To the Graduate Council:

I am submitting herewith a thesis written by Patricia Ann Cotterell entitled "A Test of Emotion Discrimination for Hearing Impaired and Normal Hearing Children." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Audiology.

Carl W. Asp, Major Professor

We have read this thesis
and recommend its acceptance:

Accepted for the Council:

Vice Chancellor
Graduate Studies and Research

A

A TEST OF EMOTION DISCRIMINATION FOR HEARING IMPAIRED AND NORMAL HEARING CHILDREN

A Thesis

Presented for the

Master of Arts

Degree

The University of Tennessee, Knoxville

Patricia Ann Cotterell

June 1981

3051810

DEDICATION

Two roads diverged in a yellow wood,
And sorry I could not travel both
And be one traveler, long I stood
And looked down one as far as I could
To where it bent in the undergrowth;

Then took the other, as just as fair,
And having perhaps the better claim,
Because it was grassy and wanted wear;
Though as for that the passing there
Had worn them really about the same,

And both that morning equally lay
In leaves no step had trodden black.
Oh, I kept the first for another day!
Yet knowing how way leads on to way,
I doubted if I should ever come back.

I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood, and I -
I took the one less travelled by,
And that has made all the difference.

Robert Frost

To my parents, Arthur and Mary Jane Cotterell, who have always encouraged me to take the road less travelled.

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ABSTRACT

A Test of Emotion Discrimination (TED) was constructed to measure the ability of ten hearing impaired children (trained in the Verbo Tonal method) and ten matched normal hearing children to discriminate among four primary emotions through listening. The TED consisted of 20 test items. Each pre-recorded sentence was spoken with one of four simulated emotions: (1) anger, (2) sorrow, (3) joy, or (4) fear. The children listened to the sentence and pointed to one of the four photographs simulating the same emotion. The TED is a reliable test. The normal hearing children scored significantly better than the hearing impaired children. "Anger" was the best identified emotion while "fear" was the most difficult to identify for both groups. The normal hearing children scored significantly better on "joy" than the hearing impaired children, but did approximately the same on "sorrow." The socioeconomic background of the hearing impaired children seemed more important in the development of listening skills than for the normal hearing child. The ability of the hearing impaired children to discriminate among the four emotions may be related to their level of oral communication skills.

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CHAPTER I

INTRODUCTION

The communication of emotions is the essential foundation for all human relationships (Howes, 1927). This sharing of emotions is a highly rewarding, enriching experience and people are constantly striving to achieve such experiences (Scott and DeGhett, 1972). The emotional need to communicate must be present or be created within children before they will communicate with others (Krapez, 1970). For example, the infant may cry to communicate that a change of diapers is needed. Without this need, the child may continue sleeping and not have to communicate with others.

Human beings may communicate their emotions through a variety of cues: auditory, visual, tactile, or a combination of all three. For the auditory channel, the emotional content of speech is communicated primarily through the various rhythm and intonation patterns (Silverman, Lane, and Doehring, 1970). These patterns, or suprasegmentals, carry more significant information about the emotional content of the message than the words themselves (Myklebust, 1964). Without the proper processing of the suprasegmental patterns, it is extremely difficult to perceive the emotional meaning of an utterance (Guberina, 1981; and Chester, 1981).

There is a deep human need to provide a richer emotional coupling to the world through audition (Ramsdell, 1970). Most hearing impaired children have difficulty in expressing and understanding the emotions of others. This difficulty may restrict or impede their interactions with others (Myklebust, 1964; Schlesinger and Meadow, 1972). Rainer et. al.

(1963) reported that the delayed emotional development and the social problems of hearing impaired children are compounded, if not caused by, poor communication skills.

In this study, the hearing impaired children had developed speaking, listening, and language skills through the Verbo Tonal Method (Guberina, 1964; Guberina, 1971; Asp, 1971; and Guberina and Asp, 1981). This method emphasizes the suprasegmental aspects of speech as the basis for developing normal oral communication skills. The children were successfully mainstreamed into regular public school classrooms.

A test was developed to examine the ability of these hearing impaired children to discriminate among emotions by listening to speech. The value of this test is its function as a diagnostic tool. For the hearing impaired child who can discriminate among emotions through the suprasegmental patterns of speech, the foundation for developing an auditory perceptual system for communication is already established. The chances are greater for this child to develop an auditory-oral mode of communication and be successfully mainstreamed into the society. For the hearing impaired child who can not make these discriminations, the prognosis is much poorer. This child does not have the basic skills for interpreting the suprasegmental patterns of speech, and considerable time must be spent to teach those skills. This child may experience problems being integrated into the normal hearing world.

The purpose of this study was to compare the ability of hearing impaired and normal hearing children to discriminate among four emotions through listening. (See Appendix A for Null Hypotheses, Appendix B for Definition of Terms, and Appendix C for Review of Literature.)

CHAPTER II

METHOD

A. SUBJECTS

Two groups of children, 6 years 5 months to 11 years 11 months of age, served as subjects. One group consisted of ten hearing impaired children who: (1) had a three frequency pure tone average of 50 dB HTL (ANSI, 1969) or greater at the better ear; (2) had a minimum of one year of training in the Verbo Tonal Method; (3) had normal intelligence on the Leiter Performance Scale; and (4) attended a regular public school classroom.

The other group consisted of ten normal hearing children who: (1) had passed a screening test at 25 dB HTL (ANSI, 1969) for 1000, 2000, and 4000 Hz; (2) had normal intelligence as judged by the classroom teacher; (3) had normal language skills as judged by the classroom teacher; (4) were enrolled in the Knoxville City Public School System; and (5) were matched to the hearing impaired subjects on sex, race, age ($\pm$ 3 months), and socioeconomic background. See Tables 1 and 2 for "matched" subject information. The matched pairs are identified as 1/11, 2/12, 3/13, 4/14, 5/15, 6/16, 7/17, 8/18, 9/19, and 10/20. The socioeconomic questionnaire and criteria for determining the category of each child is displayed in Appendix D.

In addition, two hearing impaired adults and ten normal hearing adults served as subjects. The test scores for these adults were used for graphic compairson with the children to obtain a better perspective of their performance. However, they were not used for the statistical analyses.

Table 1. Summary of Hearing Impaired Subject Information

Subject	Age (yrs-mths)	Sex	Socioeconomic Background	Pure Tone Detection Thresholds of Better Ear in dB	Etiology of Hearing Loss	Length of Time in Verbo Tonal Group Program
1	9-5	F	Upper-Lower Class	82	anoxia at birth	43 months
2	6-8	F	Lower-Middle Class	88	meningitis at 14 mos.	22 months
3	11-10	M	Lower-Middle Class	98	meningitis at 21 mos.	67 months
4	6-5	M	Upper-Middle Class	50	unknown	18 months
5	7-10	M	Upper-Middle Class	63	meningitis at 18 mos.	34 months
6	10-6	F	Lower-Middle Class	93	unknown	24 months
7	9-2	F	Upper-Middle Class	80	viral infection at birth	31 months
8	6-8	F	Lower-Middle Class	73	unknown	27 months
9	10-3	M	Upper-Middle Class	100	hereditary	54 months
10	11-11	M	Upper-Lower Class	73	unknown	9 months

Table 2. Summary of Normal Hearing Subject Information

Subject	Age (yrs-mths)	Sex	Socioeconomic Background	Hearing Screening Passed at 25 dB for 1000, 2000, and 4000 Hz
11	9-6	F	Upper-Lower Class	normal
12	6-6	F	Lower-Middle Class	normal
13	11-11	M	Lower-Middle Class	normal
14	6-6	M	Upper-Middle Class	normal
15	7-8	M	Upper-Middle Class	normal
16	10-5	F	Lower-Middle Class	normal
17	9-3	F	Upper-Middle Class	normal
18	6-11	F	Lower-Middle Class	normal
19	10-1	M	Upper-Middle Class	normal
20	11-10	M	Upper-Lower Class	normal

B. TEST

A Test of Emotion Discrimination (TED) was constructed which had four practice items and 20 test items. A local professional actress simulated and spoke each emotion. These utterances were recorded in a sound-treated test suite (IDE Processes model 130), using a microphone (Electro-Voice model RE20), a mixer (Shure model M67), and a tape recorder (Ampex model AG440B).

For the practice section, the first four items were the emotions of surprise and disgust. Each practice emotion was presented two times, to train the subjects to perform the listening task.

For the test section (items 1 through 20), the emotions anger, sorrow, joy, and fear were varied in order of presentation (see Figure 1). Each test emotion was presented five different times. The responses to the 20 items were used as the criterion measure for the data analysis.

The second part of the test instrument included a separate 5" x 7" high-quality photograph for each simulated emotion on the audio tape. Each photograph had the actress simulating an emotion in relationship to a stuffed animal. Each photograph was mounted on a separate card.

C. VERIFICATION OF THE TEST ITEMS

The entire set of stimuli for the emotions test (24 items) was spoken twice and recorded twice (48 items), so that the best items could be selected.

To validate the test instrument prior to data collection, three panels evaluated the test items. The first panel had five normal hearing adults (screened at 25 dB HTL, ANSI, 1969, for 1000, 2000, and 4000 Hz). The items were presented with a tape recorder (Ampex, model AG440B), a custom

Practice Section

1. The cat is sleeping on the floor. (surprise)
2. The cat is sleeping on the floor. (disgust)
3. The dog is chewing on his bone. (surprise)
4. The dog is chewing on his bone. (disgust)

Test Section

1. The baby is sleeping in his bed. (sorrow)
2. The man is drinking a glass of milk. (fear)
3. The puppy is running out the door. (joy)
4. The girl is eating a hamburger. (joy)
5. The boy is riding his bicycle. (anger)
6. The man is drinking a glass of milk. (sorrow)
7. The baby is sleeping in his bed. (fear)
8. The puppy is running out the door. (anger)
9. The boy is riding his bicycle. (fear)
10. The girl is eating a hamburger. (anger)
11. The girl is eating a hamburger. (joy)
12. The puppy is running out the door. (fear)
13. The man is drinking a glass of milk. (sorrow)
14. The baby is sleeping in his bed. (joy)
15. The boy is riding his bicycle. (fear)
16. The man is drinking a glass of milk. (joy)
17. The baby is sleeping in his bed. (sorrow)
18. The puppy is running out the door. (anger)
19. The girl is eating a hamburger. (anger)
20. The boy is riding his bicycle. (sorrow)

Figure 1. A Test of Emotion Discrimination (TED)

power amplifier, and a loudspeaker (Amprex System, model 22), at a most comfortable loudness level. There were eight practice items and forty test items. This panel had a list of two emotions to choose from (surprise, disgust) during the practice section, and four emotions to choose from (anger, sorrow, joy, fear) during the test section. (see Appendix E.) The practice and test sections were presented individually and evaluated separately. Their task was to select the emotion from the appropriate list which best represented the stimuli presented. They also judged the strength of each simulated emotion on a scale of one to five, with one being the weakest and five being the strongest representation of the emotion.

For each emotion and each sentence, the item with the highest percent correct (100 percent) and the highest overall rating (between 3.4 and 5.0) was selected as the best recording of that emotion. These items were dubbed from one tape recorder (Ampex, model AG440B) to a second tape recorder (Sony, model TC-377). The final test tape had 24 items, which included 4 practice items and 20 test items. There was a problem in the randomization of the test sentences and the test emotions. Each sentence did not have one example of each test emotion. There were five examples of each of the four test emotions, but they were not equally divided among the sentences. This problem was considered to have a minimal effect on the outcome of the scores because all the sentences had the same grammatical structure, the same number of syllables, and each child had passed a pre-test demonstrating an understanding of the language content of each sentence.

The photograph of each simulated emotion was verified by the panel using a similar procedure. Each photograph was presented individually

to the panel. Their task was to select the emotion of the photograph. There were four photographs of each simulated emotion.

The photograph with the highest percent correct (100 percent) and the highest overall rating (3.8 to 5.0) for each emotion was selected. This photograph was assumed to be the best example of that emotion. For the final selection, there were six photographs, two photographs for the practice section (see Appendix F), and four for the test section (see Appendix G).

The second panel for the verification consisted of three 6-year olds with normal hearing (screened at 25 dB HTL, ANSI, 1969, for 1000, 2000, and 4000 Hz). The children's panel only verified the six photographs selected earlier by the adult panel. For example, the two photographs for the practice section were placed in front of the child. The child was instructed to "Show me surprise; Show me disgust." The child pointed to one photograph for each. Next the four photographs for the test section were placed in front of the child. The child was instructed to "Show me mad (anger); Show me sad (sorrow); Show me happy (joy); Show me afraid (fear)." The child pointed to one photograph for each. The result of the photograph verification procedure was 100 percent correct for each child.

The third panel for the verification consisted of ten normal hearing adults (screened at 25 dB HTL, ANSI, 1969, for 1000, 2000, and 4000 Hz). The final test instrument was administered to the panel. All test items were 70 percent correct or higher, with the exception of item #4 which was 40 percent. The overall mean percent correct for the four emotions was: Anger, 100 percent; Sorrow, 96 percent; Joy, 94 percent; and Fear, 80 percent.

D. TESTING THE SUBJECTS

Prior to presenting the emotions test, a screening test was administered to each child to evaluate the child's understanding of the language content of the test sentences (two for the practice section, and five sentences for the test section). This was done using a microphone (Spher-O-Dyne, model 533SB), a custom power amplifier, and headsets (Koss, model K6LC) adjusted to a most comfortable loudness level.

A 5" x 7" drawing that illustrated the content of each of the seven sentences was made by a local artist. The two drawings for the practice section (see Appendix H) were placed in front of each child. The examiner spoke each of the two practice sentences with no specific emotion in the voice. The child pointed to the drawing which represented what he or she had heard. No visual cues were used. The same procedure was used for the test sentences. The five drawings (see Appendix I) were placed in front of the child, and the examiner spoke each of the five test sentences. The child pointed to the picture which showed what he or she had heard.

Each child had to score 100 percent correct on both the practice and the test sections. All of the children passed the screening test.

After rapport was established, the emotions test was administered individually. The hearing impaired children were tested in a sound-treated room at the Verbo Tonal Program at the University of Tennessee Clinic. The normal hearing children were tested in a quiet room at their respective schools. Pure tone screening audiometry was completed on the normal hearing children using an audiometer (Beltone, model 10-D), with TDH-39 earphones in MX-41/AR cushions, before administering the emotions test.

A tape recorder (Sony, model TC-377) with a broad band custom power amplifier was used to deliver the test items. Headsets (Koss, model K6LC) were worn during the testing by both hearing impaired and normal hearing children. (See Appendix J.) Each test item was presented at a most comfortable loudness level. Later, the sound pressure level output at the headset was measured with a sound level meter (Bruell and Kjaer, model 2203), an artificial ear (model 4152), and a condenser microphone (model 4144). This information is presented in Table 3.

During the practice section of the emotions test, each child was trained to perform the task. The two practice photographs (surprise, disgust) were placed in front of the child. The examiner demonstrated each practice emotion two times for a total of four stimuli as the child observed. Visual and auditory cues were available to the child. The child was instructed to "point to the picture that looks like my face."

The next part of the practice section involved listening to the audio tape. The child listened to the practice item and then pointed to the photograph which represented the emotion which was perceived. This was done with the photographs in front of the child while listening to the pre-recorded items. Each practice item was presented two times for a total of eight practice items. The practice section trained the child to listen and select one photograph. When the child demonstrated three consecutive responses, the test section began.

During the test section of the emotions test, the four photographs (anger, sorrow, joy, fear) were placed in front of the child. Throughout the test, the examiner randomly re-arranged the photographs after every five test items had been presented. For scoring the test, the examiner

Table 3. Presentation Level of Test of Emotion Discrimination (TED) in dB SPL

Subject	RE	LE	Subject	RE	LE
1	126	127	11	94	95
2	126	127	12	93	95
3	123	124	13	92	93
4	96	97	14	89	91
5	100	100	15	89	89
6	112	112	16	88	90
7	117	118	17	90	90
8	115	116	18	89	90
9	116	119	19	89	94
10	116	118	20	92	94
$\overline{X}$ =	114.7	115.8	$\overline{X}$ =	90.5	90.2
Range =	96-126	97-127	Range =	88-94	89-95

judged each response (pointing) as correct or incorrect. The examiner also noted the picture item that was selected. The percent correct for the 20 test items represented the test score on the TED. This criterion measure was used for the hypotheses testing.

During the testing, the examiner was relaxed, pleasant, and supportive of the children as they performed the tasks. The examiner randomly reinforced the child with comments such as "good pointing," "good listening," "good try," and "you're doing a good job." There was no verbal or visual reinforcement to indicate whether the child's responses were correct or incorrect. The practice and test sections were completed within 20 minutes by most children.

CHAPTER III

RESULTS AND DISCUSSION

A. RELIABILITY

Two subjects from each group were randomly selected and tested one week later in order to evaluate test-retest agreement. These results are listed in Table 4.

Table 4. Test-Retest Scores on the Test of Emotion Discrimination (TED) in Percent Correct as Judged by the Examiner

	TED			
Subject	Test	Retest	Difference	Percent Agreements
3	50	40	-10	70
5	50	65	15	85
17	85	80	- 5	95
19	55	80	25	65

The difference in test-retest scores on the TED ranged from 5 to 25 percent. Two of the retest scores were lower and two of the retest scores were higher. The percent of agreements ranged from 65 to 95 percent. The percent of agreements were considered reasonable and within the limits of this testing procedure because of the difficulty of the test.

Inter-judge agreement was evaluated by having one graduate student evaluate the responses of a child during one test session, and another graduate student evaluate a child in another test session. The percent agreement between the examiner and these two graduate students was

100 percent for both test sessions. This result suggested that the examiner is in agreement with others in scoring the responses. Therefore, the test scores of the examiner were used for the statistical analyses.

B. COMPARISON BETWEEN HEARING IMPAIRED AND NORMAL HEARING CHILDREN

The purpose of this study was to compare the ability of hearing impaired and normal hearing children to discriminate among four emotions through listening to speech. The Test of Emotion Discrimination (TED) was used for this comparison.

The percent correct on the TED for the hearing impaired and normal hearing children are shown in Tables 5 and 6, respectively. The mean percent correct of the normal hearing subjects (68 percent) was significantly greater ($t=3.88$; $df=18$; $p < 0.05$) than the mean percent correct of the hearing impaired subjects (44 percent). Therefore, Hypothesis 1 was rejected (see Appendix A). This suggests that normal hearing children are more capable of discriminating among emotions through listening than hearing impaired children of similar ages and socioeconomic background (see Figure 2).

In comparison, the mean percent correct for hearing impaired adults (N=2) was 76 percent, and the mean percent correct for normal hearing adults (N=10) was 92 percent (see Figure 2). The adults scored noticeably better than the children which suggests the listening skills for identifying emotions is related to the age and/or linguistic skills of the listeners. The test scores for the adults were obtained for comparing with the children, and were not used for the statistical analyses.

For the emotion "anger," the range of responses for the hearing impaired children (20-100 percent correct) was larger than the range for

Table 5. Test Scores of Hearing Impaired Children on the Test of Emotion Discrimination (TED) in Percent Correct

Subject Number	Anger % (5 items)	Sorrow % (5 items)	Joy % (5 items)	Fear % (5 items)	Total % (20 items)
1	60	40	40	20	40
2	100	20	20	80	55
3	40	60	60	40	50
4	80	0	20	20	30
5	100	60	0	40	50
6	20	80	20	40	40
7	60	0	20	20	25
8	60	20	20	60	40
9	60	0	60	40	40
10	100	60	60	60	70
$\overline{X}$	68	34	32	42	44
Median	60	30	20	40	40
SD	26.98	29.89	21.50	19.89	12.87
Range	20-100	0-80	0-60	20-80	25-70

Table 6. Test Scores of Normal Hearing Children on the Test of Emotion Discrimination (TED) in Percent Correct

Subject Number	Anger % (5 items)	Sorrow % (5 items)	Joy % (5 items)	Fear % (5 items)	Total % (20 items)
11	80	40	60	40	55
12	100	20	20	80	55
13	100	20	100	80	75
14	100	40	80	40	65
15	100	40	100	60	75
16	100	100	100	80	95
17	100	80	80	80	85
18	80	20	60	40	50
19	100	20	60	40	55
20	100	20	100	60	70
$\overline{X}$	96	40	76	60	68
Median	100	30	80	60	67.5
SD	8.43	28.28	26.33	23.09	14.76
Range	80-100	20-100	20-100	40-80	50-95

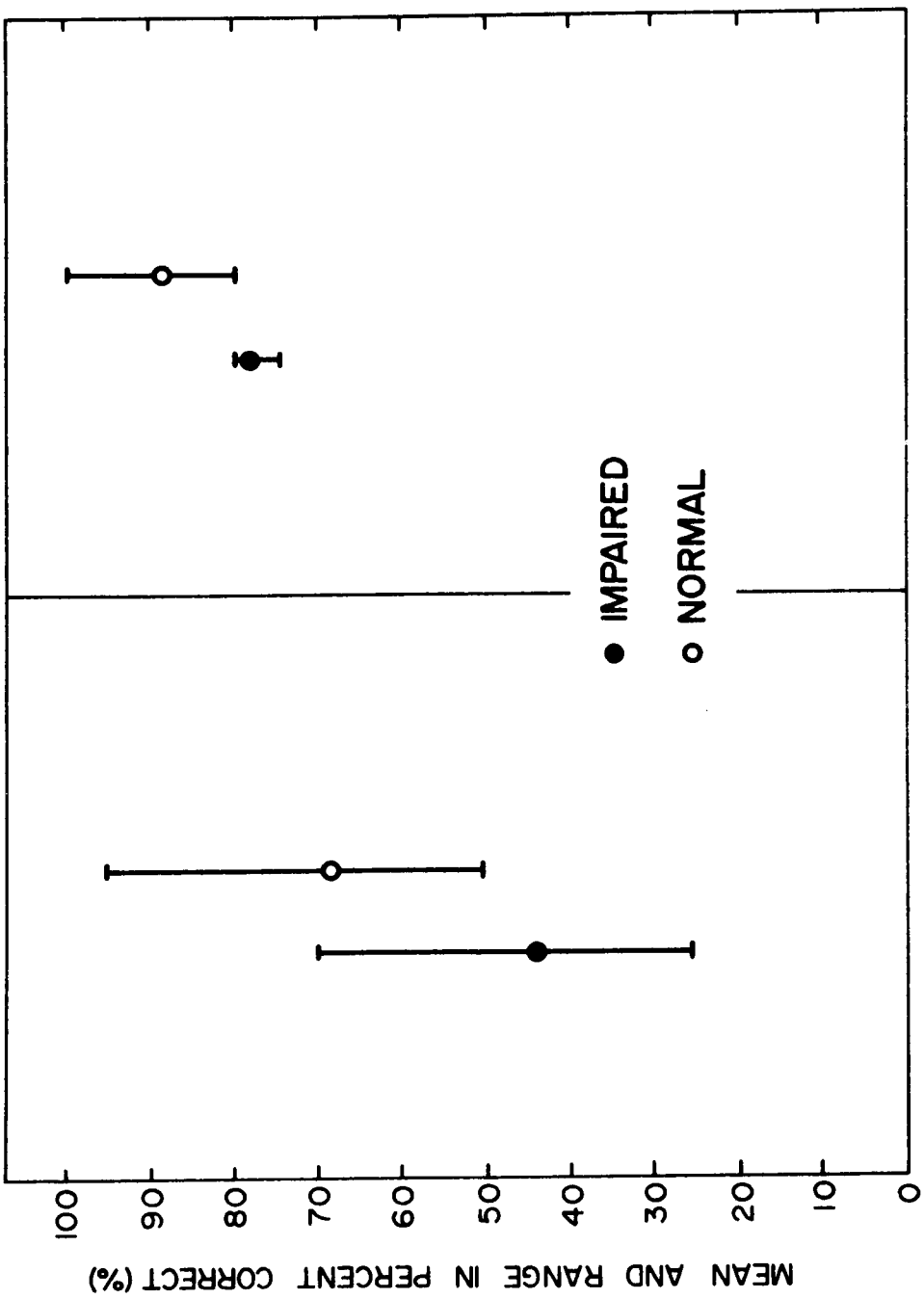


Figure 2. A comparison of the mean percent correct for each group on the test of emotion discrimination (TED).

the normal hearing children (80-100 percent correct). (See Figure 3.) The mean percent correct for the hearing impaired children on "anger" (68 percent)was the highest score for any emotion on the TED. The mean percent correct for the normal hearing children and adults were similar. The emotion of "anger" was identified best by all groups.

For the emotion "sorrow," the range of responses for the hearing impaired children (0-80 percent correct) was similar to the range of responses for the normal hearing children (20-100 percent correct). The mean percent correct for the hearing impaired children (34 percent) was also similar to the mean percent correct for the normal hearing children (40 percent). These similarities between hearing impaired and normal hearing children are in contrast to the range (80-100 percent correct) and mean percent correct (96 percent) for the adult listeners. This suggests that the emotion "sorrow" was quite difficult to discriminate through listening for both groups of children, whereas it was relatively easy for the normal hearing adults.

For the emotion "joy," the range for the hearing impaired children (0-60 percent correct) was slightly less than the range for the normals (20-100 percent correct). The mean percent correct for the hearing impaired children (32 percent) was considerably less than the mean percent correct for the normals (76 percent). The normal hearing childrens' scores approached those for the normal hearing adults (94 percent), but the range of scores were different. The normal hearing children were noticeably better than the hearing impaired children, but both groups had a wide range of responses.

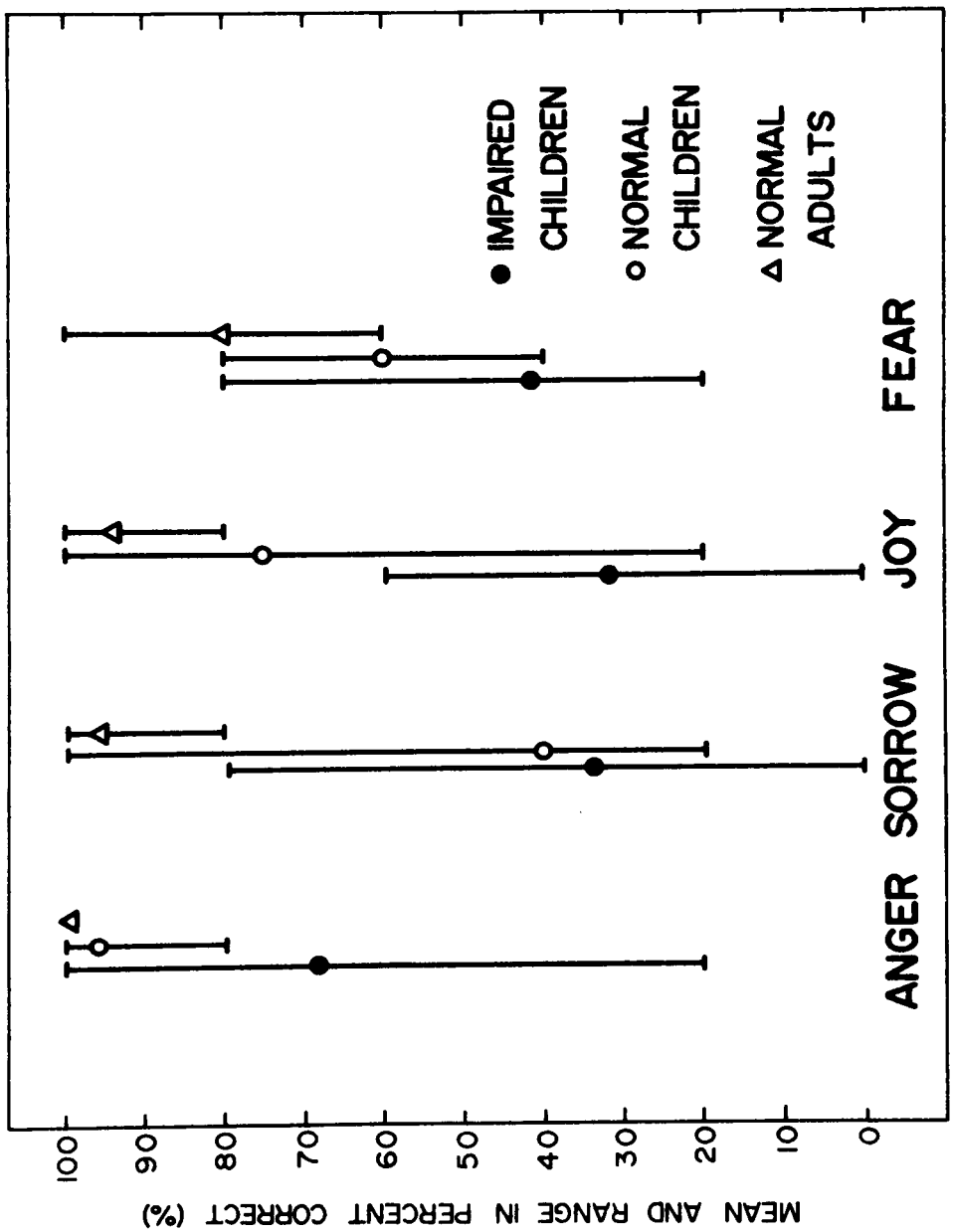


Figure 3. A comparison of the mean percent correct for the individual emotions on the test of emotion discrimination (TED).

For the emotion "fear," the range of scores for the hearing impaired children (20-80 percent correct) was slightly greater than the range of responses for the normal hearing children (40-80 percent correct). The mean percent correct for the hearing impaired children (42 percent) was less than the mean percent correct for the normal hearing children (60 percent). While the mean percent correct for the normal hearing adults (80 percent) was greater than both groups of children, the range of the scores (60-100 percent correct) was similar. This suggests that the emotion of "fear" was the most difficult to discriminate for all three groups.

C. PERCENT CORRECT ON THE TED FOR INDIVIDUAL PAIRS

The overall percent scores on the TED are shown for both the hearing impaired children and the normal hearing children in Figure 4. The scores are presented for "matched" pairs of children. For eight of the "matched" pairs, the hearing impaired child scored less than the normal hearing child. For two of the "matched" pairs (pair 2/12 and 10/20), the hearing impaired child scored the same as the normal hearing child. These results suggest that despite significant hearing losses (88 dB and 73 dB respectively), these two hearing impaired children were able to discriminate among emotions through listening with similar skill.

The overall percent scores for each emotion on the TED are shown in Figures 5, 6, 7, and 8, according to "matched" pairs. For the emotion of "anger," the hearing impaired child in each pair scored less than the normal hearing child, except for the pairs 2/12, 5/15, and 10/20 (see Figure 5).

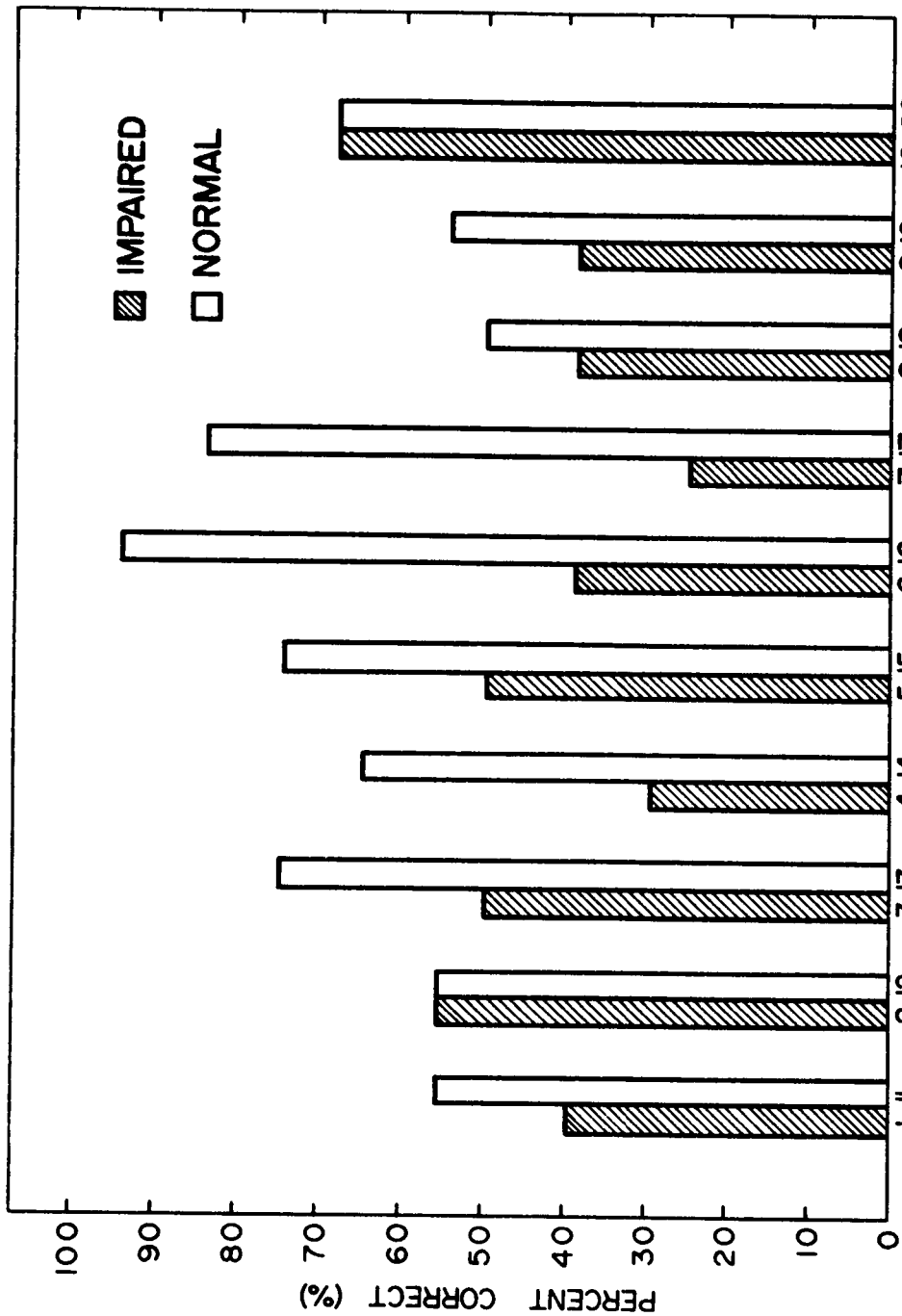


Figure 4. A comparison of the total percent correct scores on the test of emotion discrimination (TED) for the hearing impaired and normal hearing groups.

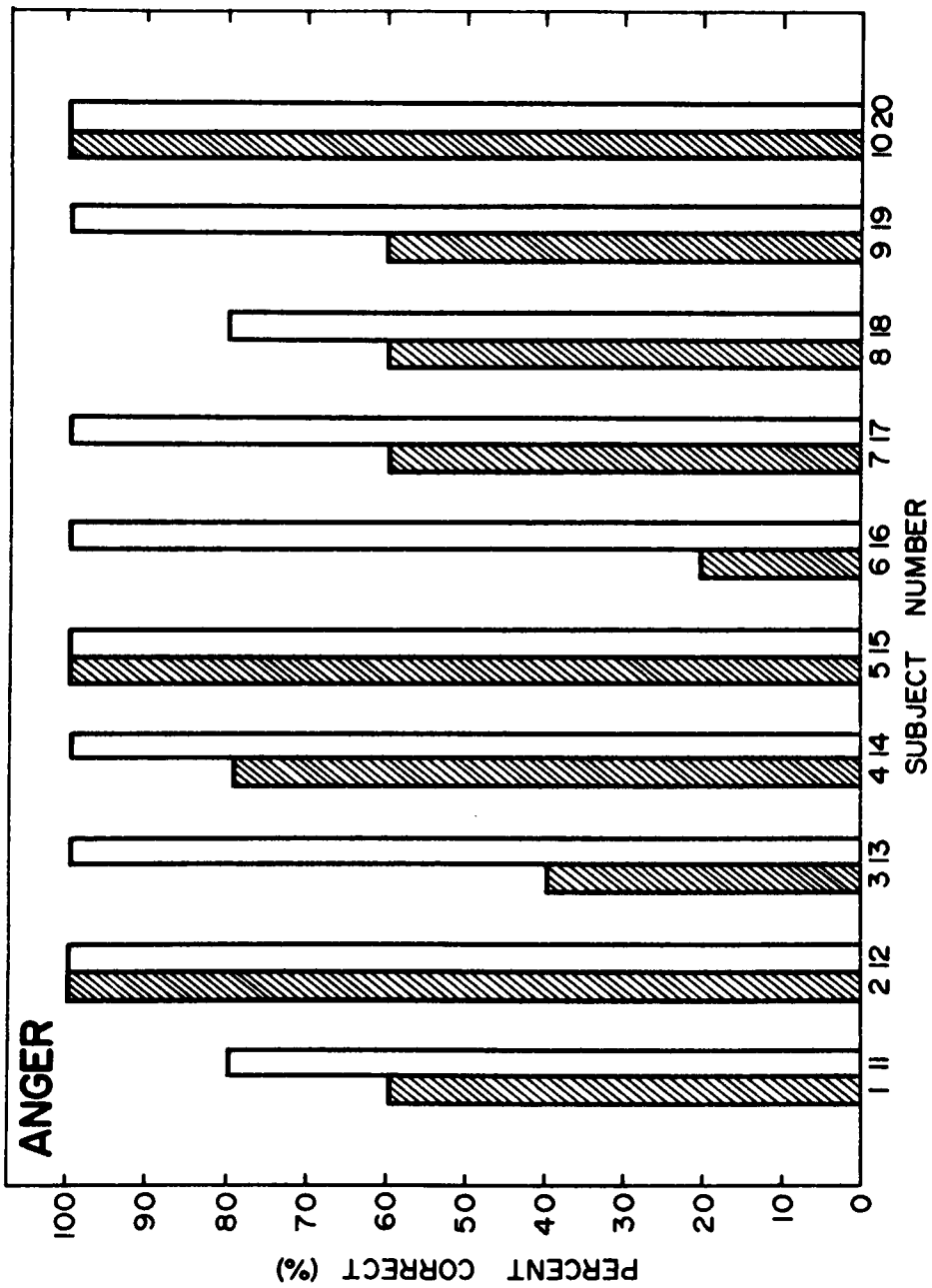


Figure 5. A comparison of the total percent correct for "anger" on the test of emotion discrimination (TED) for the hearing impaired and normal hearing groups.

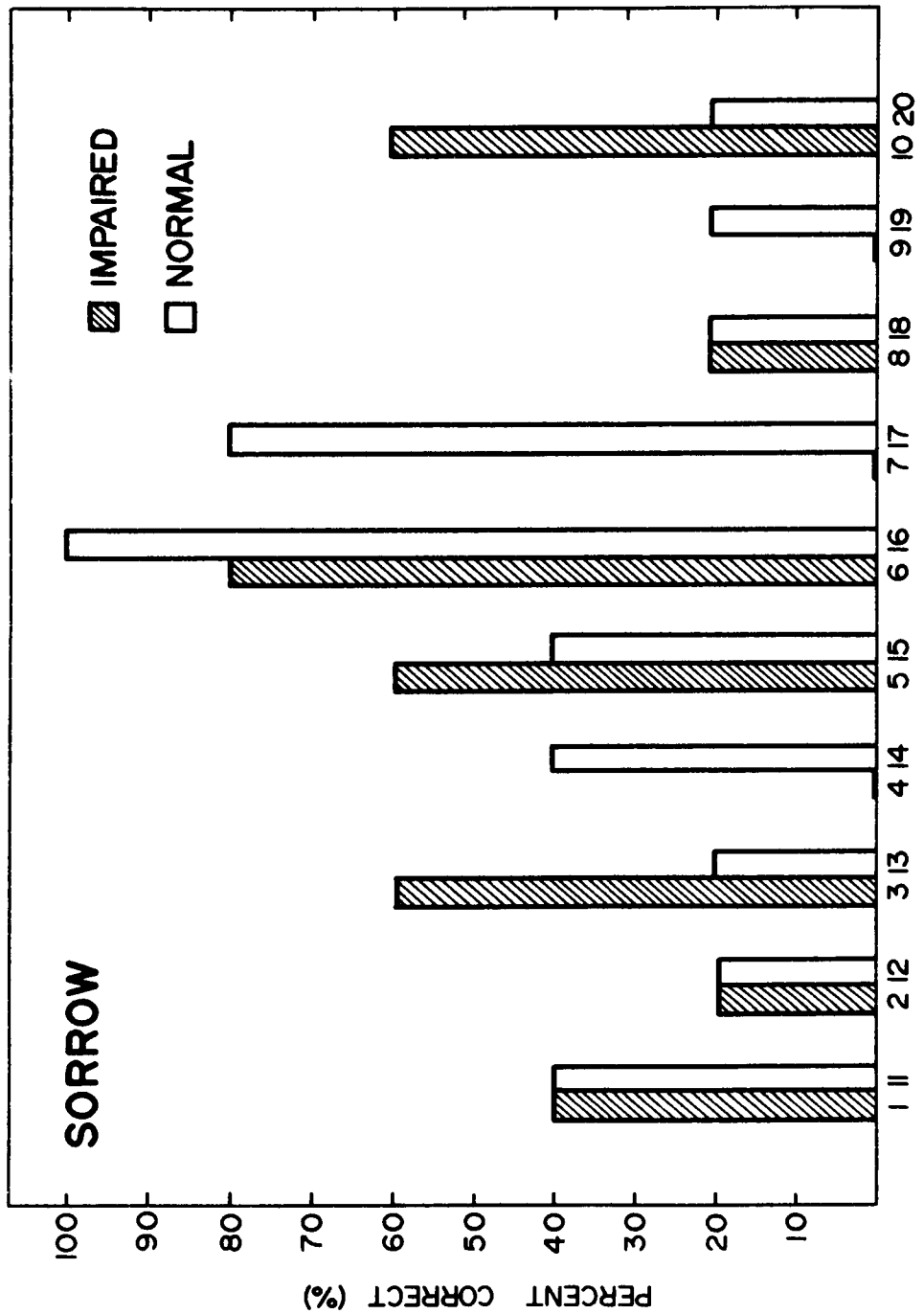


Figure 6. A comparison of the total percent correct for "sorrow" on the test of emotion discrimination (TED) for the hearing impaired and normal hearing groups.

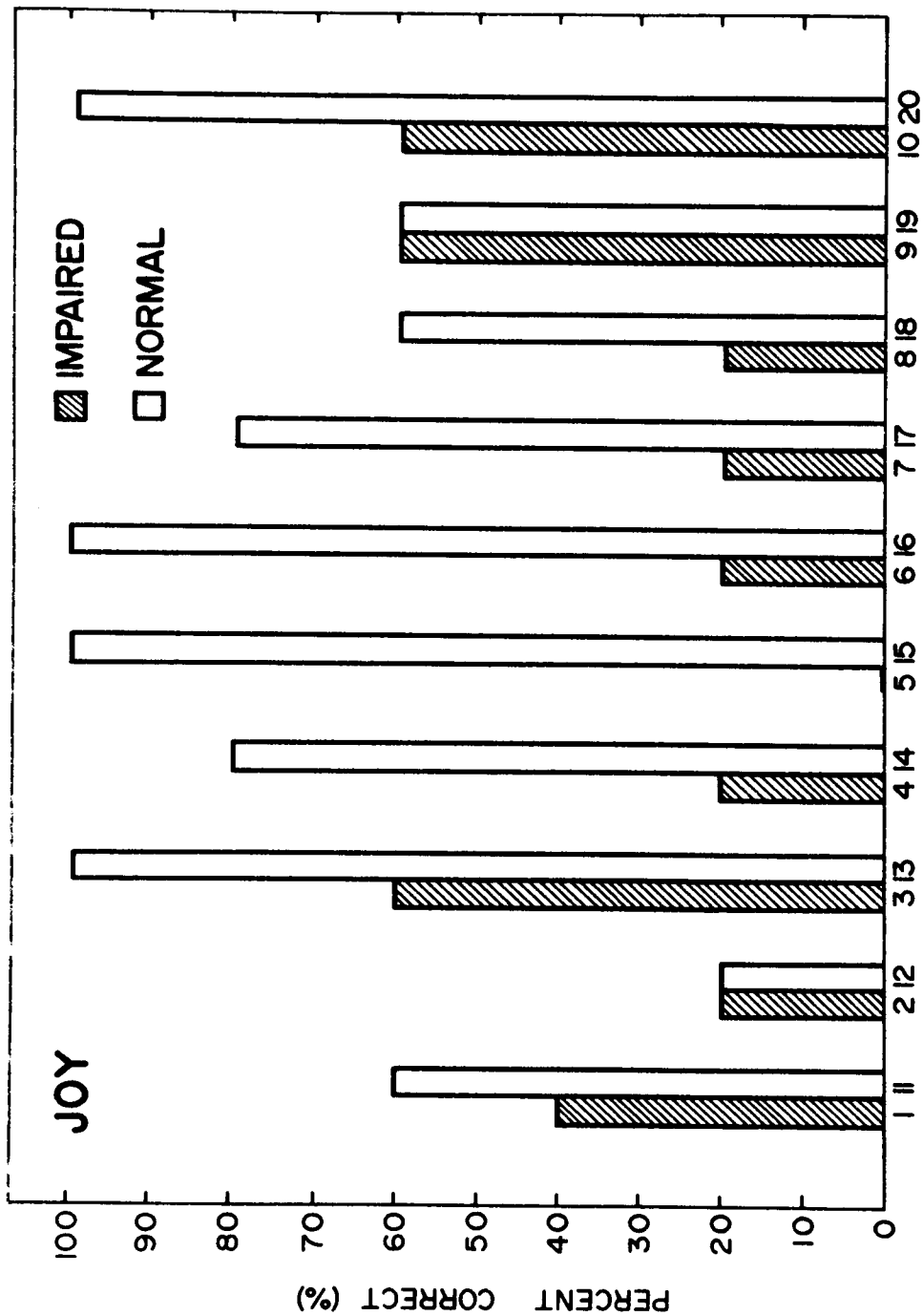


Figure 7. A comparison of the total percent correct for "joy" on the test of emotion discrimination (TED) for the hearing impaired and normal hearing groups.

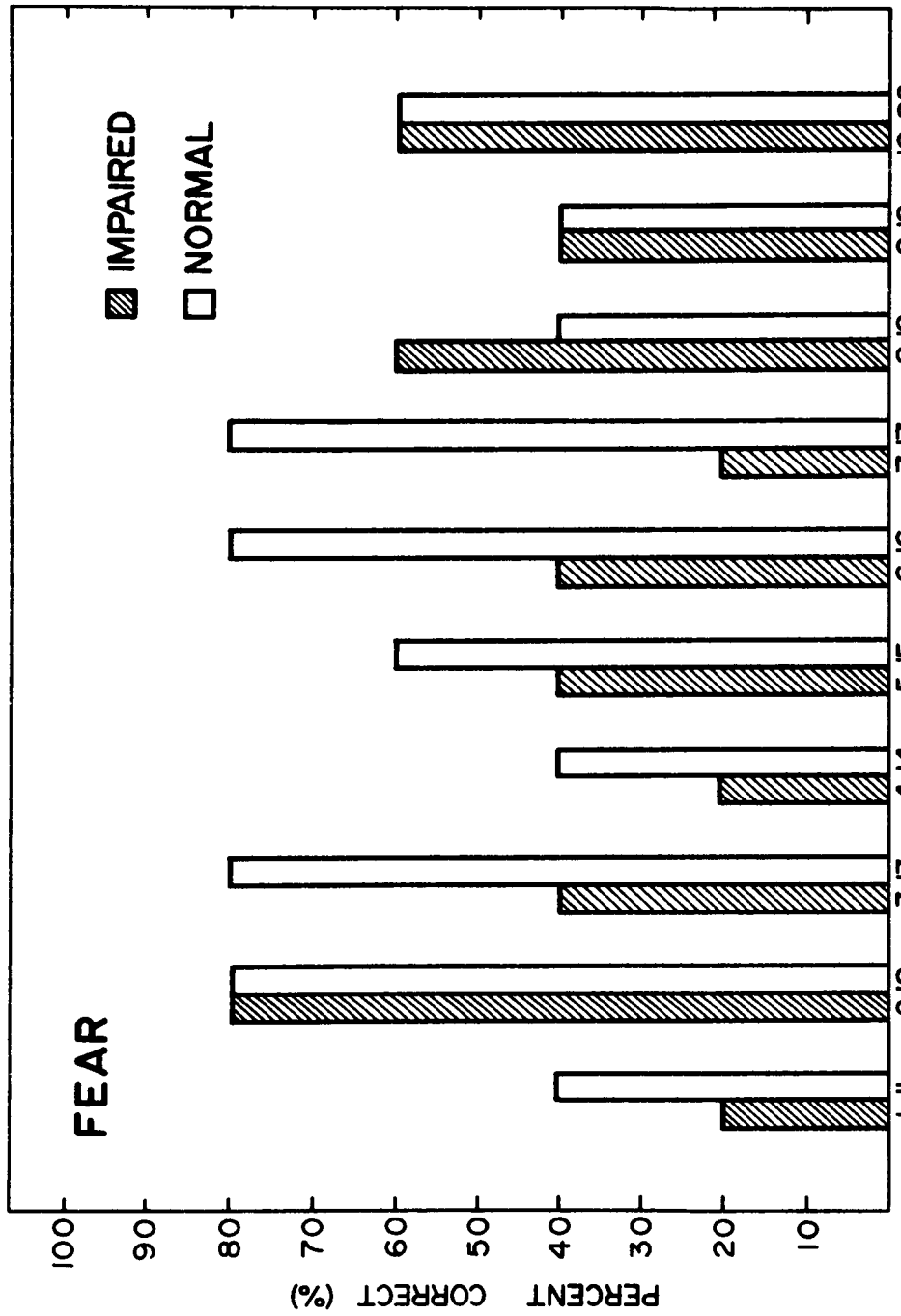


Figure 8. A comparison of the total percent correct for "fear" on the test of emotion discrimination (TED) for the hearing impaired and normal hearing groups.

For the emotion of "sorrow," there was great variability in the scores. (see Figure 6) For the pairs 6/16, 4/14, 7/17, and 9/19, the hearing impaired child scored less than the normal hearing child. For the latter three pairs, each of the hearing impaired children scored 0 percent correct. The hearing impaired children of the pairs 3/13, 5/15, and 10/20 scored better than the normal hearing children. On the remaining three pairs (1/11, 2/12, and 8/18), the hearing impaired children scored the same as their normal hearing peer.

For the emotion of "joy," the hearing impaired child in each pair scored less than the normal hearing child, except for pairs 2/12, and 9/19. (See Figure 7.) On these latter two pairs, both the hearing impaired child and the normal hearing child scored the same (20 percent for the first pair and 60 percent for the second pair).

For the emotion of "fear," there was some variability in the scores. (See Figure 8.) For six pairs of children (1/11, 3/13, 4/14, 5/15, 6/16, and 7/17), the hearing impaired child scored less than the normal hearing child. For the pairs 2/12, 8/18, 9/19, and 10/20, the hearing impaired child scored equal or higher than the normal hearing child (80 percent, 60 percent, 40 percent and 60 percent respectively).

The results of the four emotions are shown for the hearing impaired (see Figure 9) and the normals (see Figure 10). In a comparison, subject pair 2/12 was similar. Subject pair 9/19 were the same on "joy" and "fear," while subject paired 10/20 scored the same on "anger" and "fear." These results suggest that subject pair 2/12 could discriminate all four emotions through listening with the same degree of accuracy, despite the hearing impaired child's hearing loss of 88 dB. Subject pair 9/19 and 10/20 could discriminate among two selected emotions through listening with the same

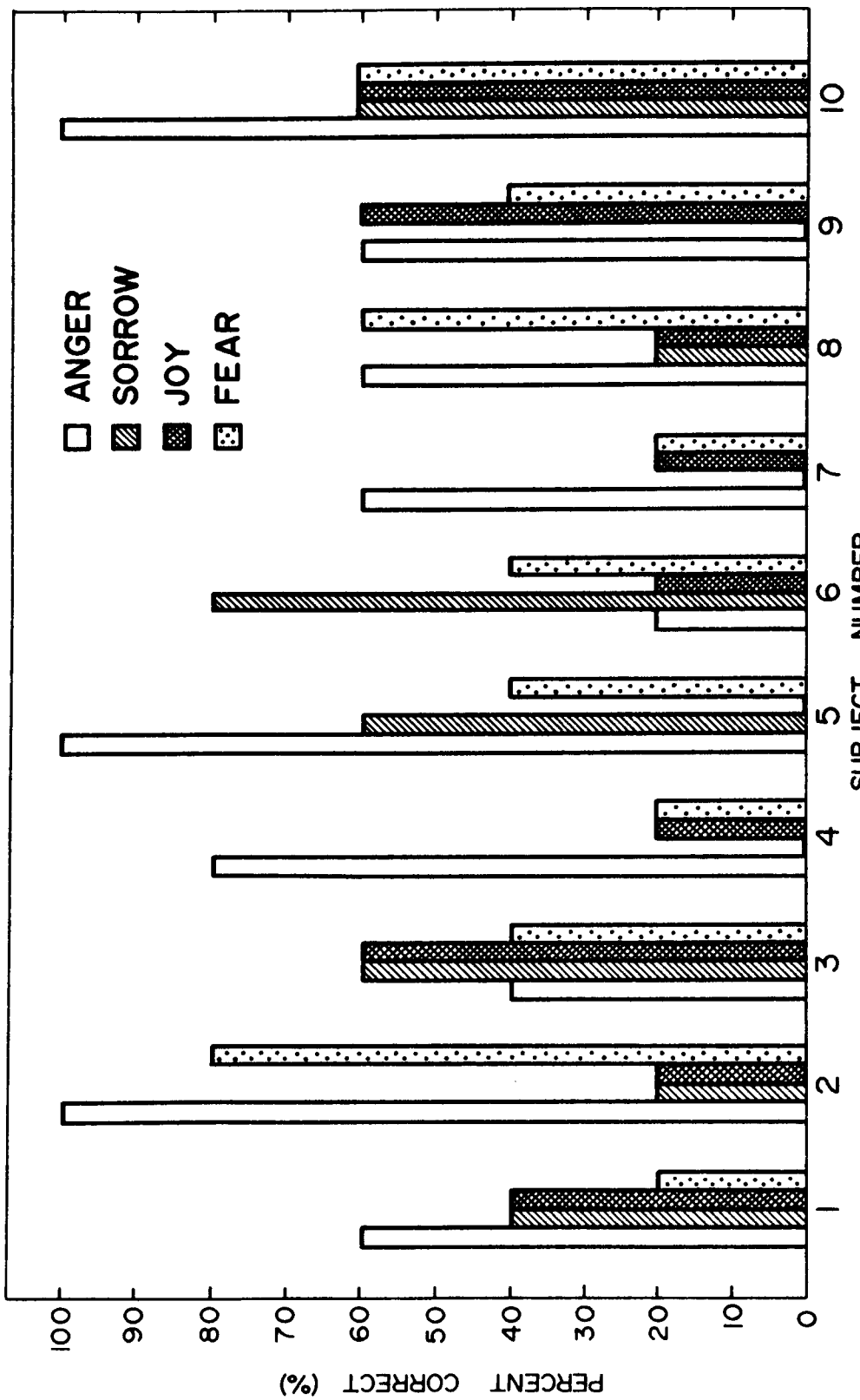


Figure 9. A comparison of the four emotions on the test of emotion discrimination (TED) for hearing impaired children.

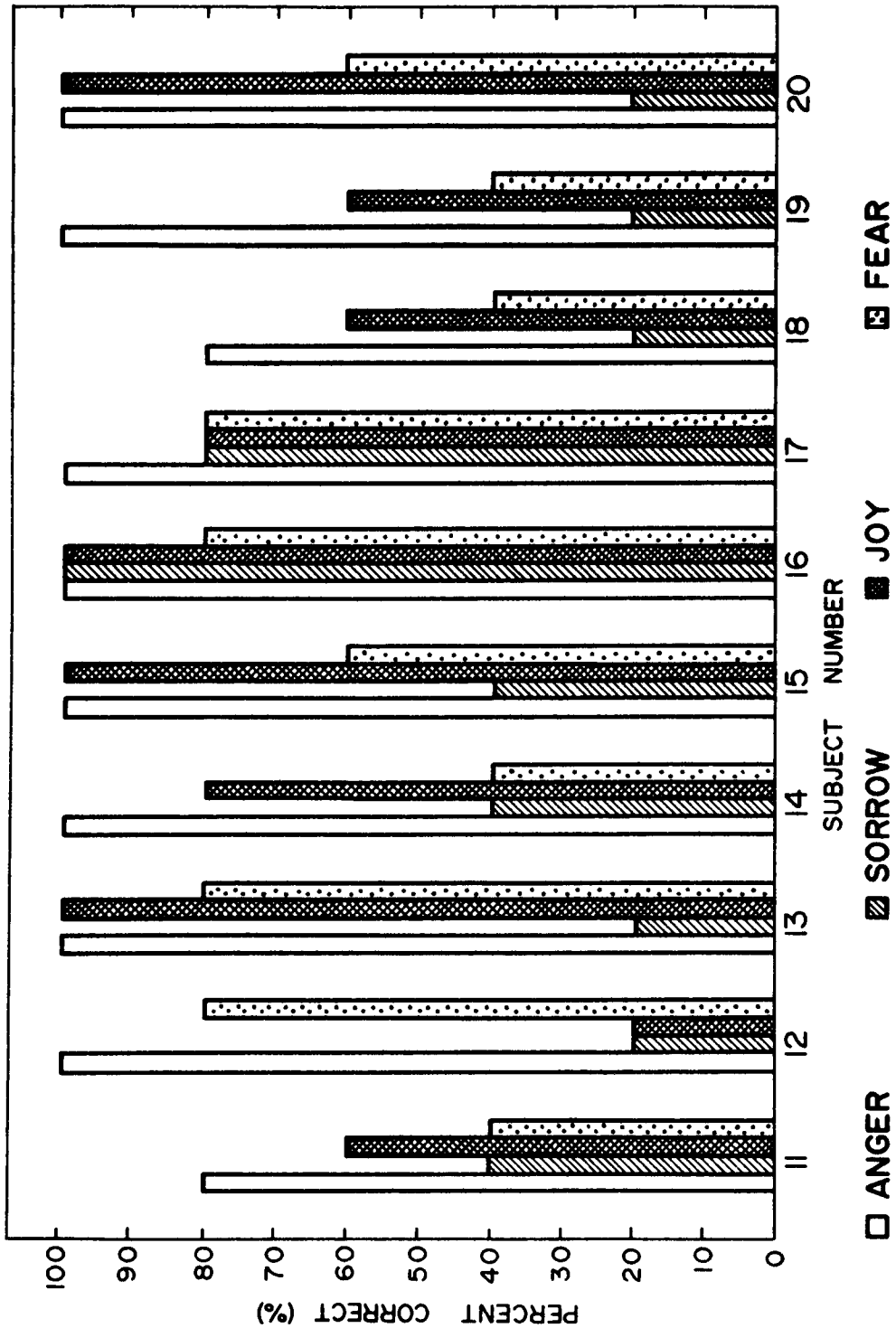


Figure 10. A comparison of the four emotions on the test of emotion discrimination (TED) for normal hearing children.

degree of accuracy despite the hearing impaired subjects' hearing loss of 100 dB and 73 dB, respectively.

D. PERCEPTION OF EMOTIONS

The perception of the four emotions on the TED varied between the groups. Due to the wide range of the childrens' test scores, it is difficult to draw firm conclusions. The range of scores for the normal hearing adult listeners were much smaller overall.

The emotion "anger" was identified best by all groups. This result suggests that the acoustic information in the suprasegmentals was relatively easy for all groups to use in identifying the emotion.

The emotion "sorrow" was quite difficult to discriminate through listening for both groups of children, whereas it was relatively easy for the normal hearing adults. This suggests that the acoustic information available in "sorrow" is more subtle, and takes more listening experience to be able to use it effectively.

The emotion "joy" was relatively easy for the normal hearing adults to discriminate. The normal hearing children were noticeably better than the hearing impaired children, but both groups had wide ranges of responses. This result suggests that the information available in "joy" is also subtle and demands listening experience as evidenced by the range of responses. The normal hearing children were able to use the subtle cues better than the hearing impaired children.

The emotion "fear" was also difficult for all three groups. The acoustic information available is more difficult to use in discriminating this emotion.

In testing both groups of children, there was a fairly consistent error pattern between "fear" and "sorrow." This pattern was not observed in the adult group. If hearing impaired children made an error on discriminating "sorrow," 44 percent of the time they chose "fear." A similar pattern occured with "fear." If the child made an error in discriminating "fear," 28 percent of the time it was identified as "sorrow."

If the normal hearing children made an error in discriminating "sorrow," 50 percent of the time they chose "fear." If the child made an error in discriminating "fear," 26 percent of the time it was identified as "sorrow."

A spectrographic analysis is needed to determine the similarities and differences among the four emotions. This could be handled in a future study.

E. THE RELATIONSHIP OF TED SCORES WITH OTHER FACTORS

For hearing impaired children, a Pearson product moment correlation coefficient (Bruning and Kintz, 1968) was calculated between the scores on the TED and the following factors: (a) hearing level ($r=0.12$; $df=8$; $p > 0.05$); (b) amount of Verbo Tonal training in a group ($r= -0.17$; $df=8$; $p > 0.05$); (c) chronological age ($r=0.37$; $df=8$; $p > 0.05$); and (d) socio-economic background ($r=0.58$; $df=8$; $p > 0.05$). For the normal hearing children, the correlation coefficients were (a) chronological age ($r=0.42$; $df=8$; $p > 0.05$); and socioeconomic background ($r= -0.18$; $df=8$; $p > 0.05$).

A Point-biserial correlation coefficient (Bruning and Kintz, 1968) was calculated between the scores on the TED and the hearing impaired

children's sex ($r=0.33$; $df=8$; $p > 0.05$); between the scores on the TED and the normal hearing children's sex ($r=0.00$; $df=8$; $p > 0.05$).

All of the above correlation coefficients were not significant. Therefore, Hypotheses 2 and 3 were not rejected. (See Appendix A.)

The correlation between the hearing impaired childrens' scores on the TED and the hearing level ($r=0.12$) was not significant. This suggests that the ability to listen and discriminate among emotions is not related to the detection threshold of hearing as measured by pure tone audiometry for these hearing impaired children. It does not appear to be related to how much hearing sensitivity a child has, but rather how that child uses the hearing sensitivity available to derive meaning from speech.

The correlation between the hearing impaired childrens' score on the TED and the length of time of Verbo Tonal training ($r= -0.17$) was not significant. All of these hearing impaired children were mainstreamed after they had developed good oral communication skills. The length of time for each child to satisfy this criteria varied from 9 months to 67 months. This may explain the low correlation coefficient. The level of oral communication skills may be the most important factor in the ability to discriminate among these four emotions.

The correlation between the hearing impaired childrens' score on the TED and chronological age ($r=0.37$), and the correlation between the normal hearing childrens' score and age ($r=0.42$) were not significant, but were of sufficient magnitude to be considered for discussion. As children grow older, they have more chances to experience various listening situations in which the emotional content of speech is a large part of the communication. If the hearing impaired children are trained to develop good listening

skills, they may be more successful in discriminating among emotions of a speaker. This idea is supported by a comparison of the childrens' scores and the adults' scores. Adults, both hearing impaired and normal hearing, scored considerably higher on the TED.

The correlation for the childrens' score on the TED and socioeconomic background was r=0.58 for the hearing impaired, and r= -0.18 for the normal hearing subject. While neither were significant, the coefficient of the hearing impaired group was of sufficient magnitude to be considered for discussion. Within the group, the upper middle class scored 36 percent correct (N=4), the lower middle class scored 46 percent correct (N=4), and the upper lower class scored 55 percent correct (N=2). These results suggest that the lower socioeconomic group scored better on the TED. This may be due to a more open expression of emotions which is characteristic of the lower class. The middle class is influenced more by social norms, and may not openly vent their emotions in the same way as the lower class. It also appears that the socioeconomic background of the hearing impaired child is more crucial in the development of listening skills than for the normal hearing child.

The correlation for the hearing impaired childrens' score on the TED and the child's sex (r=0.33), and the correlation for the normal hearing children (r=0.00) were not significant. This result suggests that whether the child is male or female, the child's sex is not related to the ability to discriminate among emotions through listening.

CHAPTER IV

SUMMARY AND CONCLUSIONS

A. SUMMARY

A Test of Emotion Discrimination (TED) was constructed to measure the ability of ten hearing impaired children (trained in the Verbo Tonal method) and ten matched normal hearing children to discriminate among four primary emotions through listening. The TED consisted of 20 test items. Each pre-recorded sentence was spoken with one of four simulated emotions: (1) anger, (2) sorrow, (3) joy, or (4) fear. The children listened to the sentence and pointed to one of the four photographs of a woman simulating the same emotion. The pointing responses were recorded by the examiner and two independent judges. The TED was found to be a reliable test. The normal hearing children scored significantly better than the hearing impaired children. "Anger" was the best identified emotion while "fear" was the most difficult to identify for both groups. The normal hearing children scored significantly better on "joy" than the hearing impaired children, but did approximately the same on "sorrow." The hearing impaired child in two matched pairs (2/12 and 10/20) scored the same overall percent correct on the TED as the normal hearing child, despite significant hearing losses. The hearing impaired child in pair 2/12 scored the same percent correct on each of four emotions on the TED. The correlation between the hearing impaired childrens' scores on the TED and chronological age ($r=0.37$), and the correlation between normal hearing childrens' score and age ($r=0.42$) were not significant, but were of sufficient magnitude to suggest that a relationship might exist. The correlation for the childrens' score on the TED

and socioeconomic background was r=0.58 for the hearing impaired, and r= -0.18 for the normal hearing subjects. While neither were significant, a trend does appear to exist. The socioeconomic background of the hearing impaired child seems more important in the development of listening skills than for the normal hearing child. The correlation between the hearing level (r=0.12), and the correlation between TED scores and length of time in Verbo Tonal training (r= -0.17) were not significant. All of the hearing impaired children were mainstreamed into regular public school classrooms after they had developed good oral communication skills. The most important factor in the ability to discriminate among the four emotions through listening may be the hearing impaired child's level of oral communication skills.

B. CONCLUSIONS

The results of this study suggest the following conclusions:

1. The normal hearing children scored better on discriminating emotions than the hearing impaired children of similar ages and socioeconomic backgrounds.
2. Adults who were hearing impaired or normal hearing scored noticeably better than the children who were hearing impaired or normal hearing. This suggests that the listening skills for identifying emotions is related to the age and/or linguistic skills of the listeners.
3. The order of difficulty in discriminating among emotions was anger, fear, sorrow, and joy for the hearing impaired children. For the normal hearing children, the order was anger, joy, fear, and sorrow. The order for the normal hearing adults was anger, sorrow, joy, and fear.

4. The socioeconomic background of the hearing impaired child is more crucial in the development of listening skills than for the normal hearing child.
5. The child's sex is not related to the ability to discriminate among emotions through listening.
6. The ability to listen and discriminate among emotions is not related to the detection threshold of hearing. It is more important how the hearing impaired children use their remaining hearing sensitivity to derive meaning from speech.
7. The length of time for each hearing impaired child to develop sufficient oral communication skills through Verbo Tonal training in order to be mainstreamed into regular public school classrooms varied for each child. This may explain the low correlation between TED scores and the amount of Verbo Tonal training in a group. The level of oral communication skills may be the most important factor in the ability to discriminate among these four emotions for the hearing impaired children.
8. The results of this study suggest that the TED is a sensitive test instrument for examining the ability of persons to discriminate among four emotions through listening, and could therefore be used as a preliminary diagnostic tool. This test can provide information about how a person's auditory perceptual system is developed for discriminating among suprasegmental patterns of speech. This information is valuable for hearing impaired children, but may also be applied to language and speech impaired children.

C. LIMITATIONS OF THE STUDY

1. The language content of the test instructions may have been too difficult for some of the hearing impaired children. Some of these children may have scored higher if the instructions were simplified.
2. The practice training was presented "live" by the examiner. It would have been more consistent to provide examples on videotape for the children.

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APPENDIXES

APPENDIX A

NULL HYPOTHESES

1. There is no significant difference between the ability of hearing impaired children (trained in the Verbo Tonal Method) and normal hearing children to discriminate among four primary emotions through listening only.
2. There is no correlation between the hearing impaired children's scores on the TED and
   (a) hearing level;
   (b) amount of group Verbo Tonal training;
   (c) chronological age;
   (d) sex; and
   (e) socioeconomic background.
3. There is no correlation between the normal hearing children's scores on the TED and
   (a) chronological age;
   (b) sex; and
   (c) socioeconomic background.

APPENDIX B

DEFINITION OF TERMS

Communication	The sharing of information, opinions, thoughts, ideas, or feelings by two or more individuals (Ling and Ling, 1978).
Emotion	This consists of three components: a situational reference, the anticipation of an action, and a person's previous emotional experience (Vine, 1973).
Hearing Impaired	Any person with any type and degree of hearing loss. Sometimes the term is used with certain qualifier adjectives, such as mild, moderate, severe, or profound to denote the degree of the impairment (Ross and Giolas, 1978).
Intonation	The inclusive term that refers to variation of pitch as a function of time. It may be applied to a single inflection or to long-term variation that extends over numerous inflections and shifts (a change of pitch from the end of one phonation to the beginning of the next) (Fairbanks, 1940).
Mainstreaming	The interaction of children with a hearing loss and normal hearing in educational settings. The strategy of mainstreaming or integration consists of educational programming in which hearing impaired children attend classes with normal hearing children (Yater, 1977).
Pre-lingual	A hearing impairment that is present at birth or shortly thereafter (Schow and Nerbonne, 1980).
Primary emotions	A set of general emotions which share common attributes within the group, but are quite different between the groups (Plutchik, 1962).
Rhythm	The recurrence of a pattern of vocal change (Fairbanks, 1940).
Socioeconomic background	The combination of a parent's annual income level, occupation, and level of education (Adler, 1979).
Suprasegmentals	The quality, stress, and tonal or pitch features which extend over more than one segment or phoneme in speech (Lehiste, 1970)

APPENDIX C

REVIEW OF LITERATURE

In order to provide a background, a review of literature was conducted in the following areas: (1) the development of emotions; (2) studies on emotions; (3) effect of hearing loss on communication ability; (4) impact of emotions on communication, and (5) reaction to the hearing impairment.

DEVELOPMENT OF EMOTIONS

Emotion has been described as having three components: a situational reference, the anticipation of an action, and a person's previous emotional experience (Vine, 1973). Emotion has also been described in terms of general or basic groups which share common attributes within the group, but are quite different between the groups. This is the concept of primary emotions (Watson, 1925; Piaget, 1954; Plutchik, 1962; Tomkins and McCarter, 1964; Ekman and Friesin, 1971; Frijda, 1973; Stringer, 1973; and Vine, 1973). Primary emotions are analogous to primary colors. There is a basic set of emotions which can be combined to form an infinite number of emotions. Researchers do not identify the same set of primary emotions. Plutchik (1962) lists the following as primary emotions: surprise, disgust, anger, sorrow, joy, fear, acceptance, and anticipation. Then, he combines two primary emotions to form a third emotion. For example, anger + joy = pride; fear + sorrow = despair; and acceptance + surprise = curiosity.

There are many theories on the development of emotions, with some disagreement among researchers. Piaget's (1954) theory on emotional development supports the role of emotions as being the foundation for communication and all human relationships. Piaget postulated that

emotional development and cognitive development occur simultaneously in the child and can not be separated. He stressed a functional parallelism between their two evolutions, with constant interaction yielding modifications in both areas. Some researchers have used this idea to infer cognition from emotional development. Haviland (1976) described procedures that are used in standard baby tests, such as the Bayley Scales of Mental and Motor Development (Bayley, 1936). For example, the visual attention skills of a child are evaluated by measuring the child's interest in an object.

Basic emotion patterns are present at birth, and later mature through a process of differentiation (Bridges, 1932; and Vine, 1973). The earliest emotional reactions are usually very general responses. As the child grows older, the responses have more form. This is a result of association bonds being made between the emotional reactions and the provoking situations. For example, if the children experience a pleasant feeling when they are being fed by the mother, they will begin to associate positive feelings with the mother's presence. The mode of the emotional response also gradually changes as the child's muscles develop, and as new cognitive skills are learned. For example, an angry child of four months may cry if a favorite toy is taken away, while a child of ten months may hit the person who took away the toy.

Birth to 6-month period. Non-verbal behavior, including visual, tactile, and auditory cues, must at first transmit all meaning communicated between the mother and the infant (Vine, 1973). The emotional reactions of the infant to this stimulation is not highly differentiated (Bridges, 1932). The most common initial response of the infant is a sense of

general agitation or excitement, which is demonstrated by an acceleration of activity, alertness, slight tension, and restlessness.

In response to a strong stimulus such as a loud noise or sudden movement, the infant's arm and hand muscles are tensed, breathing quickens, and the legs make jerky kicking movements. This same startle reaction is observed after the infant awakes suddenly from sleeping, is lowered quickly into the crib, and prior to feeding (Bridges, 1932).

The startle reaction gradually diminishes to a milder form of restlessness, and at four months of age the child jumps in response to a loud noise and looks in the direction of the sound. At five months of age, Ahrens (1954) reported that children could discriminate between positive and negative affective expressions of adults.

Another early response shown by the child is distress (Bridges, 1932). Distress is part of the general emotional response of excitement, but copes more satisfactorily with obnoxious stimuli. It is difficult to separate from general agitation.

After birth, regular crying is a major part of the child's general activity level. By the end of the first month of life, the crying pattern differentiates and is traced to three major causes: discomfort, pain, or hunger. As children grow older, they cry less of the total time. The child will show distress, however, if there is a delay or change in the normal procedures. For example, expecting food in the presence of an adult and receiving none will elicit a distress response from the child.

Children of four months of age are very fond of attention, and show distress if the adult leaves the room, or stops playing with them. The child also displays distress if a favorite toy is removed or if specific

foods are offered. This repulsion to certain foods may be the beginning of the emotional reaction labelled disgust.

A third response shown by the child during this period is delight. Delight is differentiated from general excitement at a later time period than distress. During the first few weeks of life, the infant is content when satisfied after a meal. Children of two months may give a fleeting smile while nursing (Bridges, 1932; and Vine, 1973), which later develops into cooing while they are being fed. Children of five months smile when an adult talks to them, laughs aloud if an adult plays with them, waves, vocalizes, and reaches towards a familiar person.

Six to 12-month period. A fear system begins to develop in the child at approximately six months of age (Bridges, 1932; Freedman, 1961; and Campos, Hiatt, Ramsay, Henderson and Svejda, 1978). The child stops activity when the stranger appears, watches, and may cry slowly. The child is not certain about what to do. By 12 months of age, the children will pull back and stare if the stranger approaches. They may also hide their eyes. During this time period children also begin to vocalize more. They babble and laugh to themselves, and they like to make noises. Children watch the adult who nurses them attentively, initiating the beginnings of the emotional reaction labelled affection. Children at this age are very popular with adults, laughs, bounces up and down, and mimics the play actions of adults. They also begin to develop an interest in other babies.

At 12 months of age, children are curious about exploring the environment around them. They may cry suddenly if they feel themselves falling or losing their grip while climbing. Kagan (1978) describes the child of 12 months as able to anticipate the future.

One to two-year period. Socialization with other people and interaction with the environment play a major role in the child's daily life at this time. Between 12 to 15 months, children learn to walk, an accomplishment which gives them great delight. They call out, smile, wave, and show interest and affection for other children.

Another response which may become evident during this period is temper tantrums, occuring when a favorite food or toy is withheld at the time they want it. Children may throw themselves down on the floor and scream. They may also show their annoyance by hitting another child who took their toy or has what they want.

At 18 months the child enjoys walking and running, chasing other children, laughing,jabbering with other children, and playing noisy games. Children are anxious to attract attention, and if that attention is given to another child, they may show the beginnings of the emotional reaction labelled jealousy.

The child of 24 months is still fearful of strangers and may run away and watch from a safe distance. Kagan (1978) asserts that a child at this age can reflect on the past, take the role of another, and make inferences. Vine (1973) states that a child of this age has a repertoire of expressions fairly similar to that of adults, at least for the more simple or primary emotions.

Two to three-year period. Bridges (1932) observed two year old children at their annual physical examinations. The children had very different reactions to the same test procedures, an example of their expressions of individuality. Some of these reactions were related to heredity, but many were determined by the child's experiences since birth.

Freedman, Loring, and Martin (1967) stated that childrens' social experiences and environmental conditions had a direct influence on their crying, smiling, and laughing patterns. Adaptive behavior develops at this time to cope with fear and anxiety, while refusals to comply and resisting imitation are evidence of resistance and negative reactions. Anger and agression are also displayed in quarrels with other children.

At three years of age, children are able to infer the psychological state of another (Kagan, 1978). This leads to an understanding of how their actions influence others. Freedman, Loring, and Martin (1967) summarize this time period by stating that the first three years of life are critical in the development of a child's personality.

Three to four-year period. Children of four years are able to realize that they had a choice with respect to a prior action (Kagan, 1978). The emotional behavior patterns and traits are fairly stable by three or four years, and usually remain consistent throughout later years (Freedman, Loring, and Martin, 1967). The changes which occur in a child's emotional reactions after this age are generally a result of social experiences and social norms. Adults are more likely to inhibit or change overt emotional expressions to conform to social standards than children (Goodenough, 1931).

RESEARCH METHODS FOR EMOTIONS

Emotions have been divided into two general areas for research purposes: the visual recognition of emotions, and the auditory recognition of emotions (Williams and Sundene, 1965). The recognition of visual emotions has been evaluated using posed photographs, schematic drawings,

acted live presentations, rating scales, videotaped spontaneous responses to specific stimuli, and physiologic measurements of facial muscles (Oster, 1978).

In the recognition of the spoken expression of emotions, the natural visual cues available during normal communication are absent, making the listening task more difficult. The main problem in this area of research has been to eliminate the verbal content of speech and leave the non-verbal aspects. This has been attempted in three basic ways: (1) having subjects express different emotions as they recite the alphabet, (2) having the subject express the same neutral sentence in different ways, (3) using filtering conditions on recorded speech (Oster, 1978), and (4) playing recorded speech backwards (Asp, 1981).

In the area of the spoken expression of emotions, certain correlates have been found between speech and emotion. These acoustic correlates have been grouped under the general heading of suprasegmentals which Lehiste (1970) has defined as the quality, stress, and tonal or pitch features which extend over more than one segment or phoneme in speech. More specifically, Williams and Stevens (1972) have stated that the contour of the fundamental frequency (f_o) versus time gives the clearest indication of the speaker's emotional state. Other important acoustic factors are the median f_o and the range of f_o, shifts in the spectrum, duration changes, and voicing irregularities, all in relation to the speaker's normal f_o and f_o range.

Researchers have also described average values and ranges of the f_o as differing from one emotion to another (Fairbanks and Pronovost, 1939), and the relationship between phonation duration and pause duration to be a distinct characteristic of specific emotions (Fairbanks and Hoaglin, 1941).

COMMUNICATION AND HEARING IMPAIRMENT

Communication is the sharing of information, opinions, thoughts, ideas, or feelings by two or more individuals (Ling and Ling, 1978). It is also a sense of belonging,an exchange of understanding, and a mutual respect for the other's humanity (Jacobs, 1974). While communication may use physical tools and have social aspects, it is basically a psychological process (Davis, 1970).

Communication must be developed early in a child's life. Children can not grow emotionally without a proper relationship to their parents, and communication is so much the essence of that relationship (Rainer, Altshuler, Kallman, and Deming, 1963). Mindel and Vernon (1971) emphasize the importance of communication by stating that closeness to other people comes from meaningful exchanges of information and feeling, from understanding and empathy.

Hearing impaired children, like all other human beings, need full communication from the time of their birth or loss of hearing in order to develop and grow psychologically and linguistically. This normal development is not possible for hearing impaired children unless they are able to participate fully in the give and take of communication in their family, and to be totally involved in their activities (Jacobs, 1974).

The basic handicap of a hearing loss arises from its interference with communication. Problems in the hearing impaired child's language growth, social interaction, and academic learning all stem from that source. (Naiman and Schein, 1978). Rainer, Altshuler, Kallman, and Deming (1963) support this view by asserting that almost all of the emotional

difficulties of the hearing impaired are compounded, if not caused by, barriers in communication.

A hearing impairment seriously interferes or eliminates communication with others. Holcomb (1977) offers two powerful descriptions illustrating the influence of communication barriers, and the information which is lost to the child.

> You are a baby. You never hear the sweet, soothing, assuring, admiring, comforting sound of your mother's voice.
> You are a baby and are riding piggyback on your father. You can't hear him laughing, growling, panting, and trying to talk with you.

Communication difficulties experienced by hearing impaired children can result in significant social and emotional problems. One of the earliest breakdowns occurs in the mother-infant relationship. The loss of conventional communication methods creates a sense of distance, which can cause later alterations in personality development of the hearing impaired child (Mindel and Vernon, 1971). This sense of alienation, isolation, lack of stimulation, and lack of interaction between infants and their parents can have disintegrative effects on the emotional growth of the children (Myklebust, 1964).

The child who is born with a hearing impairment, or the child who has acquired hearing loss early in life, is subject to all the frustrations of the hearing child. But to these is added the further frustration of the inability to communicate (Ballantyne, 1977). Hearing impaired children have a strong urge to express their feelings and thoughts, and they must find an outlet for these thoughts (Ewing and Ewing, 1938). Aborted attempts at communication may lead to tension and negative feelings for both the hearing impaired child and the others involved. This creates

a spiral effect leading the hearing impaired child to seek increasing isolation from social interaction (Newby, 1979; and Meadow, 1980).

The cost of unclear communication for the hearing impaired child is a significant increase in behavior and adjustment problems compared to normal hearing children (Schlesinger and Meadow, 1972; and Meadow, 1980). Estimates of the incidence of behavioral disturbance in hearing impaired children range from 8 percent to more than 22 percent. These rates appear to be from 3 to 10 times higher than for a comparable group of normal hearing children.

Newby (1979) states that a hearing impairment almost always produces some problems in adjustment for the individual. These adjustment difficulties may take the form of deviate behavior, mental and personality problems, or retarded social development (Goetzinger, Harrison, and Baer, 1964; Jacobs, 1974; and Meadow, 1980).

Rainer, Altshuler, Kallmann, and Deming (1963) describe the outstanding personality features of the hearing impaired subjects observed in their research as having a lack of understanding of, and regard for, the feelings of others, coupled with inadequate insight into the impact of their own behavior and its consequences in relation to others. Other specific personality traits previously cited have been passive and withdrawn, or alternatively hostile and destructive (Ling and Ling, 1978), socially isolated, impulsive with pervasive underachievement (Mindel and Vernon, 1971), hyperactive, lacking in social and emotional maturity (Meadow, 1980), immature, egocentric, rigid (Goetzinger, 1978), and lacking in thoughtful introspection with a confused awareness of the self in relation to others (Rainer, Altshuler, Kallmann, and Deming, 1963).

Problems in communication may also result in an incomplete cognitive development.

> The mental growth of a child depends largely on the formation of concepts about himself and his environment. The hearing impaired child is handicapped in forming any concepts that make use of sounds. His concept of an "angry" dog may be distorted by the fact that he can not hear the growling of an angry dog, and his concept of the passage of time never includes the sounds made by a clock. (Silverman, Lane and Doehring, 1970).

The hearing impaired child will also have difficulty in comprehending the more abstract concepts unless his communication becomes rich enough to be flexible with the use and meaning of words employed (Jacobs, 1974).

Men, women, children, and infants are basically social beings and depend on human interaction and companionship for survival. The consequences of inadequate communication over a long period of time as experienced by the hearing impaired, can be quite devastating, both emotionally and socially (Ling and Ling, 1978). Habits and emotional attitudes formed in early years may influence the children's behavior, self-confidence, sense of security, and what is summed up as their "social adjustment" throughout their whole life (Myklebust, 1950).

In a study comparing institutionalized children to foster home children, Goldfarb (1945) noted that institutional deprivation in infancy resulted in developmental delays in emotional organization, social relationships, and the ability to conceptualize. When the institutionalized children were later placed in foster homes, it was observed that extreme psychological deprivation in infancy produced a lag in mental growth which was maintained even under new conditions of enriched stimulation.

EMOTIONAL MEANING IN COMMUNICATION

Attitudes and feelings are mainly conveyed non-verbally, by means of a glance, a smile or a groan, by turning towards or away from someone, by physical contact, or tone of voice (Ling and Ling, 1978). Non-verbal cues may be used quite deliberately to alter the literal meaning of a statement. One's facial expression and tone of voice can determine the true meaning of the sentence (Ling and Ling, 1978).

Young children are particularly sensitive to non-verbal cues and will tend to react to the latter rather than spoken words where there appears to be conflict (Ling and Ling, 1978). The hearing impaired child is more likely to attend to the non-verbal components of communication, information which is heavily laden with emotional charge (Mindel and Vernon, 1971). Hearing impaired children can not get meanings from words as well as do the normal hearing children (Myklebust, 1950). They notice and respond more directly to the moods and attitudes of the other person (Naiman and Schein, 1978).

Myklebust (1950), in a paper directed to parents, outlines the non-verbal transmission of attitudes and feelings within the context of the family's daily routine.

> You are constantly revealing your deeper feelings by the way you look at your child, the way you approach him, the way you help him with eating, dressing, and going to bed, as well as in many other ways. Your hearing impaired child is constantly sensing your feelings. He knows when you are tense and unhappy, just as he knows when you are calm and happy. This is why nothing is more important to him than the feelings and attitudes with which his family surrounds him.

Non-verbal cues may be divided into the auditory or suprasegmental aspects of speech, and visual cues apparent on the face and body.

During the first year or so of life, the suprasegmental aspects of spoken language are especially important. Infants can derive meaning from tone and voice and intonation patterns before they are able to do so from the phonetic or segmental aspects (Ling and Ling, 1978). As the child grows older, the content of language takes on the communicative value of meaning.

Hearing impaired children are in an entirely different situation. Even though they can understand words that are spoken to them, they may be unaware of the emotional content of the speech, since this must often be judged solely on the basis of the tone of voice used by the speaker (Silverman, Lane, and Doehring, 1970). Myklebust (1964) states that the problem of deafness is much more than a limited use of language. The deaf person can not follow the inflectional and intonational meanings which often are more significant than the words themselves. Without the full range of normal hearing, the hearing impaired child misses the little innuendos and other unverbalized meanings that are so much a part of daily conversation (Myklebust, 1964; and Ramsdell, 1970).

A pre-lingually hearing impaired adult, recounted a personal experience highlighting the value of suprasegmental cues for emotional meaning (Holcomb, 1977):

> You judge a person to be very nice by his appearance and manners, never knowing that his voice labels him as a big phoney.

In the area of non-verbal visual cues, Goodenough (1931) has defined facial expression of emotion as primarily a learned reaction, functioning as a form of language. Hearing impaired children particularly

depend upon other people's body movements for an understanding of their thoughts and feelings (Naiman and Schein, 1978). They rely heavily on eye contact, facial expression, action and gesture, together with their interpretation of the ongoing situation and their past experience (Holcomb, 1977; Ling and Ling, 1978; and Meadow, 1980). Hearing impaired children will watch feelings parade across their parents' faces to obtain crucial information for ascertaining intent and good will (Mindel and Vernon, 1971). When restricted to judgements based solely on facial expressions, they may often react inappropriately in many social situations (Silverman, Lane, and Doehring, 1970).

Mehrabian and Wiener (1967) in a study of inconsistent messages of attitude found that when sentences were presented to normal adult listeners with no visual cues, the tonal or suprasegmental component made a significantly greater contribution to the interpretation of the total message than did the content component. A similar relationship was found between the visual component and the content component in the transmission of inconsistent attitude messages. The visual component made a significantly greater contribution than the content component in the total interpretation of the attitude. The conclusions of this study suggest that suprasegmental cues and visual cues have more importance in determining the meaning of attitudes than the specific language content of the message.

REACTION TO HEARING IMPAIRMENT

The reaction of the family to the diagnosis of a hearing impairment in their child is crucial to the emotional development of that child.

Ling and Ling (1978) have described three important variables directly related to the hearing problem: (1) the degree of hearing impairment, (2) the age of onset, and (3) the timing and type of rehabilitation.

Mindel and Vernon (1971) have cited several specific factors to consider relative to the child's environment. These factors include the individual personalities of the parents, the parent's ability to adapt and cope with stress, the status of the marriage relationship, the ordinal position of the hearing impaired child, and the status of the extended family relationships (e.g., the interactions between the grandparents of the hearing impaired child and the parents of the child). They also describe the importance of the family's cultural background. In large families with limited educational background, the language development of the child usually does not have great importance. This factor could influence how early the hearing impaired child is identified, and the parents' interest and cooperation in habilitation procedures. Hearing impaired children coming from families with more education are subject to much more attention for articulation, grammar, and semantic correctness. The importance placed on the child's language is a significant advantage for hearing impaired children from this background.

Meadow (1980) described that the additional financial burden of maintaining a hearing impaired child may be a constant concern and source of frustration for the parents. Items and services specifically related to the hearing loss which must be dealt with on a regular basis include hearing aids, batteries, ear molds, maintenance and repair work on the hearing aids, and audiometric examinations.

Meadow (1980) also discussed the common practice of educators training the mother of hearing impaired children to be their primary teacher. The strain of additional demands on the mother's time and attention, combined with the frustration of communication can be a difficult situation for the mother to cope with effectively.

An additional factor which has gained considerable attention in the literature is the hearing status of the parents. Ninety percent of hearing impaired children are born to normal hearing parents (Schein and Delk, 1974; and Meadow, 1980). The social and emotional adjustment of the remaining ten percent of hearing impaired children born to hearing impaired parents has been shown to be better than hearing impaired children born to normal hearing parents (Rainer, Altshuler, Kallman, and Deming, 1963; and Meadow, 1980). The hearing impaired child of hearing impaired parents may be a cause of some disappointment, but it does not create fear and panic in such parents since hearing loss is a familiar and ever-present part of their daily lives. This acceptance provides a firm basefor communication (Ling and Ling, 1978). These hearing impaired parents are less likely to define hearing loss as a tragic crisis (Meadow, 1980), while normal hearing parents often express feelings of incompetence, self-doubt, and sorrow (Meadow, 1968a; and Mindel and Vernon, 1971).

Jacobs (1974) describes the differences in family environments.

> Hearing impaired children of hearing impaired parents have never had frustrations because they had full communication and understanding parents all their life, while the others must have had bad moments during their lives, when their hearing parents discovered their hearing loss and found it to be a problem living and communicating with their hearing impaired child; their expressions and utterances showing grief, disappointment, and impatience must have been obvious to the hearing

> impaired youngsters. Such displays must have been very traumatic to the hearing impaired child's pride, self-satisfaction, and self-image. And, they must have become adjusted to a feeling of inferiority, which hearing impaired children of hearing impaired parents do not usually develop.

During the child's early years before a definite diagnosis of the hearing impairment has been made, the parents experience frustration and increasing anxiety as their suspicions about their child grow (Vernon and Ottinger, 1980).

At the time of diagnosis the parents go through a pattern of feelings ranging from disbelief to anger and guilt (Myklebust, 1950; Ling and Ling, 1978; and Vernon and Ottinger, 1980). Luterman (1979) describes a five step progression illustrating the parents' psychological reaction to the diagnosis of hearing impairment in their child.

1. Shock - This is a relatively short period, ranging from a few hours to a few days, in which the parents divorce themselves from the crisis situation. This serves as a defense mechanism to get the parents through the initial mourning stages.
2. Recognition - In this stage, the parents realize the awfulness of the situation, and begin to acknowledge the situation emotionally with an active mourning. Strong feelings such as total confusion, inadequacy, anger, depression, impotency, guilt, and resentment emerge from the parents. This stage may last up to several weeks as the parents search for the cause of the hearing problem.
3. Denial - This is a coping mechanism to reduce the extreme anxiety level of the previous stage. It serves as a defensive

retreat and can last a long time, or can be present to a slight degree forever. Some common forms of denial are searching for a miracle cure, shopping around for more opinions on the diagnosis, directing anger towards the physician, or getting extremely involved in fund raising for hearing impaired school programs while neglecting their own child at home.

4. Acknowledgement - This is another period of extreme anxiety because the parents must again confront reality. It consists of an acceptance of their child's hearing impairment as something that can not be changed, however, they as parents are capable of helping the child grow into being a responsible human being.

5. Constructive Action - This stage involves a re-structuring of their lifestyles, and a re-examining or fundamental change in their value systems as they adapt to having a hearing impaired child. This stage, as well as the acknowledgement stage, are life-long stages. Parents go through these over and over as they are forced to give up old ways of thinking and make new decisions.

The family's reaction to the diagnosis of a hearing loss has a major influence on the child. The psychological problems do not effect family members in isolation, but because of the interplay of feelings in the family unit all members are effected in various ways. If the parents and other family members do not resolve their initial reactions to having a hearing impaired child, they will continue to retard the hearing impaired child's social and emotional development (Mindel and Vernon, 1971). Myklebust (1950) agrees that parent attitudes can be damaging and he

suggests that those attitudes may be a greater handicap to the child than the hearing impairment. Acceptance of hearing impairment, however, is not accomplished once and for all. Even after a fairly good adjustment, painful feelings may recur as hearing impaired children present new difficulties to parents, and as parents become aware of new kinds of problems (Naiman and Schein, 1978).

APPENDIX D

SOCIOECONOMIC QUESTIONNAIRE

AND CATEGORY CRITERIA

SOCIOECONOMIC QUESTIONNAIRE

Please fill out the questionnaire as accurately as possible. It is important to obtain the information from both parents if the child lives with both parents; from one parent if the child lives with one parent; or from the guardian if the child lives with a guardian. Please circle the appropriate statements below.

Name of child participating in study _____

Child's birthdate _____

1. Who does the child live with?

   Mother

   Father

   Both Parents

   Guardian

2. Income Level
   Circle the income range which includes your yearly income.

Mother	0 - $16,957	$16,960 - $33,917	$33,920 - $72,080+
Father	0 - $16,957	$16,960 - $33,917	$33,920 - $72,080+
Both Parents	0 - $16,957	$16,960 - $33,917	$33,920 - $72,080+
Guardian	0 - $16,957	$16,960 - $33,917	$33,920 - $72,080+

3. Occupation
   Please list occupation, specific job title, and brief description of duties.
   Example: Occupation - Banker Job Title - Cashier
   Duties - Make Installment Loans

   Mother: Occupation _____ Job Title _____
   Duties _____

   Father: Occupation _____ Job Title _____
   Duties _____

   Guardian: Occupation _____ Job Title _____
   Duties _____

4. Education

Circle the last year of school completed.

Mother: 1 2 3 4 5 6 7 8 9 10 11 12 college 1 2 3 4 grad sch 1 2 3 4

Degree _____

Father: 1 2 3 4 5 6 7 8 9 10 11 12 college 1 2 3 4 grad sch 1 2 3 4

Degree _____

Guardian: 1 2 3 4 5 6 7 8 9 10 11 12 college 1 2 3 4 grad sch 1 2 3 4

Degree _____

Please indicate the type of school attended other than a 4 year college or university: business, vocational, technical, other

Mother: Type _____ Years attended _____

Father: Type _____ Years attended _____

Guardian: Type _____ Years attended _____

** The information contained on this form will be kept strictly confidential by the examiner.

CRITERIA FOR SOCIOECONOMIC BACKGROUND

Income[1]	Lower Class	0 - $16,957 per year
	Middle Class	$16,960 - $33,917 per year
	Upper Class	$33,920 - $72,080+ per year
Occupation[2]	Upper-Middle Class	professional, managerial
	Lower-Middle Class	trade or mechanical skill
	Upper-Lower Class	manual labor
	Lower-Lower Class	chronic welfare aid
Education[3]	Upper-Middle Class	13 years of school and over (college)
	Lower-Middle Class	high school
	Upper-Lower Class	0-9 years (elementary or junior high)
	Lower-Lower Class	0-5 years (some or no elementary)

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[1]Helton, J.R., The value of occupation, education, and income in predicting PPVT scores in preschool-aged-children. Unpublished Masters Thesis, The University of Tennessee, Knoxville, 1974.

1970 Census Information Figures - U.S. Dept. of Commerce

Lower Class	$ 1,999 - $ 7,999 per year
Middle Class	$ 8,000 - $15,999 per year
Upper Class	$16,000 - $34,000+ per year

These figures were multiplied by the annual average U.S. city consumer price index change (2.12) for urban wage earners and clerical workers between 1970 and 1980 to give the 1980 figures used. Consumer price index figures from the Bureau of Labor Statistics, U.S. Dept. of Commerce, were provided by the Center for Business and Economic Research, University of Tennessee, Knoxville, Tennessee.

[2]Adler, S., Poverty Children and Their Language. New York: Grune and Stratton, pp. 22-23, 1979.

[3]Ibid.

[4]The decision making process consisted of first determining the total income of the family. Next, the occupation and education factors for each parent was determined. A minimum of three out of four factors had to fall within the same category, and be consistent with the income level. For one parent families, the minimum was one out of two factors. The remaining factor had to be in the next category (high or low), or the child was not selected as a subject for this study.

APPENDIX E

VERIFICATION SCORE SHEET

AUDIO VERIFICATION

Practice Section

I. Select one emotion from the pair listed below which best describes each sentence you hear.

II. Judge the strenth of each selected emotion on a scale of 1 to 5, with 1 being the weakest representation and 5 being the strongest representation of the emotion.

surprise, disgust

	Emotion	Weak 1 2 3 4 5 Strong
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____

Test Section

I. Select one emotion from the four listed below which best describes each sentence you hear.

II. Judge the strength of each selected emotion on a scale of 1 to 5, with 1 being the weakest representation and 5 being the strongest representation of the emotion.

anger, sorrow, joy, fear

	Emotion	Weak 1 2 3 4 5 Strong
1.	_____	_____
2.	_____	_____
3.	_____	_____
4.	_____	_____
5.	_____	_____
6.	_____	_____
7.	_____	_____
8.	_____	_____
9.	_____	_____

10. _____ _____

11. _____ _____

12. _____ _____

13. _____ _____

14. _____ _____

15. _____ _____

16. _____ _____

17. _____ _____

18. _____ _____

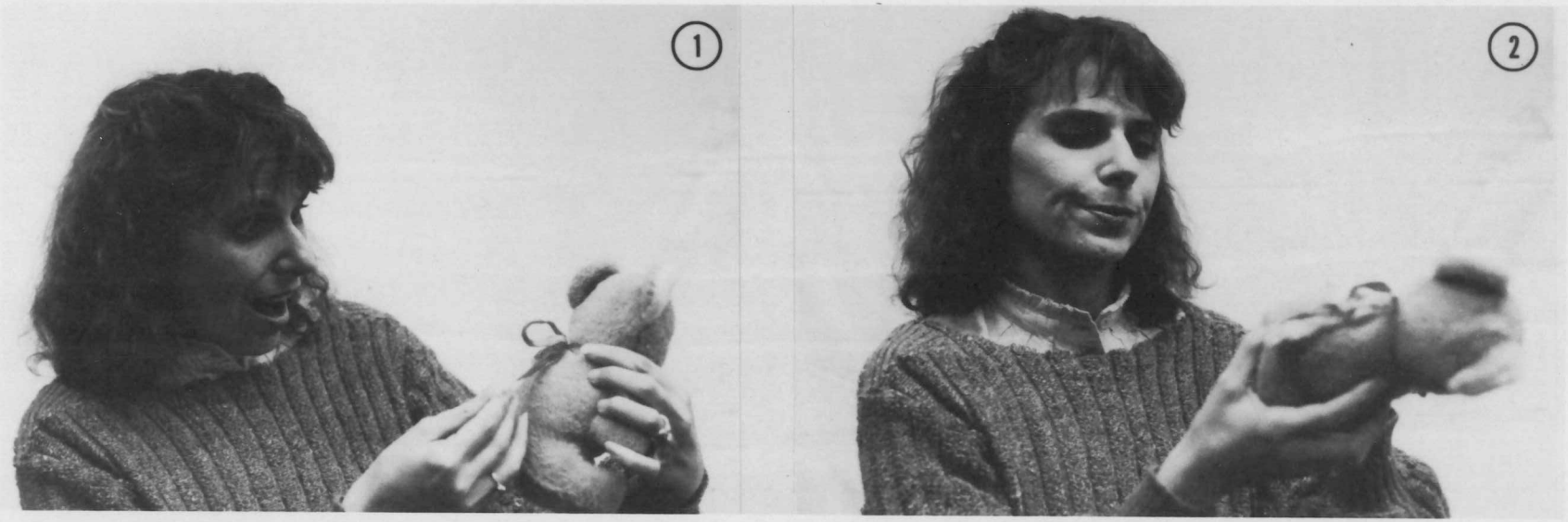
19. _____ _____

20. _____ _____

Verification Score Sheet for Panel 1

APPENDIX F

PRACTICE PHOTOGRAPHS



1. Surprise
2. Disgust

APPENDIX G

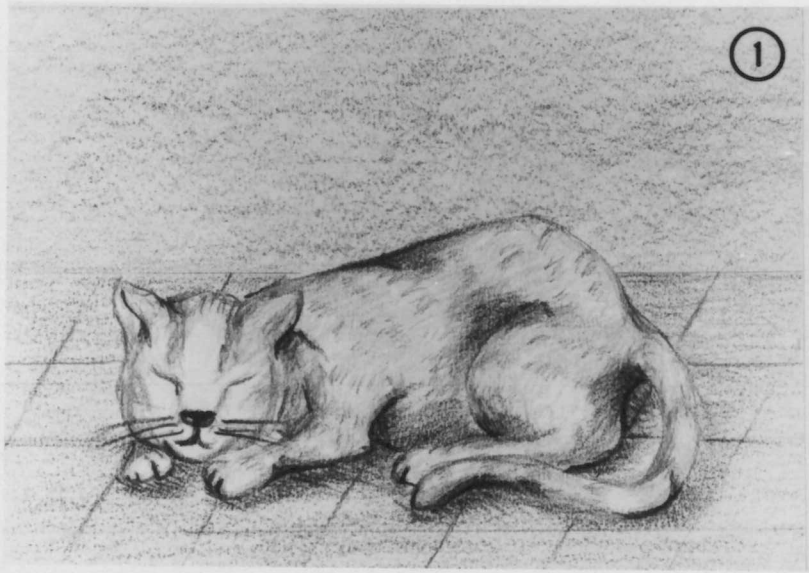
TEST PHOTOGRAPHS



1. Anger
2. Sorrow
3. Joy
4. Fear

APPENDIX H

PRACTICE PRE-TEST DRAWINGS

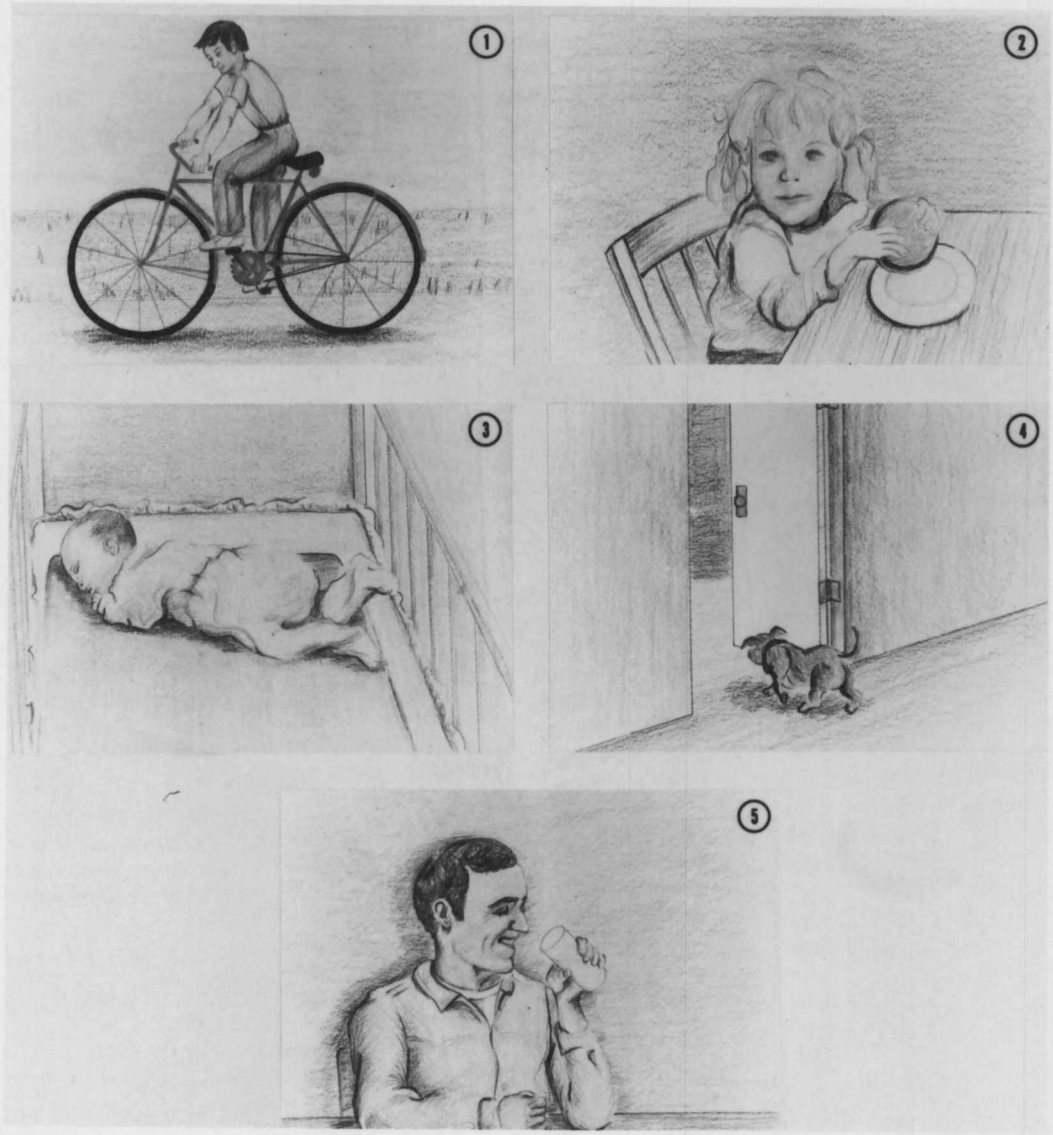




1. The cat is sleeping on the floor.
2. The dog is chewing on his bone.

APPENDIX I

TEST PRE-TEST DRAWINGS



1. The boy is riding his bicycle.
2. The girl is eating a hamburger.
3. The baby is sleeping in his bed.
4. The puppy is running out the door.
5. The man is drinking a glass of milk.

APPENDIX J

TESTING SITUATION PHOTOGRAPH



VITA

Patricia Ann Cotterell was born in Summit, New Jersey on January 19, 1957. She attended elementary schools in that city, and was graduated from Summit High School in June, 1975. The following September, she entered the Pennsylvania State University, University Park, Pennsylvania, and in May 1979, she received a Bachelor of Science degree with a double major in Speech Pathology and the Education of the Hearing Impaired. The author entered the Graduate School of The University of Tennessee, Knoxville, in September 1979. During her Master's study, she worked for the Audiology and Speech Pathology Department on a graduate assistantship and then as a lead teacher at the Pediatric Language Laboratory. She received a Master of Arts degree with a major in Audiology in June 1981.