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NORMS FOR A FILM PRESENTATION OF THE
1959 REVISION OF THE SEMI-DIAGNOSTIC TEST
IN AURAL REHABILITATION

Thesis for the Degree of M. A.
MICHIGAN STATE UNIVERSITY
Margaret Lorraine Wynn
1964

THESIS

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ABSTRACT

NORMS FOR A FILM PRESENTATION OF THE 1959 REVISION OF THE SEMI-DIAGNOSTIC TEST IN AURAL REHABILITATION

by Margaret Lorraine Wynn

The purpose of this study was to establish norms for a film presentation of the 1959 Revision of the Semi-Diagnostic Test in Aural Rehabilitation. This is a multiple-choice test of fifty monosyllabic words which was designed to get an estimate of auditory, visual, and combined auditory-visual discrimination, and to indicate the kinds of speech sounds the client has difficulty recognizing.¹

Small samples quite heterogeneous in age-educational level, type, and degree of hearing loss had been used in previous studies. Such small samples had necessitated that results be cautiously interpreted. Therefore, norms were needed on the Semi-Diagnostic Test to provide a yardstick in evaluating results.

In order to establish norms for lipreading ability as measured by the Semi-Diagnostic Test, A Kodacolor, silent film was shown to 162 subjects from a normal population. These subjects included 90 males and 72 females and represented

¹Charles Hutton, "Directions for Using the Semi-Diagnostic Test in Aural Rehabilitation," 1959 (An unpublished manual).

three distinct age-educational levels: 60 fourth grade pupils (mean age 9.7 years), 60 seventh grade pupils (mean age 12.9 years), and 42 young adults (mean age 19.9 years). In this study young adult subjects were individuals between the ages of seventeen and twenty-seven with a twelfth grade education.

Age was not isolated from educational level since educational level usually increases as age increases. Therefore, the reciprocal effect of age and education was referred to as age-educational level.

No group of more than fifteen subjects was tested at any given time. A film was used to measure lipreading ability because such a medium eliminated extraneous factors which enter into testing when the live voice procedure is used. The female speaker would first give the number of the test items and then say two words. Subjects were allowed approximately fifteen seconds to draw a line through the two words on their response sheets and to read over the possible answers in the next group of test items. The procedures for administration and scoring as outlined in the test manual were followed when feasible during the planning and execution of this study.

A two-way analysis of variance showed significant differences in scores according to age-educational level and sex at the .01 level.

Test items varied in difficulty. As many as 95 per cent of the subjects in one group responded correctly to a given test item, while 5 per cent represented the smallest percentage of subjects in any group responding correctly to a key word.

The highest possible score on the Semi-Diagnostic Test was 100 per cent. The mean score for the 162 subjects included in this study was 23.6 per cent.

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1959 REVISION OF THE SEMI-DIAGNOSTIC
TEST IN AURAL REHABILITATION

By

Margaret Lorraine Wynn

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF ARTS

College of Communication Arts, Department of Speech

1964

ACKNOWLEDGMENTS

It is with a deep sense of gratitude that special appreciation is expressed to Dr. Charles Pedrey and Dr. Edward Hardick for assistance in the preparation of this study.

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CHAPTER I

STATEMENT OF THE PROBLEM

Introduction

The handicap of hearing impairment produces numerous problems in communication. An individual with a hearing handicap must rely on other sensory modalities to compensate for this difficulty in communicative situations. His eyes become a channel for interpreting stimuli which his impaired hearing mechanism cannot adequately decode. However, it is no easy task to assess the combined elements which form the phenomenon of lipreading. Yet it is an essential part of the aural rehabilitation program for the hearing-handicapped. Lipreading is one of the few compensatory avenues open to such individuals.

In most cases those who have a severe hearing loss must look to educational rather than medical means as a rehabilitative procedure.¹ This further points to the need to carefully consider the rudiments of lipreading skill and the structure of lipreading tests. The individual who works in the area of aural rehabilitation should use tested instruments to measure lipreading ability. Teachers

¹John J. O'Neill and Joann L. Davidson, "Relationship between Lipreading Ability and Five Psychological Factors," Journal of Speech and Hearing Disorders, XXI (December, 1956), p. 478.

of lipreading have to devise methods of instruction, evaluate the present lipreading ability of the individual with a hearing impairment, and measure achievement or progress.²

Tests for measuring lipreading ability, indeed, should be carefully evaluated. Since this skill is an asset to those who have hearing losses, it is essential that each new lipreading test be closely examined for its usefulness.

Statement of Problem and Purpose of Study

The purpose of this study was to establish norms for a film presentation of the 1959 Revision of the Semi-Diagnostic Test in Aural Rehabilitation. The visual intelligibility section of this test is designed to test lipreading ability among both young and old individuals. However, without norms test results must be cautiously interpreted. The examiner merely has a score with little indication as to whether these results are good, average or poor performance. Therefore, norms were needed to make the Semi-Diagnostic Test a more valuable measuring device.

Questions Posed at Onset

Questions posed at the beginning of this study were:

1. Is there any difference in scores according to age-educational level of the subjects?

²John O'Neill, "An Exploratory Investigation of Lip-reading Ability among Normal Hearing Students," Speech Monographs, XVIII (November, 1951), p. 309.

2. If so, are these differences statistically significant?
3. What percentage of subjects according to age-educational level correctly respond to one-half, at least one-fourth, and less than one-fourth of the Semi-Diagnostic Test?
4. Is there any difference in scores according to sex of the subjects?
5. If so, are these differences statistically significant?
6. What percentage of subjects according to sex correctly respond to one-half, at least one-fourth, and less than one-fourth of the Semi-Diagnostic Test?
7. Do the test items differ in difficulty?
8. What is the average score for lipreading ability on the Semi-Diagnostic Test when a large sample from a normal population is tested?

Importance of Study

Standardized tests are an asset to objective measurement. Such tests allow one group to be compared with another group and also, individuals within a group can be rated. Objective techniques are essential to the measurement of lipreading ability because of the diversity of

methods that are used and because of the great individual differences in lipreading ability.³

In order for the Semi-Diagnostic Test to be of value in aural rehabilitation, data must be available as to the performance of a large sample from a normal population. Too few subjects have been used in the experiments with this test that are reported in the literature. These subjects also were dissimilar in age and had varying types of hearing losses.

This present study investigates the lipreading ability of 162 subjects when the Semi-Diagnostic Test is the tool for measurement. Some norms can thus be established from these subjects' scores. With norms comparisons and ratings of lipreading ability can be objectively made. From test results a clinician can not only discover which phonemes are troublesome in lipreading, but statements can be made as to whether an individual is presently a good, average, or poor lipreader as measured by the Semi-Diagnostic Test. Thus, useful information has been obtained about lipreading ability, and the score on the Semi-Diagnostic Test becomes more meaningful. Certainly norms are necessary if any testing instrument is to serve its intended purpose.

³Grace M. Heider, "The Utley Lipreading Test," Volta Review, XLIX (October, 1947), p. 477.

Definition of Terms

For the purposes of this study, these terms are defined in the following manner:

Semi-Diagnostic Test in Aural Rehabilitation.--A multiple choice test of fifty monosyllabic words which is designed to get an estimate of auditory, visual, and combined auditory-visual discrimination ability, and to indicate the kinds of speech sounds the client has difficulty recognizing.⁴

Young Adult.--In this study, a person between the ages of seventeen and twenty-seven years of age.

Age-Educational Level.--The combined effects of a subject's age and educational level as these factors influence lipreading ability. Age cannot be isolated from grade level since educational level usually increases as age increases. Therefore, the reciprocal effect of age and educational level is written as age-educational level in this study.

Visual Intelligibility.--Refers to that section of the Semi-Diagnostic Test which measures lipreading ability.

Item Difficulty.--Percent of correct responses for a key word on the Semi-Diagnostic Test.

⁴Charles Hutton, "Directions for Using the Semi-Diagnostic Test in Aural Rehabilitation," 1959 (An unpublished manual).

Organization of the Thesis

This chapter stated the problem and the purpose of the study. Questions to be considered, the importance of the study, and definitions of terms were also included.

Chapter II is a review of the literature relating to the problem.

Chapter III is a discussion of subjects, equipment and procedure.

Chapter IV brings forth results of the study and a discussion of these results.

Finally, Chapter V gives a summary and conclusions.

CHAPTER II

REVIEW OF THE LITERATURE

Importance of Lipreading

A person with a hearing loss must seek an alternate course of stimuli reception if he is to communicate effectively. Adequate training in the use of visual clues cuts through the barrier of an impaired-hearing mechanism since the eyes assume additional duties. Certainly lipreading training helps the eyes to adapt to this new role. Therefore, in any aural rehabilitation program, lipreading is an integral part of the training. Those who work in the area of aural rehabilitation must be aware of factors involved in lipreading and useful tests for objective measurement of this ability.

Use of the Film to Measure Lipreading Ability

Since lipreading is essential to those with hearing impairments, the measurement of lipreading must be given careful consideration. It has been difficult to devise tests for lipreading because there is considerable question as to what factors contribute to successful lipreading.

Studies of the relationship of this ability to such possible indexes as chronological age, intelligence, education, language and reading ability, synthetic ability and the perception of color and form appear in the literature.¹

O'Neill and Oyer state several reasons why lipreading tests are important:

. . . They can be used to measure the basic lipreading ability of an individual . . . A second reason that lipreading tests are desirable is that they can be employed to measure the effects of lipreading training . . . A third reason for the use of a lipreading test is to aid in proper placement of individuals within a training program . . . Fourth, a lipreading test is helpful in deciding which teaching methods, or combination of methods, are most appropriate for students of various ages and performance levels.²

The value of a test depends in large measure upon the care with which it is constructed. The background and needs of the population which will use the test must be weighed as the test is devised. In an ideal lipreading test, the influence of age and experience is negligible. The format of the test, speakers' selection of test items, test conditions and method of scoring must be evaluated so that the results will be valid and reliable.³ Tests of lipreading ability also allow the comparison of lipreading skill before training with post-training results.

¹Audrey A. Simmons, "Factors Related to Lipreading," Journal of Speech and Hearing Research, II (December, 1959), p. 344.

²John J. O'Neill and Herbert J. Oyer, Visual Communication (Englewood Cliffs: Prentice-Hall, Inc., 1961), p. 20-21.

³Ibid., p. 30.

Broadly speaking, lipreading tests can be categorized into two types: the face to face lipreading test and the silent motion picture film test.⁴ Since the latter method of presenting visual stimuli was used in this present study, cognizance of the advent and development of filmed lipreading tests is important. The earliest recorded attempt of a filmed test for lipreading skill was E. B. Nitchie's film of three proverbs which appeared in 1913.⁵

F. K. Heider and Grace M. Heider of the Clarke School for the Deaf developed three filmed lipreading tests in the early forties. The composition of their first test included unrelated nouns, phonetic combinations, animal names and sentences. Their second test consisted of thirty animal names, thirty unrelated nouns, thirty unrelated sentences and two stories. The only variations from Test II in the Heiders' final film were the omission of animal names, and the showing of each story in its entirety before a sentence by sentence viewing.

In order to avoid tiring their subjects, the Heiders administered the filmed lipreading tests in two sessions. The groups, which consisted of from four to nine subjects, sat at a distance from nine to twelve feet from the screen.

⁴M. C. Stephens, "An Experimental Investigation of the Relationship Among Three Filmed Lipreading Tests and Their Relationship to Teacher Ratings" (Unpublished Master's thesis, The Ohio State University, Dept. of Speech, 1956).

⁵O'Neill and Oyer, op. cit., p. 22.

No test material was repeated for the subjects except the stories, and the test material was scored according to the number of items correctly answered. Attempts were made to exclude homophonous words from the test.

The number of persons and age range of the subjects for the Heiders' three filmed tests were:

Test I - 86 subjects - Ages 7-17, lower and middle school.

Test II - 93 subjects - Ages 9-19, middle and upper school.

Test III - 68 subjects - Ages 9-19, middle and upper school.⁶

After a five-year period, forty-two children who had taken Test II also took Test III. The correlation of $.75 \pm .05$ between the results of the two filmed tests indicated that the rank of a child in a group tested for lipreading ability changes little over a period of years.

Each of the Heiders' filmed tests revealed considerable differences in subjects' scores. The wide range in scores was sharply emphasized in Test II in which the highest score was 134 points and the lowest score was 32 points. Thus, a most noticeable difference of 102 points existed between the highest and lowest score. Such results seem to

⁶F. K. Heider and Grace Heider, "Studies in the Psychology of the Deaf," Psychological Monographs, LII, 1940, p. 129.

indicate that individual differences are influential factors toward the phenomenon of lipreading. Their findings showed a correlation of $.19 \pm .08$ between chronological age and years of training, and a correlation of $.54 \pm .06$ between educational age as measured by Stanford achievement test and lipreading ability on Test III.⁷

From their study of filmed lipreading tests, the Heiders drew a number of conclusions. Their investigation showed that filmed lipreading presentations had a high degree of reliability. Subjects performed at a higher level when test material consisted of familiar words. The effects of educational achievement on lipreading was difficult to analyze since such an evaluation involved language development. The ability to organize material into the whole was another factor which facilitated lipreading in the Heider studies.

The work of Fritz and Grace Heider at the Clarke School for the Deaf gave tremendous impetus to the use of the motion picture as a medium for administering lipreading tests. In this present study where norms are collected on a relatively new lipreading test, the conclusions of the Heiders serve as a means of comparison as a newer objective lipreading test is evaluated.

⁷Ibid., p. 131 and p. 133.

At Ohio State University Marie K. Mason launched her lipreading technique by developing five training films. The method was named "Visual Hearing." Her experimentations with filmed lipreading tests began when an increasing number of university students needed training in lipreading, and only a few teachers were available.

Mason recognized the need to establish norms on a large population. A five word test for pre-schoolers and an additional ten word test were especially constructed so that norms could be obtained. Among the subjects were 1000 children from six residential schools and two schools for the hard-of-hearing. The test materials in these films were selected on the basis of these factors: (1) Occurrence in the first 3,000 words of Thorndike's word frequency list, (2) the vocabulary of a deaf child, (3) inclusion of the most frequently occurring consonants and vowel sounds, (4) photogenic quality of objects, (5) freedom from visual ambiguity, (6) distinct manifestations, (7) lack of homophenity in test words except when planned.⁸

During the forties Utley also recognized a lack of standardized materials for measuring lipreading ability. In order to determine whether a reliable and valid test could be devised for individuals from a third grade level

⁸Mary K. Mason, "A Cinematographic Technique for Testing Visual Speech Comprehension," Journal of Speech Disorders, VIII (September, 1943), p. 273-275.

through the adult level, Utley first conducted a trial experiment with 200 normal hearing subjects. The test material included 100 words from Thorndike's list of most frequently used words and sentences of common, as well as, idiomatic expressions. The results of this trial lipreading test revealed that the material was not too difficult for third graders and showed that no individual had obtained a perfect score.

Utley then prepared a revision of her lipreading test for administration to 110 deaf and hard-of-hearing subjects. Attempts were made to arrange test material according to a scale of difficulty. Subjects were tested in groups of twenty or less with very little voice used by the speaker. From this preliminary study Utley selected as practice items those words and sentences which most subjects answered correctly. The final test consisted of 72 words and 62 sentences.⁹

The sentence and word sections of the test were filmed in black and white, while the story section of the film was in technicolor. Insertion of blank film allowed fifteen seconds between sentences and ten seconds between words. Utley's test was shown to 761 deaf and hard-of-hearing individuals between the ages of eight and twenty-one years.

⁹Jean Utley, "A Test of Lipreading Ability," Journal of Speech Disorders, XI (June, 1946), p. 109-111.

These subjects' grade placements ranged from first through twelfth grade.

The coefficient of validity for the Utley film was found to be .971 and the corrected reliability for the entire test was .943. Utley's table of percentage ranks made it possible to use a person's raw score to determine progress in lipreading upon a retest.¹⁰ Thus, norms were made available for the entire test based on total scores.

After establishing norms for this filmed lipreading test, Utley concluded that the ability to lipread words, sentences, and stories was interrelated. From a correlation of .382 between chronological age and the total score, she concluded that lipreading ability could not be predicted from chronological age, nor was a correlation of .552 indicative that grade placement was a predicator of lipreading ability.¹¹

Objective measurement of lipreading advanced with Utley's film and norms from a large population. She viewed the introduction of the motion picture as a vital contribution to the field of aural rehabilitation.

The use of the motion picture technique seems the only logical means for presenting material both from experimental teaching and for testing lipreading. The use of this medium for such purposes is known to be

¹⁰Ibid., p. 114.

¹¹Ibid., p. 116.

open to controversy. The extent to which the technique approaches the natural situation is still to be determined. Yet, if the factors involved in learning to read lips and in the testing of an individual's lipreading ability are to be determined the actual recognition of the problem and consideration of the possible conclusions resulting from an objective attack must be used.¹²

Utley also pointed out that standardized lipreading tests aided in school placement, measuring school progress, and served as a means of studying an individual's growth and development. Her valuable contribution to the use of motion pictures as a means of objective measurement led to other studies.¹³

Since Utley's population had included more older individuals than were usually found in the typical school for the deaf, Grace Heider did a study using the Utley film with subjects below the adult level. Her investigation involved 78 pupils of the Clarke School for the Deaf. Those subjects from Clarke's Middle School ranged in age from 9.9 years to 14.3 years with an average age of 12.5 years, while the subjects from the Upper School ranged in age from 13.2 years to 19.1 years with an average of 15.9 years.

Heider's findings showed almost the same distribution as those of Utley's standardization groups, thus adding evidence to the reliability of the filmed lipreading test.

¹²Jean Utley, "Factors Involved in Teaching and Testing of Lipreading Ability Through Use of Motion Pictures," Volta Review, XLVIII (November, 1946), p. 657.

¹³Utley, "A Test of Lipreading Ability," op. cit., p. 109.

However, the correlation between age and lipreading scores differed somewhat from Utley's findings. The lower age groups in Heider's study showed a correlation of .51 between age and lipreading ability. "This correlation indicates that the score of a 'good lipreader' of ten years cannot be expected to be as high as the score of a 'good lipreader' of fifteen years, that lipreading of school children as measured by this test shows significant progress with age."¹⁴

A difference of more than twenty points existed between the average scores of subjects from the Middle School and those from the Upper School. The average score for the Middle School subjects was 37.7 and for the Upper School subjects the average score was 58.6. The highest score any subject made was 95. Yet this score is just half of the maximum points on the test. The average score of the Middle School subjects represented only 19 per cent of the total possible score, and the average score of subjects from the Upper School represented 30 per cent of the maximum score. From these results very revealing conclusions could be drawn. Not one subject got even half of the total number of items correct and only one-fourth of the test was understood on the average. Heider observed that such low scores on the Utley filmed test still allowed worthwhile evaluations to be made about an individual's lipreading ability.¹⁵

¹⁴Ibid., p. 457-458.

¹⁵Ibid.

Other results of Heider's study indicated that the highest percentage of subjects correctly responding to an item on Utley's word test was 82 per cent, while the lowest percentage of subjects responding to an item on the word test was 1.2 per cent. Fewer than ten subjects responded correctly to 45 per cent of the test words, and less than twenty subjects understood 67 per cent of the words. Only 8.3 per cent or 3 words could be lipread correctly by at least half of the subjects watching the film.¹⁶ The findings of Heider and Utley with regard to such factors as age and grade placement, as well as the percentage of subjects who correctly responded to the test items, are certainly pertinent to this present study in which these same factors will be evaluated in a filmed presentation of the Semi-Diagnostic Test.

Gladys Reid also studied lipreading ability using a film as the medium of testing. Her subjects were ninety-nine deaf girls. The age range of these subjects was from ten to twenty-two years and a coefficient of $.186 \pm .09$ was found between chronological age and lipreading ability. However, it was assumed that the amount of training directly varied with age. Therefore, the older a subject was, the more lipreading training it was assumed he had experienced. The coefficient of correlation between intelligent quotients

¹⁶Ibid., p. 488.

and lipreading scores was .169. From her studies Reid concluded that the ability to lipread is predictable from the length of training in lipreading, mental age, intelligence quotient, and grade status.¹⁷

Miriam Pauls, Morkovin, Lowell, and Moser have also studied the use of films in lipreading training. Thus, a review of the literature indicates that since the premier of Nitchie's filmed lipreading test in 1913, numerous other persons seeking objective measurement of the phenomenon of lipreading have developed films also. Their work has contributed to the knowledge of factors involved in such standardized tests. In this study a film presentation serves as a means of establishing norms for the Semi-Diagnostic Test in Aural Rehabilitation.

The Semi-Diagnostic Test in Aural Rehabilitation

The Semi-Diagnostic Test was devised to provide a systematic method of analyzing the errors of hearing impaired persons as a means of planning a worthwhile therapy program. Such a test is useful in retesting for it demonstrates the rate and kinds of improvement. The first Semi-Diagnostic Test was developed in 1956. This is a multiple-choice word test which allows measurement of auditory-visual intelligibility. The testee selects one of four possible answers.

¹⁷Gladys Reid, "Preliminary Investigation in Testing Lipreading Achievement," Journal of Speech Disorders, XII (March, 1947), p. 81.

If there had been only three possible answers, chance factors would have provided for a large percentage of correct answers. It was impossible to find five suitable words for this multiple choice test since all words in each group differ by only one phoneme. Therefore, four possible choices seemed the most practical form. An incorrect response denoted an error in perceiving a particular phoneme. The phonemes used in the 1956 Semi-Diagnostic Test were selected according to French, Carter and Koenig, Travis, and Voelker's studies of phonetic occurrences.¹⁸

The initial test of seventy-one consonant discrimination items and thirty-three vowel discrimination items was administered to twenty-five aural rehabilitation clients during a two-year period. The visual intelligibility section, which is the focal point in this study, was administered to these same clients by the live-voice procedure with the speaker approximately six feet from the listener. Error distributions of the clients were varied and were indicative of the kind and amount of improvement which would result from therapy. Such information emphasized the usefulness of the test in planning a program for a hearing-handicapped individual. The results also showed that item difficulty was not only affected by the amount of difficulty that the

¹⁸Charles Hutton, E. Thayer Curry, and Mary B. Armstrong, "Semi-Diagnostic Test Materials for Aural Rehabilitation," Journal of Speech and Hearing Disorders, XXIV (November, 1959), p. 319-320.

key sound presented, but that the type of phonemic contrast among a group of test items also influenced item difficulty.¹⁹

In the 1958 revision test items were selected according to these criteria: A or AA occurrence in the Thorndike-Lorge general count and occurrence in Rinsland's first 2,000 words for grades one through four. The Semi-Diagnostic Test then consisted of only fifty key words presented two in a series. Four possible choices remained for each key word. This 1958 revision was also analyzed by its authors, and those test items which were poor indexes were modified or replaced. These changes brought forth the 1959 revision which consisted of eighteen vowels and thirty-two consonant discrimination items.²⁰ The 1959 revision was the instrument used in establishing norms in this investigation.

In an earlier investigation in which the 1959 revision of the Semi-Diagnostic Test was used, thirty subjects representing various types and amounts of hearing loss were tested. These subjects ranged in age from eight to seventy-one years. No attempt was made to control for educational level. First these subjects were administered the auditory section of the Semi-Diagnostic Test since most clients found this section less difficult and less discouraging than the visual intelligibility section.

¹⁹Ibid.

²⁰Ibid.

Though the authors discuss the results on the auditory section of the test in detail and compare its usefulness to the W-22 words, little mention is made of the results on the visual section of the test and its use as a measure of lipreading ability.

The sample of thirty hearing-impaired clients was further divided into three subsamples: ten subjects with conductive losses, five subjects with mixed losses, and fifteen subjects with cochlear-eighth nerve losses. A conduction loss was defined as less than an average 10 decibel loss by bone conduction. An average bone-conduction loss of 10 decibels or more and an average air-bone separation of 10 decibels or more denoted a mixed loss. When the air-bone separation was less than 10 decibels, the loss was defined as a cochlear-eighth nerve loss. The three subsamples were quite small and conclusions drawn from such a small sample or sub-samples must be viewed cautiously. Therefore, it was necessary that a large population be tested with the Semi-Diagnostic instrument so that more substantial results could indicate its use in determining error profiles and its possibilities in lipreading training. For these reasons norms were needed.

The results obtained from these thirty subjects revealed relatively low visual score, though the cochlear-eighth nerve group had a higher mean score than the other two groups. The fact that persons with cochlear-eighth

nerve losses found it more imperative to use visual clues to compensate for auditory impairments was suggested as the reason for their higher scores. These are the test-retest scores for visual discrimination when the administration procedure was via live-voice at a distance of four to six feet from the speaker:

	<u>Test</u>	<u>Retest</u>
Mean Score for Subjects with Conductive Losses	27.3	29.5
Mean Score for Subjects with Mixed Losses	18.0	17.4
Mean Score for Cochlear-Nerve Losses	37.5	34.1 ²¹

It was indicated that the negative attitude toward the lipreading section of the test may have contributed to the lower reliability of .81 for the visual section of the Semi-Diagnostic Test as compared with the reliability of .98 for the auditory section. Since the live-voice procedure was also used to administer the visual and combined auditory-visual sections, this procedure could be cited as the reason that a coefficient of .81 was found for the combine section of the test also. Live voice testing permitted extraneous factors such as rate, articulation, and movement to remain uncontrolled during the testing. Also, the use of varied speakers further limited reliability. A filmed presentation of the Semi-Diagnostic Test in this study provided control of such extraneous factors.

²¹Ibid., p. 325.

Data gathered in another study of the Semi-Diagnostic Test revealed that sounds confused auditorily are dissimilar from those confused visually. It was noted that the Semi-Diagnostic technique provides the client with an opportunity to learn what are his errors sounds and to evaluate the characteristics of phonemes. Since this present investigation is concerned with lipreading ability, only the methods suggested by the author for visual training will be mentioned. The error sound is practiced in isolation, syllables and, finally familiar words. After the error phoneme has been practiced in isolation, training is provided in phoneme discrimination through the use of short phrases, sentences and paragraphs. Further training procedures combine visual clues with auditory clues as the client drills in small groups and adverse conditions. These training techniques are distinctive in that the client's program depends on his diagnostic results.

The use of both visual and auditory training as a diagnostic approach to aural rehabilitation was examined with eighteen subjects ranging in age from eleven to seventy-four. Results indicated that those who benefited the most from the combined technique were subjects who showed substantial gains in both auditory and visual training. Those aural rehabilitation subjects who had a 14.5 per cent increase in scores on the auditory section of the test after training but had only a 1.8 per cent gain in visual

discrimination after training, had lower scores when the combined clues were presented. These lower scores were due to poor visual discrimination scores. The mean pre-training visual score for these eighteen subjects was 40.8 per cent, and the mean post-training visual score was 44.3 per cent.²² If maximum results are to be obtained from the combined approach emphasized in the Semi-Diagnostic Method, improved visual speech discrimination, as well as improved auditory discrimination, must be emphasized. This indicates the need to study this Semi-Diagnostic Test as a means of facilitating and measuring lipreading training.

In another study of twenty-five subjects heterogeneous in age and hearing loss who were administered the Semi-Diagnostic Test, the mean per cent correct for consonant intelligibility was 41 per cent. Again, the live-voice method was the procedure for test administration. When visual clues were added, an auditory mean of 64 increased to form a combined mean of 83. These results also showed that visual clues aid the individual with a hearing loss. The phoneme /f/ was highest in intelligibility with 83 per cent of the subjects responding correctly. The phoneme /w/ was the next highest in correct response. Lowest in intelligibility were the phonemes /g/ and /k/ with one per cent and four per cent respectively correct. It can be

²²Charles Hutton, "A Diagnostic Approach to Combined Techniques in Aural Rehabilitation," Journal of Speech and Hearing Disorders, XXV (August, 1960), p. 269-271.

readily noted that such scores emphasize that the most visible phonemes are easiest to lipread. The mean visual score for vowel intelligibility was 45 per cent for sixteen of the hard-of-hearing subjects. The range of scores for vowel sounds was narrower with the lowest percentage being 16 per cent for the sound /æ/. The highest per cent correct for a vowel sound was also 83 per cent for the /ʊ/ sound. For all 25 subjects the mean was 38 per cent correct.²³ Again the samples were small and heterogeneous in both age and educational level. Some of the conclusions of this study with twenty-five subjects were that the use of both auditory and visual clues resulted in greater intelligibility than either audition or vision alone, and that subjects seem to vary considerably in the utilization of visual clues in combined stimuli.

The Need for Norms

These previous studies indicate that the Semi-Diagnostic Test may have merit as a means of obtaining an individual's error profile and planning a therapy program. Thus far the samples have been small and quite heterogeneous in age, educational level, type and degree of hearing loss. However, the Semi-Diagnostic Test would be a more valuable tool in lipreading training if norms were available. With norms as

²³Charles Hutton, "Auditory and Visual Stimuli in Aural Rehabilitation," Volta Review, (September, 1959), p. 317-319.

to the average per cent correct according to sex and certain age-educational levels, the clinician has a yard stick by which to evaluate a client's score. Norms would serve as indexes as to whether the hearing-impaired individual's lipreading performance is good, poor, or average when his score is compared with scores from a typical population of his age-educational level and sex. The use of a filmed presentation of the Semi-Diagnostic Test controls extraneous factors connected with the speaker. Thus, norms should be established on a large sample with a film as the medium of presentation so that scores from this test can be interpreted objectively and the Semi-Diagnostic Test can be a more effective test instrument.

CHAPTER III

SUBJECTS, EQUIPMENT AND PROCEDURE

Subjects

In order to establish norms for the 1959 Revision of the Semi-Diagnostic Test in Aural Rehabilitation, a filmed lipreading test of the key words in Test 1A was shown to 162 individuals. These subjects were a composite of three distinct groups: 60 fourth grade pupils, 60 seventh grade pupils and 42 young adults.

The 30 fourth grade boys and 30 fourth grade girls were all pupils at Dailey Elementary School in the Beecher School District of Flint, Michigan. This group of subjects ranged in age from 9.0 to 11.0 with 9.7 being the mean age.

The 39 seventh grade males and 21 seventh grade females were students at the Beecher Junior High School in Flint, Michigan's Beecher School District. The age range of the seventh grade subjects was from 12 to 16 with a mean age of 12.9

Since the subjects in each of these two groups were alike in educational level, this level was also kept constant in the young adult group by selecting subjects with only a twelfth grade education. For the purposes of this study, as was previously stated in Chapter One, "young

adult" was arbitrarily defined as a male or female individual between the ages of seventeen and twenty-seven years of age. The lower age limit allowed persons who were graduating high school seniors of the current school year to be included in this study, and the upper age limit of twenty-seven allowed the inclusion of subjects in the young adult group who had finished high school, but had not pursued a college education. The Semi-Diagnostic Test was administered to fifteen high school seniors attending Beecher Senior High School in Flint, Michigan. The remaining twenty-seven young adult subjects were residents of Westchester County, New York. These 21 male young adults and 21 female young adults ranged in age from seventeen to twenty-seven years with a mean age of 19.9.

The use of three groups to establish norms allowed for much more information to be obtained about lipreading performance with the Semi-Diagnostic Test. Not only could the average percentage of correct answers for Test 1A be computed, but the effect of age-educational level on lipreading ability could be more accurately determined with a stratified sample.

The 90 male subjects and 72 female subjects permitted differences in scores according to sex to be examined also. In each group the scores of male subjects and female subjects could be compared and the overall performance could be evaluated.

No other criteria was set for the subjects involved in this investigation except that each individual tested had to be of a particular educational level and young adult subjects had to be within certain age limits. Hearing and vision tests were not administered due to the fact that a typical population could, indeed, include persons with some degree of hearing loss or visual defect. Therefore, there was no need to exclude individuals with possible losses or defects from this sample.

Equipment

A Kodacolor, silent film presentation was used. As the female speaker enunciated the 50 monosyllabic words, she maintained a natural, non-smiling expression. In previous studies reported in the literature the live-voice procedure had been used to administer the visual intelligibility section of the test. In a discussion of results procured from 30 hearing-impaired subjects, it was stated that the similar coefficients of the visual test and the combined visual-auditory test indicated that possibly the live-voice procedure limited the reliability of these portions of the test.¹

The use of the same speaker on film in each presentation, while establishing norms in this present study eliminated

¹Hutton, et al., op. cit., p. 328.

extraneous factors such as variability in formation of words from test to test or differences in scores which may be due to the use of more than one speaker. The authors of the Semi-Diagnostic Test had also noted that lipreading scores from different speakers are not comparable according to clinical observation.² Along with obtaining more reliable results with a standard filmed presentation, it was a more practical method of testing a large sample.

An 8 millimeter Bell and Howell, autoload projector was used to show the film on a 50 inch by 50 inch screen. Each subject was provided with a response sheet and pencil.

The procedures for administration and scoring as outlined in the test manual were followed when feasible during the planning and execution of this study.

Procedure

The Semi-Diagnostic Test in Aural Rehabilitation was administered to all subjects in a darkened room in groups of fifteen. However, with young adult subjects it was necessary to test some groups of less than fifteen subjects since these individuals were not as centrally located as the fourth and seventh grade students. A group of fifteen subjects could be suitably arranged so that no subject was farther than ten feet from the screen. Also, the testing of this many subjects at all but two showings

²Ibid.

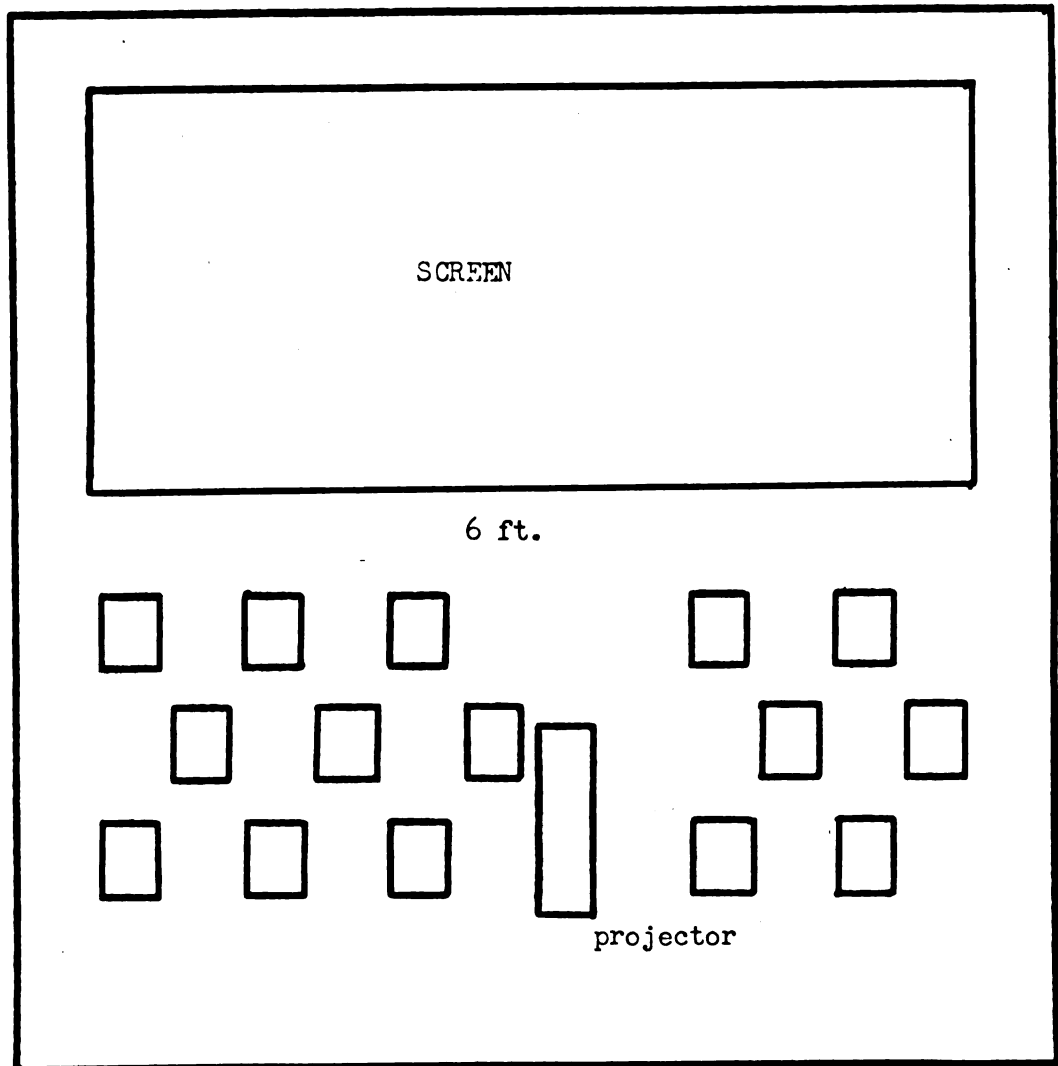
of the film reduced the wear and tear of the film which had to be stopped after each test item to permit adequate time for the subjects to draw a line through the correct answers and prepare for the next test item. This size group could be expediently tested with the necessary attention still allowed for the examiner to check the responses to the practice test items before the actual test began. This procedure assured that all subjects clearly understood the directions. At each presentation of the film, only subjects of the same educational level were tested.

The screen was placed six feet from the first row of viewers. Five subjects were in each of the three rows. The projector was placed so that there were three seats to one side of the projector and two seats to the opposite side. The seats in row two and row three were approximately 12 inches away from the seats in front of them. Each seat was placed between the two seats in front in such a way that all subjects could have clear view of the film.

Figure 1 is a diagram of the typical seating arrangement used to administer the filmed lipreading test.

The seats and equipment had been properly arranged, and an answer sheet and pencil had been placed on each desk before the subjects entered the room. After the subjects were seated, they were instructed to fill in their name, age, school, grade, and sex in the appropriate blanks on the answer sheets. When these preliminaries had been completed, the following instructions were given:

FIGURE 1.--Typical seating arrangement during testing



Today you will see a film with no sound. This is a film to see how well you read lips. All through the film you will see one person who says a number, such as "number one," followed by two words, such as "luck, it." You are to watch the person closely to see if you can tell what two words she is saying. After the number, she will say one word from each group of four words on your answer sheet. Draw a line through the words you think she said.

For example, let's look at the first practice group on the answer sheet. A line has been drawn through the word "luck" in the first column and "it" in the second column. This is the correct way to mark your answer sheet. The words do not have to be across from each other, and they don't have to mean anything together. If you see a word or part of a word and aren't sure what it is, make the best guess you can.

Each time before the speaker says the two words, you will be given time to look at the two groups of words after the number so that you will have an idea what the speaker may be saying. After the speaker has said the two words, you will be given time to mark your answer sheet. I will let you know when the next test item is about to be shown by saying aloud the number of the next test item.

Let's try one before the test begins. Look over the words in the second practice group. (Allow the subject approximately ten seconds to look over the words.) Watch me closely as I say a number followed by two words. Be sure to watch me until you have seen both words before you begin to mark your answer sheet. (Examiner then inaudibly says the following:) Number two: "for--gay." (Examiner quickly walks by each desk to see if all subjects understand the procedure.) The two words I said were: "for--gay." Most of you did well with the practice group. Are there any questions before we begin? (Pause)

Remember if you see only part of the word, make the best guess you can. If you have no idea what the word is, leave that answer blank. There will be 25 numbers and every number will be followed by two words. Read over the words following number one, and we will be ready to begin

The procedure of checking the practice group eliminated possible errors in the actual test which might have invalidated

the answer sheet or caused it to be scored incorrectly. The most common mistakes the examiner eliminated by checking the practice items were failure to draw a line through the response and making a line through two words in the same column.

The instructions in the auditory and visual sections of the Semi-Diagnostic Test manual were the basis for structuring the directions for this filmed lipreading test. Since only the visual section of the Semi-Diagnostic Test was used to establish norms, and since the answer sheet in this study varied from the original one by the inclusion of practice items, the instructions of necessity had to deviate from those in the test manual. The practice test items were a precautionary measure to minimize procedural mistakes in the actual test. It was observed that the key words for the practice group were usually marked correctly by the subjects. This let them experience initial success and reduced apprehension of the test situation.

The need to simplify test instructions so that the fourth grade subjects understood probably added to the length of the instructions. As many of the subjects' anticipated questions as possible were answered through these instructions.

The average time for administering the entire lipreading test was approximately twenty minutes with about fifteen seconds being the usual time limit between responses. For

the seventh grade and young adult groups the testing moved at a slightly more rapid pace than for the fourth grade group since fewer required additional explanations.

Scoring

The key word list for Form 1 List A served as the guide to correct responses. A check mark denoted an incorrect answer and N.A. beside a word group indicated that the subject had attempted no response for that particular word. No mark was made for a correct answer. The number of right, wrong, and blank answers were recorded. The per cent correct was computed according to the following formula:

$$2 \left(R - \frac{W}{3} \right) = \text{---} \quad (R = \text{right answer, } W = \text{wrong answer.})$$

This formula takes into account and corrects for the possibility of guessing. Blank answers were not counted as incorrect responses.

An item difficulty chart was organized to show the percentage of subjects according to educational level who made correct responses to each of the 50 words.

From the procedures used and the data collected norms were, thus, established as to the average per cent correct according to sex and age-educational level.

CHAPTER IV

RESULTS AND DISCUSSION

Results

Results could be statistically treated. The objective of this study was to establish norms for lipreading ability when a film presentation of the Semi-Diagnostic Test was used. The results indicated whether the variables of age-educational level and sex had an effect on the subjects' scores.

Differences in scores according to age-educational level and sex.--Mean scores which represented the average per cent according to age-educational level and sex were obtained. These results, as well as, the range in scores and standard deviations for each of the six subclasses in this study are reported in Table 1.

Statistical significance of differences in scores according to age-educational level and sex of subjects.--A two-way analysis of variance for subclasses unequal in number was employed to determine whether the results in Table 1 were statistically significant. This method, which is described by Walker and Lev, makes use of the mean of each subclass as the single case of that subclass. Therefore, each subclass was reduced to an N of one, the mean, for statistical purposes. Using the six means in this manner,

TABLE 1.--The number of subjects, range, standard deviation and mean score for each subclass.

Item	Group I Mean age-9.7		Group II Mean age-12.9		Group III Mean age-19.9	
	Fourth Grade	Seventh Grade	Twelfth Grade	Total		
Males	N	30	39	21	90	
	Range	0 - 47	0 - 41	0 - 65	0 - 65	
	Mean	13.6	18.3	27.8	19.90	
	SD	13.0	11.0	11.2		
Females	N	30	21	21	72	
	Range	2 - 41	7 - 44	15 - 52	2 - 52	
	Mean	19.7	26.8	35.2	27.3	
	SD	9.4	9.7	11.1		
Total	N	60	60	42	162	
	Range	0 - 47	0 - 44	12 - 65	0 - 65	
	Mean	16.6	22.6	31.5	23.6	

the sum of squares for rows, sum of squares for columns, sum of squares for the total, and the interaction were computed. However, sum of squares of deviations from the subclass mean was computed from the subclass mean was computed from the total sum of squares and the sum of scores when all cases were used. This method further required that the mean square of the within subclass be calculated by multiplying a constant expression by the quotient of the sum of squares for all cases divided by the degrees of freedom of the within group. The constant is the reciprocal of the number of subclasses times the sum of the reciprocals of the N for each cell.¹ Table 2 is a summary of the two-way analysis of variance and the F test for significant difference.

Inspection of this table shows that this difference in scores according to sex was statistically significant at the .01 level of significance. These results also indicate that there was a difference in scores according to age-educational level and that this difference was statistically significant at the .01 level.

Percentage of subjects according to age-educational level scoring at least 50 per cent, 25 per cent to 49 per cent, or less than 25 per cent correct on the Semi-Diagnostic Test.--To determine what percentage of the Semi-Diagnostic

¹Helen M. Walker and Joseph Lev, Statistical Inferences (New York: Henry Holt and Company) 1953, pp. 381-382.

TABLE 2.--Summary of two-way analysis of variance.

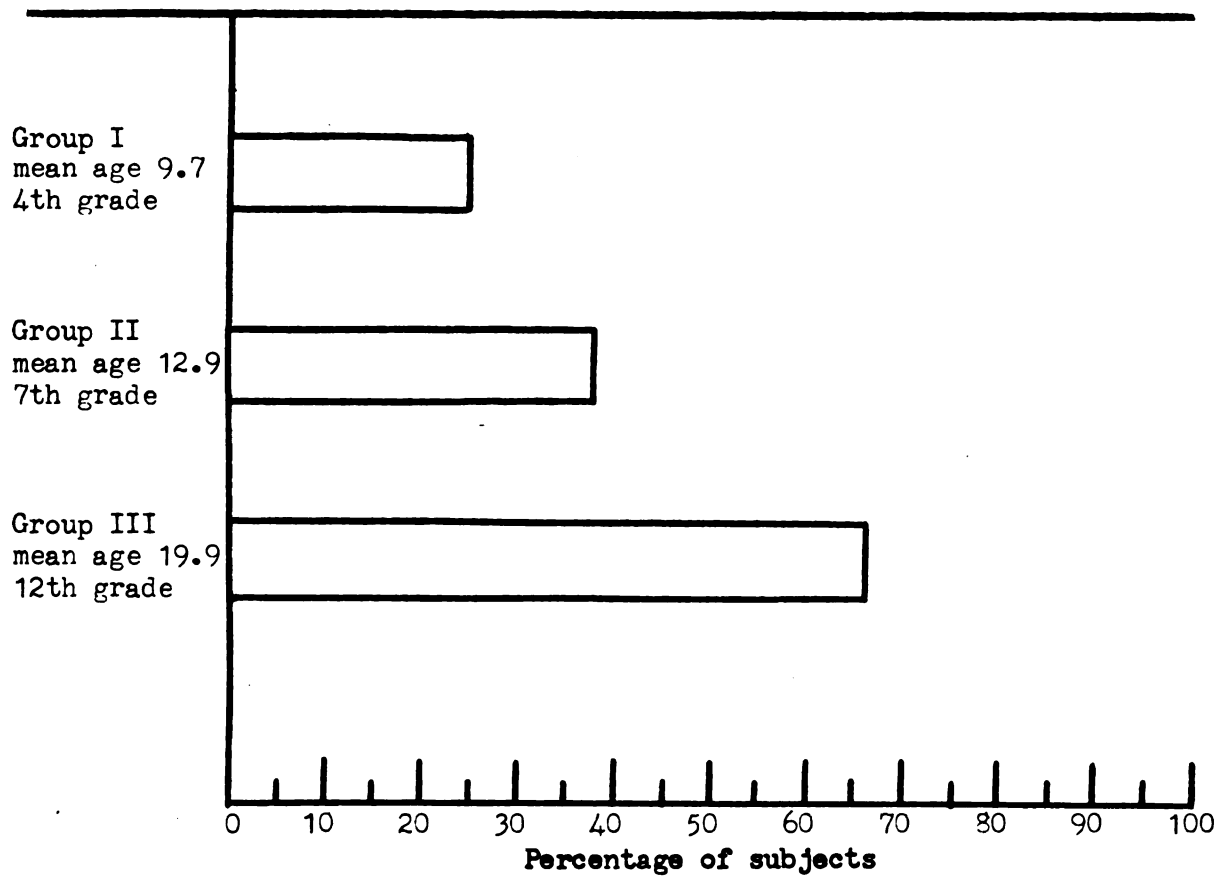
Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	F.99*
Sex	80.95	1	80.95	16.42	6.63
Age-Education	223.11	2	111.55	22.63	4.61
Interaction	1.41	2	0.705	.143	4.61
Error (WG)		156	4.93		
Total	305.47	161			

*Level of significance--.01.

Test was understood by subjects in each of the three groups, each subject's score was placed in one of three categories: at least 50 per cent correct, 25-49 per cent correct, and less than 25 per cent correct. Only three of the 162 subjects scored at least 50 per cent correct. These subjects were all young adults. Figure 2 indicates the percentage of subjects according to age-educational level who scored between 25-49 per cent correct.

Figure 2 reveals that 25 per cent of the subjects in Group I scored between 25-49 per cent correct, 38.3 per cent of the subjects in Group II could be placed in this category, while 66.6 per cent of the young adult subjects were within this range.

FIGURE 2.--Percentage of subjects according to age-educational level
scoring 25-49 per cent correct on the Semi-Diagnostic Test



The percentage of subjects who scored less than 25 per cent correct appears in Figure 3. In group I, 75 per cent of the subjects scored less than 25 per cent correct, 61.6 per cent of the subjects in Group II were in this category, while only 23.8 per cent of the young adult subjects had such low scores.

A distribution of scores for all 162 subjects indicated the category in which most scores could be placed. This distribution appears in Figure 4.

In this distribution of scores 1.8 per cent of the subjects scored 50 per cent or more correct, 40.7 per cent of the subjects scored between 25-49 per cent correct, and 57.4 per cent of the subjects scored less than 25 per cent correct on the Semi-Diagnostic Test.

Percentage of subjects according to sex scoring at least 50 per cent. 25-49 per cent, or less than 25 per cent correct.--In addition to age-educational level, the factor of sex was evaluated as to its possible effect on lipreading performance. Figure 5 gives the distribution of scores on the Semi-Diagnostic Test according to sex.

These results indicated that 1.1 per cent of the male subjects and 2.7 per cent of the female subjects scored at least 50 per cent correct. More than 30 per cent of the male subjects and 50 per cent of the female subjects scored between 25-49 per cent correct, while 65.5 per cent of the males and 47.2 per cent of the females scored less than 25 per cent correct.

FIGURE 3.--Percentage of subjects according to age-educational level scoring less than twenty-five per cent correct

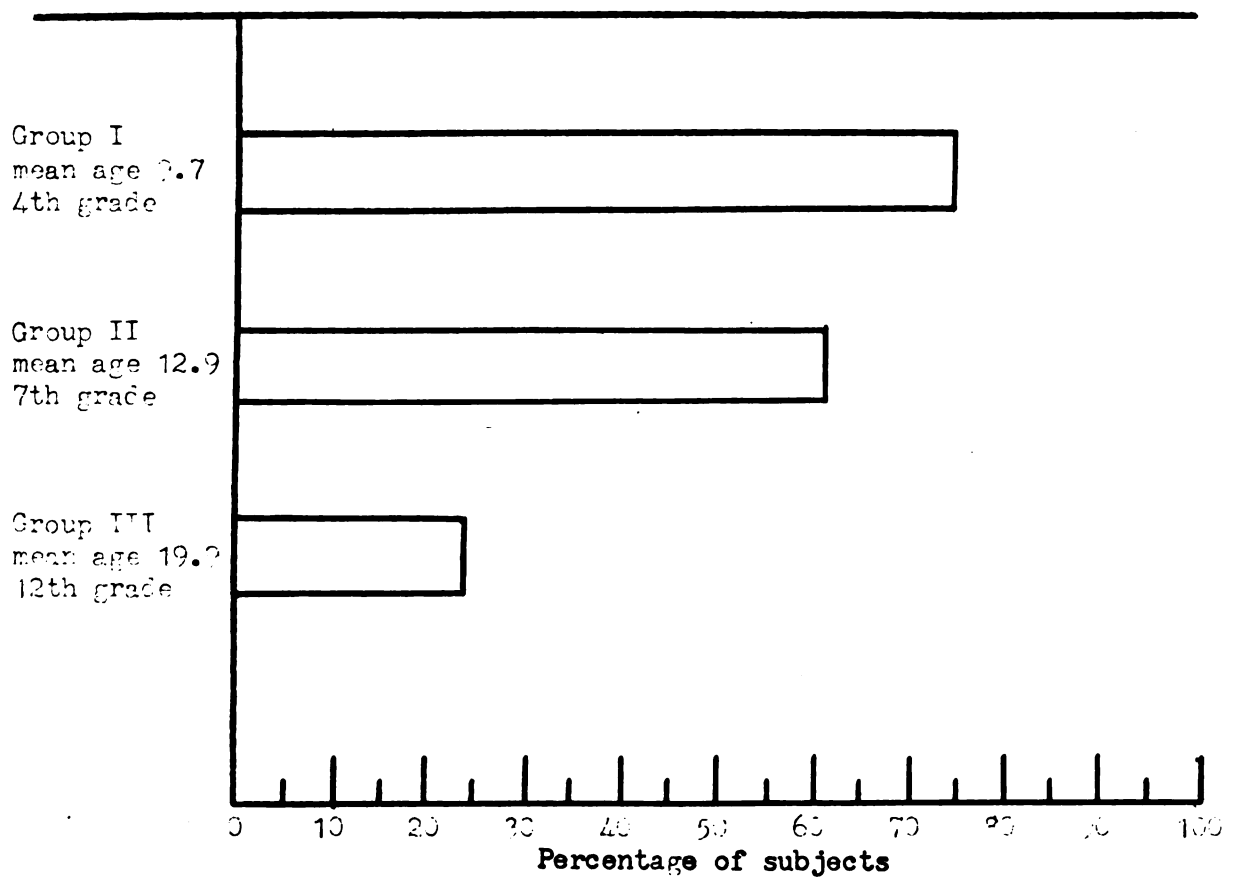


FIGURE 4.--Distribution of scores for 162 subjects on the Semi-Diagnostic Test

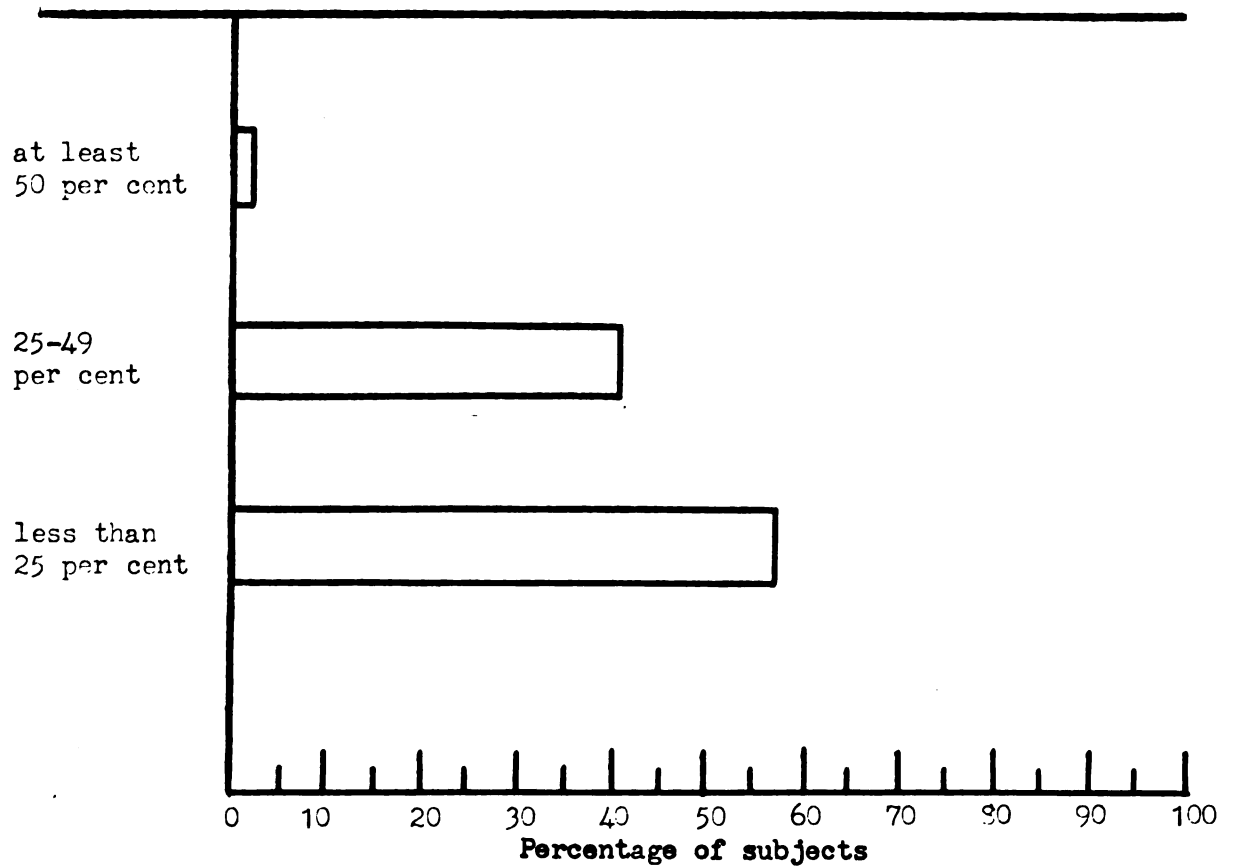
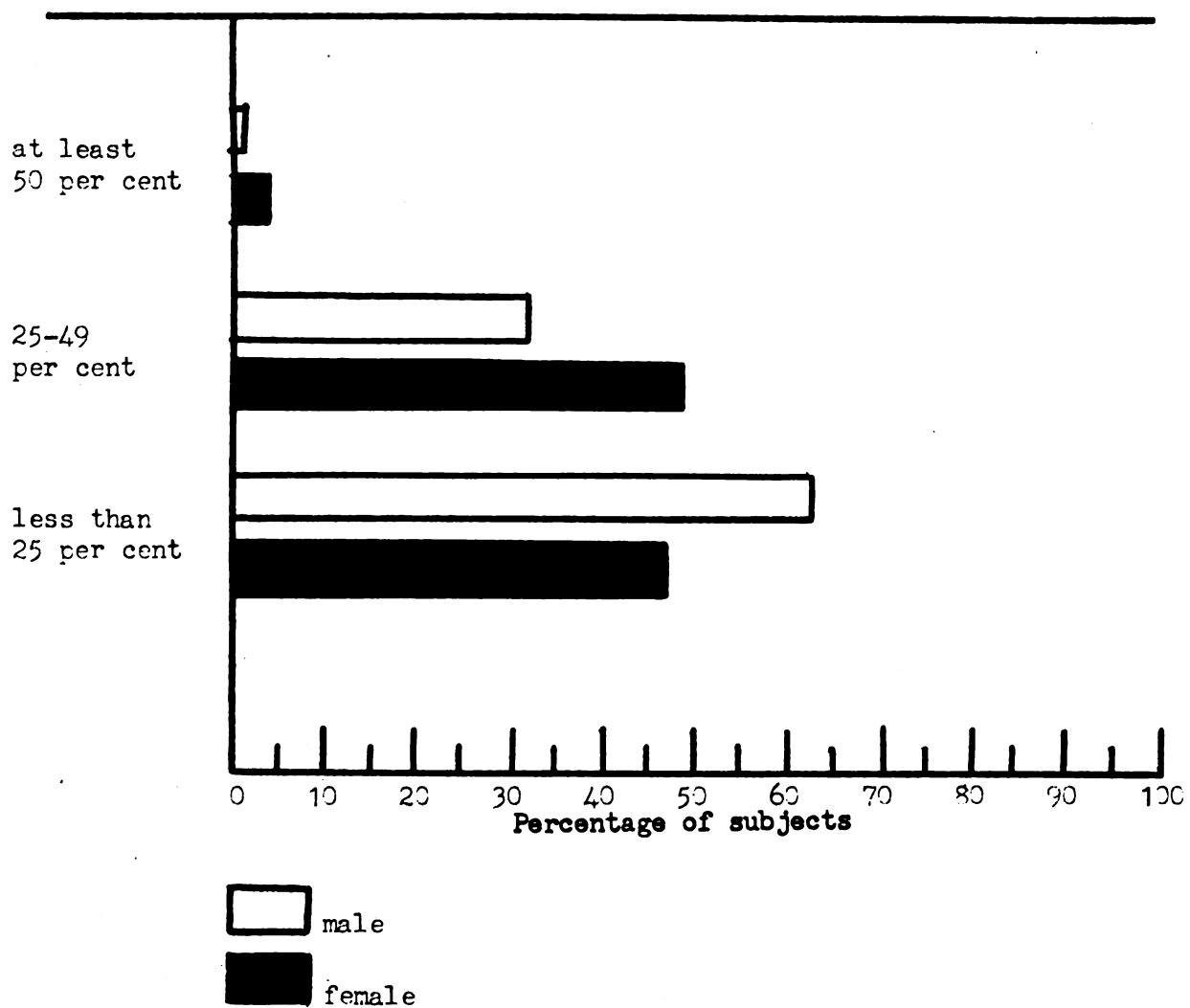


FIGURE 5.--Distribution of scores on the Semi-Diagnostic Test according to sex



Per cent of item difficulty.--From the answer sheets data was compiled to indicate whether the fifty words differed in difficulty. The results of that compilation appear in Table 3.

Discussion

As a result of statistical treatment of the data, questions posed in Chapter I could be answered.

1. There was a difference in scores according to age-educational level on the Semi-Diagnostic Test. As the age-educational level of subjects increased, the percentage of correct responses among subjects also increased. According to the results in Table 1, the mean score of subjects in Group I (mean age 9.7, 4th grade) was 16.6, while the mean score of those in Group II (mean age 12.9, 7th grade) was 22.6. The gap between the mean score of subjects in Group II and those in Group III (mean age 19.9, 12th grade) was almost ten points since the mean score for the latter group was 31.5. Hence, the percent correct increased as the age-educational level of subjects increased from a mean age of 9.7 and a fourth grade educational level to a mean age of 19.9 and a twelfth grade educational level.

TABLE 3.--Percentage of correct responses for each key word on the Semi-Diagnostic Test

Item	Group I Percentage	Group II Percentage	Group III Percentage
lad	23	18	21
an	18	8	17
eyes	50	58	64
burn	50	47	57
pie	53	53	71
tea	33	33	24
cut	13	22	36
knee	50	52	55
pain	42	47	55
like	23	28	40
men	17	17	33
some	43	63	69
wife	73	83	95
cat	38	30	38
then	42	47	64
sit	18	17	38
he	10	27	17
nut	33	33	36
row	75	67	86
wing	42	50	31
seek	23	27	24
change	27	42	74
bowl	57	57	74
eat	62	63	67
it	22	37	45
place	48	40	24
same	32	37	24
with	65	78	93
day	27	23	19
bear	38	37	43
fur	62	63	83
cool	30	30	67
seen	43	32	29
ten	32	30	26
wood	30	55	64
did	30	37	71
won	45	37	43
vote	62	72	90
lies	17	18	29
far	38	43	57
fill	18	13	48
wide	60	80	81
night	30	22	24
lay	22	27	62
will	23	23	33
luck	47	5	50
yet	43	37	29
pool	25	28	33
played	32	35	31
led	27	13	14

Group I - Mean age 9.7, educational level fourth grade.

Group II - Mean age 12.9, educational level-seventh grade.

Group III - Mean age 19.9, educational level-twelfth grade.

2. The null hypothesis that there is no significant difference in scores according to age-educational level was rejected at the .01 level of significance. These findings are contrary to Utley's conclusion that chronological age could not be a predictor of lipreading ability. Also Utley concluded that a correlation of .552 between grade placement and total score indicated that grade placement was not an index of lipreading ability.² Reid, too, had found no correlation between lipreading ability and grade level.³ However, the Heiders had reported a correlation coefficient of .54 between lipreading and grade placement.⁴ After her study of 78 subjects from the Clarke School for the Deaf, Heider had even stated that in this investigation school children showed significant progress with age in lipreading ability.⁵ The results of this present study support Heider's statement.

²Utley, "A Test of Lipreading Ability," op. cit., pp. 114, 116.

³Reid, op. cit., p. 82.

⁴Heider, et al., op. cit., p. 133.

⁵Heider, op. cit., p. 458.

However, it must be noted that in each of these studies the investigators studied chronological age and grade placement as separate factors, while in this study there was considered to be a reciprocal effect between age and educational level. Therefore, the two factors were not isolated.

3. When results were analyzed to determine the percentage of subjects scoring at least 50 per cent, 25-49 per cent, or less than 25 per cent correct, it was also evident that age-educational level affected the scores. The scores of three subjects in Group III (mean age 19.9, 12th grade) were at least 50 per cent. No individual between the ages of nine and sixteen who had a fourth grade or seventh grade educational level correctly responded to at least one-half of the Semi-Diagnostic Test.

From Figure 2 it is readily observable that the percentage of subjects who scored more than 25 per cent correct increased as age-educational level. Approximately thirteen per cent more subjects in Group II (mean age 12.9, 7th grade) than in Group I had scores in this category. In Group III (mean age 19.9, 12th grade) there was an even greater increase of 28 per cent in the percentage

of subjects who scored between 25 per cent to 49 per cent correct.

The results in Figure III pointed out the percentage of subjects scoring less than 25 per cent correct. These were the subjects who understood the least amount of the lipreading test. From these results it was noted that as age-educational level increased the percentage of subjects with low scores on the Semi-Diagnostic Test decreased. Three-fourths of the scores in Group I were in this category. This was 12 per cent more than Group II had in the same category. When the scores of subjects in Groups II, (mean age 12.9, 7th grade) were compared with the scores of subjects in Group III (mean age 19.9, 12th grade), 38.2 per cent more subjects in Group II scored less than 25 per cent correct. These data certainly emphasize that the best scores on the Semi-Diagnostic Test were among those who were older and had a higher educational level.

4. There was also a difference in scores according to sex. Table 1 showed that in each group of subjects the mean score for female subjects was higher than the mean score for male subjects. The mean score for males in Group I was 13.6, while females in this group had a mean score of 19.7.

In Group II the females also had a higher mean score of 26.8, while males had a mean score of 18.3. This trend continued among the young adult subjects. Female young adult subjects had a mean score of 35.2, while the mean score for young adult male subjects was 27.8. When all male subjects were considered collectively, the average score was 19.9. Thus, most male subjects responded correctly to less than one-fourth of the test. The 72 female subjects had a higher mean score of 27.3.

- 5 Differences in scores according to sex were statistically significant. The null hypothesis that there is no significant difference according to sex was rejected at the .01 level of significance.
6. In the distribution of scores according to sex in Figure 5, two of the three subjects who responded correctly to at least 50 per cent of the Semi-Diagnostic Test were female subjects. There were 17 per cent more females than males responding correctly to 25-49 per cent of the test. Most male subjects, in fact 65.5 per cent, scored less than 25 per cent correct. This placed more than half of the male subjects among those who scored lowest on the Semi-Diagnostic Test. These results are indicative that females are better lipreaders

than males when the Semi-Diagnostic Test is the measuring instrument.

7. Test items varied in difficulty. The percentage of subjects in Group I (mean age 9.7, 4th grade) who correctly identified any particular word varied from 10 per cent to 75 per cent. The word "he" was missed by 90 per cent of these subjects, while only 25 per cent missed the word "row." Among the subjects in Group II, (mean age 12.9, 7th grade) only 5 per cent recognized the key word "luck," but 83 per cent correctly responded to the key word, "wife." In Group III (mean age 19.9, 12th grade) the percentage of subjects lipreading any given test item ranged from 14 per cent to 95 per cent. These key words were "led" and "wife" respectively. In comparison the percentage of subjects in Heider's study of the Utley test who correctly responded to any given word varied from 1.2 per cent to 82 per cent. Table 3 showed that thirteen of the fifty words on the Semi-Diagnostic Test were understood by fewer than one-fourth of the subjects in Group I. Eleven key words were identified by less than one fourth of the subjects in Group II, while in Group III ten words were lipread by fewer than one-fourth of these subjects. When these data were

evaluated collectively, it was noted that 38 per cent of the test items were understood by less than one-fourth of a group of the subjects. On the contrary 67 per cent of the words on the Utley Test were understood by fewer than one-fourth of the group.⁶

At least one-half of the subjects in Group I correctly lipread 12 words in the Semi-Diagnostic Test. In Group II at least one-half of the subjects identified 14 key words. Among the older and more educated subjects in Group III, 22 words were understood by at least one-half of the group. However, Heider reported that only 3 words on the Utley film were correctly lipread by at least one-half of the subjects.⁷

8. The average score of the 162 subjects who were administered the Semi-Diagnostic Test was 23.6. The highest possible score on this test was 100 per cent. Thus, on the average subjects understood approximately one-fourth of the test. Heider had also reported that the 78 subjects in her study generally responded correctly to one-fourth of the test.⁸

⁶Heider, op. cit., p. 488.

⁷Ibid.

⁸Ibid., p. 458.

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS FOR FURTHER RESEARCH

Summary

Small samples dissimilar in age and education were used in previous studies of the Semi-Diagnostic Test in Aural Rehabilitation. Such small and diverse samples necessitated that results be cautiously interpreted. Therefore, some norms were needed.

In order to establish norms for the 1959 Revision of the Semi-Diagnostic Test, a film presentation of the visual intelligibility section of the test was shown to 162 subjects. These subjects included 60 fourth grade pupils, 60 seventh grade pupils, and 42 young adults. The mean age of the fourth grade subjects was 9.7 years. Seventh grade subjects had a mean age of 12.9 years, while the mean age of the young adult subjects was 19.9. Of the 162 subjects there were 90 males and 72 females. Since educational level usually increases as age increases, these factors were not isolated. Rather, a reciprocal effect was considered to exist between age and educational level. The division of the subjects into three groups of different ages and educational levels allowed the study of differences

in scores according to age-educational level. Also, differences in scores according to sex were analyzed.

A two-way analysis of variance for unequal subclasses was the statistical method used to determine whether results were statistically significant. The percentage of subjects in each group who scored at least 50 per cent, 25-49 per cent, or less than 25 per cent on the test was computed. To ascertain whether key words varied in difficulty a table was compiled of the percentage of subjects responding correctly to each key word.

Conclusions

Within the framework of this study these conclusions could be made about the Semi-Diagnostic Test in Aural Rehabilitation:

1. When lipreading scores were obtained through the use of this test, there were differences in scores according to age-educational level and sex. These results were statistically significant at the .01 level.
2. The use of a silent film allowed objective measurement of lipreading skill.
3. The Semi-Diagnostic Test does provide an error profile which can be used to plan a rehabilitative program for an individual with a hearing loss.

Implications for Further Research

1. A study of lipreading ability as measured by the Semi-Diagnostic Test among individuals younger and at a lower educational level than subjects in this investigation would indicate whether the factors of age-educational level and sex operate among such subjects. Also, these factors should be studied among individuals older than the subjects in this study.
2. A study is needed to determine the relationship between vocabulary and/or language skills and the score on the Semi-Diagnostic Test.
3. The relationship between word visibility and correct responses should be investigated.
4. Error responses should be studied in order to note any patterns among the multiple-choice test items which might contribute to incorrect responses.

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APPENDIX

APPENDIX

SEMI-DIAGNOSTIC TEST RESPONSE SHEET

Date _____

SEMI DIAGNOSTIC TEST - FORM I

Name _____	Score $2(R - \frac{W}{3})$ _____
School _____	Wrong _____
Grade _____ Age _____	Distance _____
Sex _____ Other _____	Room _____

DIRECTIONS:

DRAW A LINE THROUGH THE TWO WORDS IN EACH GROUP THAT YOU THINK ARE BEING SAID. WATCH THE FILM CLOSELY.

Practice Groups:

lack	ill	for	they
luck	is	fair	boy
lake	if	fur	gay
lock	it	far	day

LIST 1-A

1. led	an	3. pie	tea
laid	add	tie	see
lad	at	high	she
lied	am	gy	key
2. I'd	barn	4. caught	we
eyes	burn	cat	me
ice	born	coat	knee
I've	been	cut	be

LIST 1-A. (Continued)

5.	pen pain pan pine	luck lake lack like	15.	gay day bay they	bear pair dare wear
6.	mean mine men man	sun such song some	16.	far fire fur fair	tool cool fool pool
7.	wife white wipe wise	can cap cat catch	17.	seen seem sing seed	pen ten then hen
8.	pen then ten when	set sat seat sit	18.	wide word wood what	did dead dad died
9.	tea he key see	net not night nut	19.	gun fun run won	wrote boat note vote
10.	low row go bow	win will wing wind	20.	wise rise dies lies	far for fur fair
11.	seen sent seek seed	chains chair chained change	21.	full feel fill fell	lied wide died ride
12.	bowl boil ball bull	ate it at eat	22.	light bite might night	lay way ray day
13.	it it is ill	plate plays place play	23.	will we'll well wool	lake lock luck lock
14.	shame came tame same	will wish with win	24.	let yet met get	pole pull pile pool
		25.	plate play played plane	let led leg less	

KEY WORDS AND KEY PHONEMES FOR THE SEMI-
DIAGNOSTIC TEST, LIST 1-A

	Key Word	Key Phoneme	Key Word	Key Phoneme
1.	lad	æ	an	n
2.	eyes	z	burn	ʃ
3.	pie	p	tea	t
4.	cut	ʌ	knee	n
5.	pain	e	like	a
6.	men	ɛ	some	m
7.	wife	f	cat	t
8.	then	ʒ	sit	ɪ
9.	he	h	nut	ʌ
10.	row	r	wing	ŋ
11.	seek	k	change	dʒ
12.	bowl	oʊ	eat	i
13.	it	t	place	s
14.	same	s	with	ð
15.	day	d	bear	b
16.	fur	ʃ	cool	k
17.	seen	n	ten	t
18.	wood	ʊ	did	ɪ
19.	won	w	vote	v
20.	fill	ɪ	wide	w
21.	night	n	lay	l
22.	will	ɪ	luch	ʌ
23.	yet	j	pool	u
24.	played	d	led	d

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