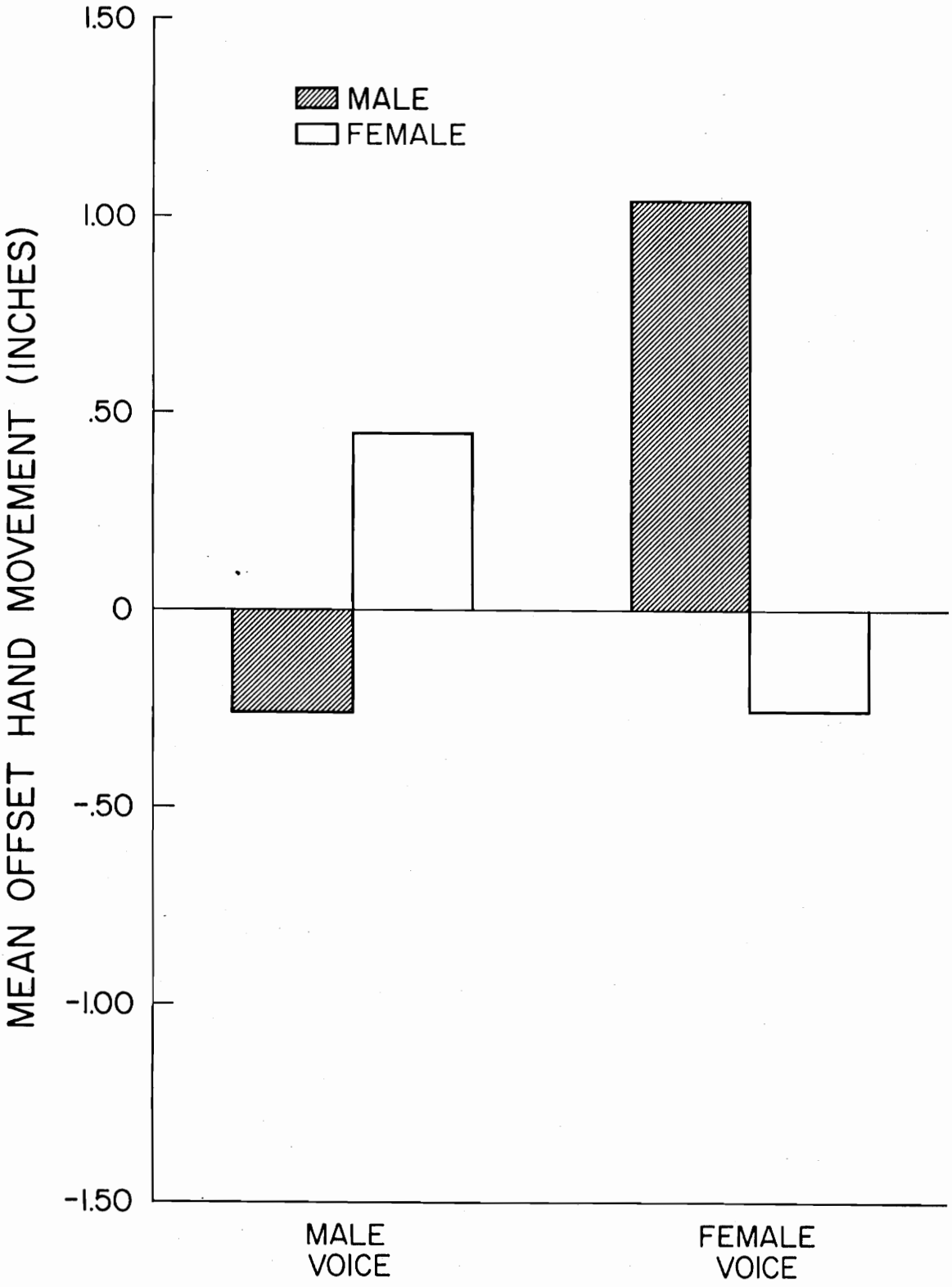

Figure 6. Sex of Voice by Sex of Subject Interaction for Mean Offset Hand Movement

The 12-month-old subjects were also less attentive to the female stranger's voice than to the male stranger's voice. It is assumed that the male stranger's voice represents the most unfamiliar voice, while the mother's voice represents the most familiar voice. Therefore, the 12-month-old infants are exhibiting a preference for the two extremes of the familiarity continuum. Perhaps this is indicative of the ontogeny of Friedlander's findings. Only further research that extends the age levels to include the first half of the second year can evaluate this notion.

The sex of the speaker appears to be an important determinant of the infant's responsiveness at a particular time period. On Trial 1 the infants were more attentive to female voices, a finding that would be expected from casual observations of babies' behaviors. An infant is usually more accustomed to hearing the voice of his mother and other females (e.g., female babysitters, female friends of the mother, etc.) more often than a male voice. The female voice is also heard more often in a situation in which the infant receives a reward (e.g., feeding, cuddling, physical nearness, etc.). On Trial 2, however, the infant is more attentive to the male voice. It is assumed that the male voice is a less familiar voice than the female voice, since a father seemingly spends very little time in verbal interaction with the infant in most American homes. Generally male strangers are also less frequent visitors to the home than are female visitors. This finding indicates that the infant prefers an unfamiliar voice after first preferring a familiar voice, a finding in agreement with Friedlander's (1970) cross-over effect.

Infants responded differentially to the stimulus conditions of this research according to the sex of the infant. The females showed greater activity than the males, perhaps because the physical development of the females has exceeded that of the males at all age levels, and therefore produces a significant difference in the activity levels of the two sexes. This possibility should be explored in further research.

The females were more attentive on the onset and offset measures than the males. The females were more attentive to the cessation of the female voice than were the male subjects. The females were also more attentive to the initiation of the father's voice than the male subjects. It may be that the male subjects require a longer time interval to exhibit differential responses to the onset and offset measure. Future research should extend the time intervals of both the stimuli conditions and the control periods.

Chapter IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

This research was designed to investigate the effects of the variables of age, sex, male vs. female voice, and unfamiliar vs. familiar voice upon the infant's body movement. The sample consisted of 40 middle-class, white infants at four age levels -- 3, 6, 9, 12 months. Five male and five female infants comprised each age group.

Four tape-recorded stimulus conditions (mother's voice, father's voice, male stranger's voice, and female stranger's voice) were presented to each infant. The body movements of the infants were recorded at one frame per second by an 8-mm. motion picture camera located outside the sound-proofed room.

Analyses of variance were performed to determine any differences among the four stimulus conditions and control periods. Results showed that male subjects were more active to cessation of the female voice than were female subjects. Male subjects also exhibited greater activity than did the female subjects to the initiation of their father's voice.

The 12-month-old infants showed more activity to the father's voice than to the male stranger's voice or to the mother's voice. Additionally, these subjects showed more activity to the female stranger's voice than to the male stranger's voice. The three other age groups (3,6,9, months) showed no significant reactions to any of the variables Sex of Voice or Familiarity of Voice. Female subjects showed significantly more activity

than male subjects on uncorrected head movements. On Trial 1 the female subjects were more active to the unfamiliar voice than were the male subjects. However, on Trial 2 the females showed greater activity to the familiar voice than did the male subjects.

Conclusions

A cross-over effect indicating an initial preference for a familiar voice followed by a preference for an unfamiliar voice is demonstrated by the results of this study. This effect may be correlated with the age of the infant, since it was significant only for 12-month-old subjects. However, the cross-over effect also appears related to the sex of the speaker. It is assumed that the female voices are more familiar than are the male voices. Infants in the study at first preferred the female voices, but later preferred the male, or less familiar, voice, thus producing the cross-over effect.

Infants responded differentially to the stimulus conditions according to their sex. Females were more active than the males. Females were more attentive than the males to the cessation of the female voice and to the initiation of their father's voice. Male infants were selectively responsive to familiar vs. unfamiliar voices as a function of trial. Initially the males were more attentive to the unfamiliar voice, followed by a preference for the familiar voice.

Recommendations

Methodological problems are obvious in the attempt to assess the recognitive sensitivity of non-verbal infants. A repeated-measures design in which each subject receives each stimulus on two separate

trials would be highly desirable, although exceedingly difficult to achieve due to factors of fatigue, separation anxiety of the infant, and an inability by the experimenter to arrange for additional experimental sessions during the prescribed age level of the subject. The body movement (e.g., head, hand, foot, total as used herein) measure appears to be a meaningful assessment measure since it is a continuous, rather than discrete variable, that can be related to all conditions over time.

The response of the infant to natural language has not been assessed by a physiological measure, such as the rate of heartbeat or the galvanic skin response. A study using this measure should be informative.

It is suggested that future research continue to investigate the relationship of the infant to the voice of familiar vs. non-familiar persons and to the sex of voice of the speaker. A power spectral density analysis of the voices would also be of interest to determine if infants respond differentially to specific characteristics of verbal language.

Future research should also extend the age levels to include the first half of the second year in an attempt to assess the cross-over effect of Friedlander (1970). The time periods of the stimulus conditions and the control periods should be varied to determine any differences of response which are a function of exposure time to the stimulus and response recovery of the control periods.

The voice of the father should definitely be included in all research related to the development of receptive language in the human neonate.

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APPENDIX

Table A-1

Mean Uncorrected Head Movement

	Male Stranger		Mother		Female Stranger		Father	
	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II
3 months								
Male	.84	.80	.84	.91	.70	.59	1.09	.80
Female	1.51	.82	.96	.96	1.38	1.17	1.38	1.07
6 months								
Male	.64	.67	.83	.90	.87	1.05	.77	1.04
Female	1.44	1.92	1.74	2.28	.90	1.66	1.59	1.44
9 months								
Male	1.72	2.01	1.72	2.18	2.08	2.20	1.78	.80
Female	2.06	1.80	2.12	2.50	1.54	2.01	1.88	1.29
12 months								
Male	.95	.82	.89	.85	.76	1.08	1.67	.97
Female	1.44	1.57	1.69	1.68	1.16	2.23	2.59	2.22

Table A-2

Mean Uncorrected Hand Movement

	Male Stranger		Mother		Female Stranger		Father	
	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II
3 months								
Male	2.68	3.49	3.21	2.81	4.69	2.88	3.45	2.13
Female	3.35	2.46	5.41	6.24	3.53	3.12	3.78	4.55
6 months								
Male	4.35	4.00	3.50	3.58	5.35	4.90	5.08	4.71
Female	5.98	7.09	4.60	5.92	4.03	2.24	4.53	4.39
9 months								
Male	7.90	7.41	5.40	7.54	5.81	6.69	6.46	6.02
Female	6.77	4.83	4.34	5.12	6.62	4.67	4.73	3.14
12 months								
Male	4.35	4.30	4.54	4.41	4.07	5.55	7.52	4.80
Female	2.70	2.99	5.44	4.07	4.56	5.03	5.99	5.74

Table A-3

Mean Uncorrected Foot Movement

	Male Stranger		Mother		Female Stranger		Father	
	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II
3 months								
Male	2.29	1.78	2.12	1.55	2.02	1.65	1.81	1.72
Female	2.96	3.33	2.51	2.02	2.38	2.06	2.27	2.17
6 months								
Male	2.96	2.93	3.65	3.13	4.43	3.63	3.25	4.22
Female	5.52	5.77	3.89	6.49	4.64	3.84	3.83	4.13
9 months								
Male	3.43	4.75	5.01	4.92	4.71	4.62	4.40	3.14
Female	3.23	2.58	2.15	4.75	3.36	1.50	1.80	1.24
12 months								
Male	2.46	2.50	2.65	2.28	3.38	4.15	4.76	3.75
Female	3.85	3.16	5.50	4.40	4.77	6.95	4.05	5.34

Table A-4

Mean Uncorrected Total Movement

	Male Stranger		Mother		Female Stranger		Father	
	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II
3 months								
Male	5.81	6.07	6.17	5.27	7.41	5.13	6.35	4.66
Female	7.83	6.60	8.88	9.23	7.30	6.35	7.43	7.79
6 months								
Male	7.95	7.60	7.97	7.61	10.65	9.58	9.11	9.97
Female	12.94	14.78	10.23	14.69	9.57	7.75	9.95	9.97
9 months								
Male	13.04	14.17	12.13	14.64	12.60	13.50	12.64	9.96
Female	12.06	9.21	8.60	12.37	11.53	8.18	8.41	5.67
12 months								
Male	7.76	7.61	8.08	7.54	8.21	10.78	13.95	9.51
Female	7.99	7.72	12.64	10.15	10.49	14.20	12.63	13.30

Table A-5

Mean Onset Head Movement

	Male Stranger		Mother		Female Stranger		Father	
	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II
3 months								
Male	.22	.26	.01	-.05	.05	.17	-.12	.17
Female	-.24	.45	.08	.08	-.49	-.28	-.11	.19
6 months								
Male	-.09	-.06	-.03	-.11	-.08	-.10	-.12	-.39
Female	-.20	-.68	-.25	-.79	.59	-.16	-.21	-.06
9 months								
Male	.23	-.07	.47	.01	.05	-.07	.26	1.25
Female	.15	.41	.02	-.36	.49	.02	-.11	.48
12 months								
Male	.33	.46	1.26	1.29	.11	-.20	-.14	.56
Female	.68	.56	1.15	1.16	.49	-.57	-.99	.61

Table A-6

Mean Onset Hand Movement

	Male Stranger		Mother		Female Stranger		Father	
	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II
3 months								
Male	.91	.11	-.08	.32	.38	2.19	.01	1.32
Female	-1.16	-.26	.10	-.73	-.15	.26	-.56	-1.33
6 months								
Male	.51	.87	1.02	.94	-.71	-.27	-.71	-.33
Female	-.13	-1.24	.61	-.72	1.57	3.37	-.04	.10
9 months								
Male	-1.02	-.53	2.76	.62	.76	-.13	1.65	2.08
Female	.07	2.02	-.23	-1.02	-.14	1.82	1.38	2.97
12 months								
Male	2.00	2.05	1.82	1.95	2.19	.71	-1.15	1.57
Female	2.13	1.83	-.62	.75	1.26	.79	-1.85	-1.61

Table A-7

Mean Onset Foot Movement

	Male Stranger		Mother		Female Stranger		Father	
	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II
3 months								
Male	-.13	.38	-.65	-.07	-.54	-.17	-.69	-.61
Female	.42	.05	.86	1.34	-.20	.13	.61	.71
6 months								
Male	1.24	1.27	-.12	.40	-1.16	-.36	-.79	-1.75
Female	-.21	-.46	.06	-2.54	-.33	.46	1.67	1.37
9 months								
Male	2.56	1.24	-.37	-.29	-.67	-.57	.02	1.29
Female	-.51	.14	-.19	-2.79	-.44	1.42	.64	1.20
12 months								
Male	1.30	1.27	1.30	1.67	-.71	-1.47	-1.19	-.18
Female	.81	1.49	-.31	.79	-.05	-2.23	.01	-1.28

Table A-8

Mean Onset Total Movement

	Male Stranger		Mother		Female Stranger		Father	
	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II
3 months								
Male	1.00	.75	-.71	.20	-.10	2.18	-.81	.89
Female	-.99	.23	1.05	.70	-.83	.11	-.07	-.43
6 months								
Male	1.85	2.19	.87	1.23	-1.79	-.72	-1.61	-2.47
Female	-.54	-2.37	.41	-4.05	1.84	3.66	1.42	1.41
9 months								
Male	1.77	.64	2.85	.35	.14	-.77	1.93	4.61
Female	-.29	2.57	-.40	-4.17	-.09	3.26	1.91	4.65
12 months								
Male	3.63	3.79	4.37	4.91	1.59	-.97	-2.48	1.96
Female	3.62	3.88	.22	2.70	1.70	-2.01	-2.83	-3.50

Table A-9

Mean Offset Head Movement

	Male Stranger		Mother		Female Stranger		Father	
	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II
3 months								
Male	.12	.07	-.32	-.18	.08	-.03	.20	-.18
Female	.58	-.11	-.37	-.37	.36	.14	.50	.19
6 months								
Male	-.04	-.01	.06	.14	-.03	.15	.01	.28
Female	.10	.58	.92	1.46	-.76	-.00	.30	.16
9 months								
Male	-.06	.24	-.75	-.30	.02	.14	.26	-.72
Female	.32	.06	-.29	.09	-.08	.39	-.13	-.71
12 months								
Male	.06	-.07	.04	.00	-.02	-1.33	.08	-.62
Female	-.06	.06	.34	.33	-.19	.88	-.16	-.54

Table A-10

Mean Offset Hand Movement

	Male Stranger		Mother		Female Stranger		Father	
	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II
3 months								
Male	-1.08	-.28	-.80	-.94	1.97	.16	.25	-1.32
Female	-1.33	-2.23	2.36	3.19	-.17	-.58	.02	.79
6 months								
Male	.27	-.08	-.66	-.58	-.38	-.83	1.01	.64
Female	-1.22	-.12	.29	1.61	-.43	-2.22	-.97	-1.11
9 months								
Male	2.71	2.22	-1.90	.24	-1.65	-.77	-.72	-1.16
Female	.57	-1.37	-3.28	-2.50	.95	-1.01	.15	-1.44
12 months								
Male	-1.79	-1.84	-1.10	-1.23	-3.66	-2.17	1.47	-1.25
Female	-1.58	-1.29	1.64	.27	.57	1.04	.82	.58

Table A-11

Mean Offset Foot Movement

	Male Stranger		Mother		Female Stranger		Father	
	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II
3 months								
Male	.94	.43	.36	-.34	-.27	-.64	-.41	-.37
Female	-.38	-.01	-.18	-.66	-1.28	-1.60	.31	.21
6 months								
Male	.32	.30	.86	.34	1.00	.20	-.72	.25
Female	2.08	2.32	-3.30	-.71	-.87	-1.67	-1.45	-1.15
9 months								
Male	-.57	.75	-.80	-.89	-.12	-.21	.38	-.88
Female	.52	-.13	-.45	2.15	.90	-.96	-.04	-.60
12 months								
Male	.28	.31	-.12	-.49	-.69	.08	-.30	-1.31
Female	1.22	.54	1.74	.63	.90	3.08	-.79	.50

Table A-12

Mean Offset Total Movement

	Male Stranger		Mother		Female Stranger		Father	
	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II	Trial I	Trial II
3 months								
Male	-.03	.23	-.77	-1.45	1.78	-.51	.04	-1.87
Female	-1.13	-2.35	1.81	2.15	-1.09	-2.04	.83	1.19
6 months								
Male	.55	.20	.26	-.10	.58	-.49	.31	1.17
Female	.95	2.78	-2.09	2.37	-2.06	-3.89	-2.12	-2.11
9 months								
Male	2.08	3.21	-3.46	-.95	-1.75	-.84	-7.37	-2.75
Female	1.41	-1.45	-4.03	-.26	1.77	-1.58	-2.02	-2.76
12 months								
Male	-1.44	-1.60	-1.17	-1.71	-5.99	-3.43	1.25	-3.18
Female	-.42	-.69	3.72	1.23	1.28	4.99	-.13	.54

VITA

Beverly Ann Huston Sgro was born in Fort Worth, Texas, on January 12, 1941. She is the daughter of Mr. and Mrs. J. C. Huston of Fort Worth, Texas, and is the wife of Dr. Joseph A. Sgro of Blacksburg, Virginia.

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Beverly Huston Sgro

THE ACTIVITY RESPONSE OF THE INFANT TO FAMILIARITY AND SEX OF VOICE

by

Beverly Huston Sgro

(ABSTRACT)

This research investigated the effects of age, sex, male vs. female voice, and unfamiliar vs. familiar voice upon the infants body movements. The sample consisted of 40 middle-class infants, balanced according to sex, at four age levels -- 3, 6, 9, 12 months.

Four tape-recorded stimulus conditions -- mother's voice, father's voice, female stranger's voice, and male stranger's voice -- were presented to each infant. The body movements of the infants were recorded at one frame per second by an 8mm. camera.

Analyses of variance were performed to determine any differences among the four stimulus conditions and control periods.

The 12-month-old infants showed more activity to the father's voice than to the male stranger's voice or to the mother's voice. These subjects also showed more activity to the female stranger's voice than to the male stranger's voice. Female subjects were more active than male subjects to the unfamiliar voices on Trial 1. On Trial 2 females showed greater activity than males to the familiar voice. Females exhibited greater activity than males overall. Males showed greater activity than females to the cessation of the female voice and to the initiation of their father's voice.

Results were discussed in terms of the infant's development as affected by sex of the infant and the cross-over effect found by Friedlander (1970).