



AN INVESTIGATION OF THE RELATIONSHIP BETWEEN
THE LIPREADING ABILITY AND INTELLIGENCE OF
THE MENTALLY RETARDED

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ABSTRACT

AN INVESTIGATION OF THE RELATIONSHIP BETWEEN THE LIPREADING ABILITY AND INTELLIGENCE OF THE MENTALLY RETARDED

by Richard C. Smith

The purpose of the present study was to investigate the relationship between lipreading test scores, obtained in a face to face presentation, and varying intelligence levels among the mentally retarded.

One hundred and twenty lipreaders and two talkers were used in the investigation. The lipreaders consisted of adult mental retardates, ages sixteen through thirty-four, randomly selected according to scores on the WAIS or the Stanford Binet, Forms L & M. All of the subjects were institutionalized in state homes for the mentally retarded. The talkers were two male graduate students enrolled in speech and hearing science at Michigan State University.

Each lipreader was tested individually and his responses recorded by a person in the room with the lipreader. Two adjoining rooms with an observation window between them were utilized to allow the talker to use voice without being heard by the lipreader.

Each presentation consisted of thirty-two unrelated sentences, sixteen of which were spoken by the first talker and sixteen by the second talker. The lipreaders responded orally to what they thought the talker said from the visual clues they received. Their responses were recorded

and the score for each lipreader was determined by the mean percentage of correct word identifications within each sentence.

The scores were analyzed using the Kruskal-Wallis one way analysis of variance by ranks. The results indicated a significant difference in test scores obtained among the intelligence classifications. In an attempt to define the source of this significant difference, seven percentile scores were computed for each of the ten intelligence levels and plotted graphically. A study of the graph revealed an increase in both central tendency and variance of the lipreading scores as a function of increases in intelligence.

On the basis of this analysis of the data, the following conclusion was made: Lipreading performance, as measured by a face to face test, varies with the level of intelligence in the mentally retarded populations studied. With the increased intelligence, lipreading performance is significantly improved.

Implications for future research were suggested and discussed.

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By

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CHAPTER I

STATEMENT OF THE PROBLEM

Introduction

Clinical research and practical experience suggests that mental retardation has become a substantial interest area to the speech pathologist and audiologist. Matthews¹ writes of this when he states, "With the increased attention currently being given to mental retardation will come more and more pressures on the profession of speech pathology to devote greater attention to speech problems associated with mental retardation."

Numerous studies have been devoted to speech, language, and hearing as these specific areas relate to mental retardation. A review of some of the more prominent studies is included here to give the reader insight into the research direction taken by various authors. Sievers,^{2,3} has conducted language studies dealing with

¹Lee Travis (ed.), Handbook of Speech Pathology (New York: Appleton-Century-Crofts, 1957), p. 532.

²D. J. Sievers, "A Study to Compare the Performance of Brain-Injured and Non-Brain Injured Mentally Retarded Children on the Differential Language Facility Test," American Journal of Mental Deficiency, 63 (1959), pp. 839-847.

³D. J. Sievers and S. H. Essa, "Language Development in Institutionalized and Community Mentally Retarded Children," American Journal of Mental Deficiency, 66 (1961), pp. 414-420.

mentally retarded subjects expressing varying degrees of retardation.

Schlanger^{1,2,3} has made several contributions to the field of speech and mental retardation; these studies have been concerned with such factors as environmental deprivation, types of speech defects within specific etiological groupings of the mentally retarded, and the results of therapy programs on the speech of retarded populations.

Several studies dealing with incidence of hearing loss in mentally retarded populations are included here for purposes of pertinence to the adequate introduction of the study. In a survey-type study, MacPherson,⁴ in 1952, evaluated the status of deaf patients committed to mentally retarded institutions. Twenty-two of the responding schools estimated 50 per cent of their populations to be hard-of-hearing or deaf. One might seriously question the reliability of results obtained through questionnaire techniques, especially in an area as technical as the evaluation of the hearing status of mentally retarded persons. This gives some suggestion, however, as to the magnitude of the problems.

¹B. B. Schlanger, "Environmental Influence on the Verbal Output of Mentally Retarded Children," Journal of Speech and Hearing Disorders, 19 (1954), pp. 339-343.

²B. B. Schlanger, "Speech Therapy with Mentally Retarded Children," Journal of Speech and Hearing Disorders, 23 (1958), pp. 298-301.

³B. B. Schlanger and R. H. Gottsleben, "Analysis of Speech Defects Among the Institutionalized Mentally Retarded," Journal of Speech and Hearing Disorders, 22 (1957), pp. 98-103.

⁴J. R. MacPherson, "The Status of the Deaf and/or Hard-of-Hearing Mentally Deficient in the United States," American Annals of the Deaf, 97 (1952), pp. 375-386.

Rigrodsky, Prunt and Glovsky¹ conducted a study to assess the incidence, and occurrence of known pathologies which contribute to the hearing loss in an institutionalized mentally retarded population in the Vineland, New Jersey State Home and Training School. The subjects ranged in age from five through seventy-one; all were classified as mentally retarded by qualified examiners. The conclusions indicate, that of the 325 subjects evaluated, 25 per cent indicated either conductive or sensorineural (or both) hearing losses.

Schlanger and Gottsleben² tested 498 subjects over the frequency range of 125 to 23,000 cycles per second. In an attempt to train the subjects to respond to sound, initial testing was done with a very loud tone. Bone conduction testing was utilized where a conductive loss was suspected. According to predetermined criterion (loss of 30 db or more at any frequency in either ear), thirty-five per cent of the total population who were testable demonstrated hearing losses which were significant and warranted remediation.

In still another study, Birch and Matthews³ used 247 mentally defective subjects in an effort to arrive at incidence figures for such a population. The obtained results were compared with general population statistics on hearing loss. The results obtained indicated

¹S. Rigrodsky, F. Prunt, and L. Glovsky, "A Study of the Incidence, Types and Associated Etiologies of Hearing Loss in an Institutionalized Mentally Retarded Population," Training School Bulletin, 58 (1961), pp. 30-43.

²B. B. Schlanger and E. H. Gottsleben, "Testing the Hearing of the Mentally Retarded," Journal of Speech and Hearing Disorders, 21 (1956), pp. 487-492.

³J. W. Birch and J. Matthews, "The Hearing of Mental Defectives: Its Measurement and Characteristics," American Journal of Mental Deficiency, 55 (1951), pp. 384-393.

hearing losses according to the following criteria:

Class A: having no loss or probably does not notice loss
and is not handicapped in ordinary life activities

Class B: may or may not notice loss and is probably occasionally handicapped in ordinary life activities

Class C: probably notices loss and is probably handicapped
in many ordinary life activities

The percentages for each classification were 44.5 per cent, 32.7 per cent, and 22.8 per cent for classes A, B, and C, respectively.

Webb et al.¹ conducted a study at Mount Pleasant State Home and Training School in Mount Pleasant, Michigan (one of the institutions represented in this study). Two testing procedures were employed in arriving at an incidence figure for hearing loss. The first, which involved a free field and live voice procedure administered to the local population, reported on incidence of 24 per cent. The second procedure utilized standard pure tone testing on those patients testable by this method. Of the 30 per cent tested by pure tone procedures, 25 per cent were found to possess some degree of hearing loss.

The foregoing studies (and others) have been concerned with the incidence of hearing loss in mentally defective populations. Though the figures are inconsistent, one might feasibly assume that there is a rather substantial degree of hearing loss in the mentally defective population. Acceptance of this assumption, in turn, assumes that the speech and hearing therapist will, more often than not, come into contact with mentally defective individuals that express some degree of hearing loss.

¹C. Webb et al., Procedures for Evaluating the Hearing of the Mentally Retarded, U. S. Department of Health, Education, and Welfare, Cooperative Research Project No. 1731 (Mount Pleasant: Central Michigan University, 1964) pp. 113-114.

Recent emphasis and interest in the problems of the mentally retarded have undoubtedly thrust speech and hearing therapists into clinical situations where judgement must be made concerning whether or not deaf and hard-of-hearing mentally defective persons can reap the benefits of a well-designed training program of lipreading instruction. For the above reason, this project is set forth as a contribution to those field workers faced with the solution of the foregoing dilemma.

Statement of Purpose of Study

The purpose of the study is to investigate the hypothesis that lipreading ability will increase as a function of intelligence. It is an attempt to determine how lipreading test scores obtained in a face to face presentation are related to varying degrees of mental retardation.

Hypotheses

Within the confines of this study, the question to be investigated and the corresponding null hypothesis are as follows:

1. Do the various degrees of mental retardation reflect themselves in the obtained lipreading test scores?

Null Hypothesis: There is no significant difference in lipreading test scores among the various levels of intelligence.

Importance of Study

For any deaf or hard-of-hearing individual, lipreading probably becomes one of the most important skills the person can have, since it is the primary means of receptive communication. With the current emphasis being given to mental retardation, the speech and hearing therapist is becoming more and more concerned with the various communicative problems

found in the mentally deficient population. Lipreading for the hard-of-hearing mentally defective may very well be an important facet of his overall habilitation program. This being the case it seems logical to explore the possibilities of carrying out lipreading instruction with such handicapped individuals. A comprehensive review of lipreading literature reveals a dearth of information regarding this problem.

This study, purports to provide information concerning the relative lipreading ability among various degrees of mental retardation in hopes that some light may be shed on the feasibility of lipreading instruction as an enhancement to the communication process of the mentally handicapped.

Limitations

This study utilized forty subjects from each of three Michigan institutions for the mentally retarded, for a total of 120 subjects. The subjects were divided into ten groups of twelve according to full scale WAIS or Stanford Binet scores. The twelve subjects in each group were randomly selected from a population of mental retardates which were found to have the same intelligence level as measured by the above intelligence tests. The age range of the subjects was limited to include only those persons between the ages of sixteen and thirty-four.

The subjects were further limited in that no person was selected who had been diagnosed as having a hearing problem or gross vision difficulties by the institution. Also, only ambulatory patients were considered for selection.

Definition of Terms

1. Mental Retardation.-- The term mental retardation refers to "subaverage general intellectual development which originates during the developmental period and is associated with impairment in adaptive behavior."¹

2. Intelligence Level.-- In this study this term and the terms, I.Q. group, and intelligence group are used synonymously. These terms refer to one of the ten populations or population samples in which lipreading ability was measured.

3. Lipreading Ability.-- As used in the present study, this term will refer to the score (mean percentage of correct word identifications over the thirty-two sentences) obtained by the lipreader in a face to face presentation of the test material (Appendix A).

4. Talker.-- The person administering the test material is referred to as the talker.

5. Lipreading.-- The process employed by the lipreader to tell what the talker is saying by utilizing visual cues is referred to as lipreading.

6. Lipreader.-- The term lipreader refers to the individual utilizing the process of lipreading.

7. Presentation.-- This term refers to a complete administration of the test material by the talkers.

¹R. Heber, "A Manual on Terminology and Classification in Mental Retardation." American Journal of Mental Deficiency, Monograph Supplement 2, 64, September 1961. , pp. 3-4.

Organization of Thesis

This thesis is divided into five chapters. The first chapter has included an introduction, statement of the problem, purpose of the study and the null hypothesis to be tested. A review of the literature pertinent to the study is included in the second chapter. The third chapter contains a description of the subjects, materials and procedures utilized in the study. The analysis of the data and a discussion of the results comprise the fourth chapter and the summary, conclusions and implications are included in chapter five.

CHAPTER II

REVIEW OF THE LITERATURE

A review of the literature indicates that several persons have devoted research studies to the determination of a relationship between lipreading ability and intelligence.

According to O'Neill and Oyer,¹ psychological factors related to lipreading ability were experimentally studied by Kitson² as early as 1914. The study was based on the assumption that synthetic perception was more essential to lipreading ability than analytic perception. Kitson was experimentally differentiating between these types of perception in the hope that he might obtain a means of predicting the ability to successfully or unsuccessfully learn the lipreading skill. The findings tended to lend support to his original assumption that synthetic perception is more essential to lipreading ability than analytic perception.

In 1929, Pintner³ attempted to show a relationship between the results obtained on various of the lipreading tests of this time, and

¹John J. O'Neill and Herbert J. Oyer, Visual Communication (New Jersey: Prentice Hall, Inc., 1961), pp. 36-37.

²H. D. Kitson, "Psychological Tests for Lipreading Ability", The Volta Review, 17 (1915), pp. 471-476.

³R. Pintner, "Speech and Speech Reading Tests for the Deaf", Journal of Applied Psychology, 12 (1929), pp. 220-225.

results obtained by the same subjects on the Pintner Non-Language Test. The results of the study pointed to a zero correlation between the two sets of obtained results.

The Heiders,¹ in the Clarke School studies of the psychology of deafness, correlated the results obtained on a lipreading test with educational age determined by the Stanford Achievement Test. The subjects for the study were 68 in number and were drawn from the middle and upper school group, ages 9 - 19. The Heiders did not attempt to differentiate between educational achievement and intelligence, but chose to classify them together:

Even with hearing children it is theoretically impossible to distinguish between educational achievement and intelligence. Some tests, it is true, test more special information, and others more general forms of thought and language, but it is impossible to separate these aspects of mental development entirely.

Utilizing this rationale, it might be assumed that the correlation which was obtained is, in actuality, a correlation between lipreading ability and intelligence.

The results of the study indicate that the correlation coefficient between the Clarke School designed lipreading test results and the educational age as determined by the Stanford Achievement Test, was .54. It should be pointed out that this relatively high correlation is quite possibly due to the effect of the oral training in the school. High achievement could have been associated with good lipreaders because the school work was given orally.

¹F. Heider and G. Heider, "An Experimental Investigation of Lip Reading," Psychological Monographs, 52, (1), (1940), pp. 1-153.

To this point, the Pintner and Heider studies have investigated lipreading ability as it relates to certain isolated factors, viz.

(1) reaction time (2) color sorting (3) reaction to form (4) amount of formal education (5) intelligence. These studies, including Kitson's as well, used as subjects, hard-of-hearing adults and deaf children. In general, the review indicates the obtained results of the studies to be quite inconclusive.

More recently, studies have been conducted utilizing normal hearing subjects. These studies, as those in the past, were concerned with the discovery of psychological factors associated with lipreading ability. It was anticipated that if such factors could be isolated, based on pertinent experimental research, they might be successfully transferred and applied to the instruction of lipreading to the deaf and hard-of-hearing.

In 1946, Reid¹ gathered four scores for each of 99 subjects in a study designed to correlate teacher's ratings of lipreading ability, chronological ages, intelligence quotients, and mental ages with lipreading ability as measured by a lipreading film constructed for the explicit purpose of evaluating this ability. All of the subjects used in the study were enrolled in state-supported, deaf education, residential centers.

According to Reid, "From these results, and with reference to the group of subjects studied, it is reasonable to conclude that lipreading ability is not quantitatively correlated with, and cannot be predicted from the length of training in lipreading, mental

¹Gladys Reid, "A Preliminary Investigation in the Test of Lipreading Achievement," American Annals of the Deaf, 91 (1946), pp. 403-413.

age, I.Q., and grade status respectively." An almost complete absence of correlation was found between intelligence quotients and test scores. The I.Q.'s ranged from 71 to 167; r equalled .066.

Cavender,¹ in a more recent study, used normally hearing subjects from elementary and high school levels. Intelligence test scores and scores from a test of lipreading ability were compared. The results of the study indicated no significant correlation between the two sets of results.

O'Neill² conducted a study in 1951 which was based on the assumption that lipreading ability is a skill present in some degree among all users of the English language. The study utilized 20 normally hearing college students in an attempt to evaluate the degree of lipreading ability displayed by each subject, and to discover the psychological factors which might be related to this ability. All subjects were evaluated with a Mason motion picture test of visual hearing that consisted of ten graded sentences with a possible score of 61 points. The obtained scores ranged from one to thirty-two points, and were accepted as a relative measure of each student's lipreading ability. The subjects were then exposed to a series of tests purported to measure personality traits. Five areas of personality and ability were sampled,

¹Betty J. Cavender, "The Construction and Investigation of a Test of Lip Reading Ability and a Study of Factors Assumed to Affect the Results", (Unpublished Master's Thesis, Indiana University Department of Speech, 1949).

²John J. O'Neill, "An Exploratory Investigation of Lipreading Ability Among Normal Hearing Students," Speech Monographs, 18 (1951), pp. 309-311.

they are as follows: (1) degree of personal adjustment, (2) perceptual abilities, (3) reading ability, (4) intelligence (measured with WAIS test), and (5) speech attitude.

Subjects were ranked according to scores obtained on the criterion Mason film test. Rank order correlations were computed between these rankings and rankings on each of the comparison and subtests. The results of the study indicated that the factors sampled did not maintain a significant relationship with lipreading ability. In addition, normally hearing persons did not possess the ability to lipread in any systematic manner.

In another study by O'Neill and Davidson¹ thirty normally hearing college students were used in an attempt to investigate the existence of a relationship of five psychological factors to lipreading skill. The factors were (a) concept formation, (b) intelligence, (c) reading comprehension, (d) visual perception, and (e) level of aspiration. A silent motion-picture was used to measure each subject's relative lipreading ability.

The results obtained in the study indicated no statistically significant relationship between lipreading ability and level of aspiration, intelligence, reading comprehension, or digit memory span. The correlation coefficient between lipreading ability and intelligence was .03.

¹John J. O'Neill and J. L. Davidson, "Relationship Between Lipreading Ability and Five Psychological Factors," Journal of Speech and Hearing Disorders, 21 (1956), pp. 478-481.

Simmons,¹ in a more recent study, correlated several factors with lipreading ability in a project concerned with the measurement of lipreading ability and the factors in the individual related to ease or difficulty experience in lipreading.

The study involved 24 hard-of-hearing subjects whose lipreading ability was defined as a rating scale score derived from a face-to-face interview with five judges. To obtain information pertaining to the relationship between lipreading and intelligence, Form I of the Wechsler-Bellevue Scale was used. All subtest measures were compared with the interview rating of lipreading ability, and an I.Q. Full Scale was compared with the same interview rating. In addition, all subtests and the I.Q. Full Scale was compared with lipreading ability scores of the same subjects obtained with the Utley and Mason filmed lipreading tests. The results of this study indicated a lack of significant correlation between I.Q. and any measure of lipreading ability.

Discussion of Literature

The review of the literature rather consistently supports the concept that lipreading ability is only vaguely, if at all, related to intelligence. If such a relationship does exist, to any degree, the detection and isolation of the intellectual factors operating to the benefit of lipreading ability, have escaped experimental research.

¹Audrey A. Simmons, "Factors Related to Lipreading," Journal of Speech and Hearing Research, 2 (1959), pp. 340-352.

The research has been concerned with the detection of isolated factors which can be effectively capitalized on to benefit the deaf and/or hard-of-hearing education. The marked individual differences in the ability to lipread do not seem to be obvious enough to be detected by current research techniques.

CHAPTER III

SUBJECTS, EQUIPMENT, AND PROCEDURES

Subjects

The populations for this study consisted of patients in residence at the Mount Pleasant State Home and Training School, the Lapeer State Home and Training School and the Coldwater State Home and Training School. The aforementioned facilities are maintained by the State of Michigan for mentally retarded patients. Persons are committed to these institutions by court order on the certification of two physicians. The patients must have the diagnosis of mental retardation prior to admission.

This study was concerned with ascertaining the lipreading ability of ten populations of mental retardates. These ten populations were defined by full scale scores on the Wechsler Adult Intelligence Scale¹ and the Revised Stanford Binet, Forms L or M.² (Table I)

¹D. Wechsler, The Measurement and Appraisal of Adult Intelligence. (Baltimore: Williams and Wilkins Company, 1958).

²L. M. Termin and M. A. Merrill, Measuring Intelligence. (Boston: Houghton Mifflin Company, 1937).

TABLE 1

INTELLIGENCE SCORE, MEASURING INSTRUMENT AND
SAMPLE SIZE EACH OF THE TEN POPULATIONS

Population	Intelligence Score	Sample Size	Intelligence Test
1	30-34	12	Revised
2	35-39	12	Stanford Binet
3	40-44	12	<u>Forms L or M</u>
4	45-49	12	
5	50-54	12	
6	55-59	12	Wechsler
7	60-64	12	Adult
8	65-69	12	Intelligence
9	70-74	12	Scale
10	75-79	12	

The first three populations were defined by Stanford Binet scores while the remaining seven were defined by scores on the WAIS.

The sampling procedure for each of the ten populations involved randomly selecting four subjects from each of the institutions. This resulted in a sample size of twelve subjects for each population.

The subjects selected for this study ranged in age from sixteen to thirty-four years of age and had normal hearing and vision. Normal hearing was assumed if the subject had not been diagnosed as having a hearing problem by the institution. Vision was considered to be normal for purposes of this study if the subject could identify correctly the number of fingers held up by the talker at a distance of five feet.

Discussion

This discussion is concerned with two major points in regard to the selection of the subjects; (a) The selection based on Stanford Binet scores for the first three intelligence classifications and (b) The selection based on the small (five I.Q. points) intervals.

The original research design called for subjects to be selected according to WAIS scores. A review of the test manual reveals that the WAIS is not recommended as a measure for persons in the thirty to forty I.Q. range. The lowest full scale score is forty-four. This left three alternatives; (a) Use the WAIS exclusively and not test lipreading ability at the lower I.Q. levels, (b) utilize the Stanford Binet score as the I.Q. thru the entire I.Q. range or, (c) leave the design as originally planned but with the lower I.Q.'s being selected on the basis of another test.

Because this study purported to investigate a relationship of lipreading ability and intelligence it was felt that the lower I.Q. levels should not be disregarded. Therefore, the exclusive use of the WAIS was rejected as a possible alternative. However, the WAIS is generally accepted in the field of psychology as the best instrument for the assessment of adult intelligence. This is because of the extensive study that has gone into the establishment of norms for adult at various age groups.¹ It is the only measure of adult intelligence for which extensive normative data are available. For this reason it seemed desirable to utilize the WAIS score in as many cases as possible. For this reason the Stanford Binet was not selected exclusively. The Stanford Binet was selected as

¹Wechsler, op. cit., pp. 86-92.

the I.Q. measurement for subjects below the I.Q. of 45 because of the widespread use of the Binet and its high correlations with scores on the WAIS¹ (Appendix D).

The second major point to be discussed is the utilization of the small intervals between the I.Q. classifications. The classification system used to classify the mentally retarded seems to be determined by the particular professional group doing the classifying. The medical field is primarily concerned with etiological factors and makes its classifications in terms of heredity and environment.²

Clinical types, in terms of physical disabilities or distortions, are often used for catagorical purposes also. These are listed by Kirk and Johnson³ as cretinism, mongolism, murecephely, hydrocephely and cerebral palsy.

Legal classifications held by states for institutionalized purposes are usually psychological in nature and are based on intellectual functioning. The terms idiot, imbecile and moron or custodial, trainable and educable are frequently used for this purpose, referring to I.Q. levels of 0-25, 26-50, and 51-75 respectively, in both terminology systems.⁴

¹Ibid, p. 105.

²A. Tregold and K. Soddy, A Textbook of Mental Deficiency (Baltimore: Williams and Wilkins Co., 1959). p. 2.

³S. Kirk and G. Johnson, Educating the Retarded Child, (New York: Houghton-Mifflin, 1951). pp. 15-24.

⁴Heber, op. cit., pp. 92-94.

For educational purposes, many educators feel that a more diversified system, based on maturation level, learning capacity and social adjustment would be helpful in insuring greater comprehension, not only in the field of education, but also in the areas of medicine and psychology.¹ Heber² has proposed a system of classification in terms of the above factors and suggested that five categories of classification be used rather than the conventional three (Appendix D).

The rationale for the classifications used in this study is based in part on the research of Dunn and Hottel³ who suggest that differences in progress made by children of different I.Q.'s need to be studied by grouping the children into groups of smaller I.Q. intervals, ie, group in one class those children with I.Q. from thirty to forty and in other classes those with I.Q.'s of forty to fifty and fifty to sixty. This, they claim, would allow for more homogenous groups than are presently defined by the American Association of Mental Deficiency.

For purposes of this study, the trend for more homogenous groupings, according to I.Q. levels, was carried one step further in an attempt to provide a more sensitive measure of the relationship between intelligence and lipreading ability. According to Blalock,⁴ as the number of subjects in a population sample increases the effects of

¹W. Sloan and J. Birch, "A Rationale for Degrees of Retardation", American Journal of Mental Deficiency, 60: 1955, pp. 258-265.

²Heber, op. cit., pp. 55-64.

³J. Dunn and L. Hottel, The Effectiveness of Special Day Class Training Programs for Severely Mentally Retarded, U. S. Office of Education, Dept. of Health, Education and Welfare, Contract SAE, (Washington, 1962). pp. 25-26.

⁴H. M. Blalock, Social Statistics, (New York: McGraw-Hill Book Company, Inc., 1960). pp. 135-141.

individual differences within the sample is decreased. It is the opinion of this investigator that the size of each sample was sufficiently large to minimize any gross effects of, (a) the individual differences within the sample and (b) the standard error of measurement inherent in intelligence testing. If this is indeed the case it is possible to assume that each sample represented a population with a unique level of intelligence in regard to each of the other intelligence levels.

Test Environment

Adjoining rooms were utilized in conducting the experiment. One room was used as a control room, the other a test room. The test room was sound treated with acoustical tile with a two way window located between the room. This general kind of facility was available in all three institutions.

The chair for the subjects was located in the test room on line with the midpoint of the observation window. The front of the chair was two feet from the window. From a seated position, the subject's view of the talker was limited to the upper shoulder, neck and head.

The talker was seated on a chair in the control room, the chair front was two feet from the observation window and located on line with the midpoint of the observation window (Appendix E).

Two clamp-on desk lamps, each with a one-hundred watt bulb were used in the control room, to illuminate the face of the talker. They were mounted just above the upper corners of the observation window and directed into the face of the talker. This served to eliminate doubtful shadows on the talker's face.

Materials

Scoring Sheets.-- Scoring sheets were utilized with information regarding the subject under test. The information contained therein consisted of the name of the institution, sex, age, and I.Q. score and the name of the psychological instrument (WAIS or Stanford Binet) from which the I.Q. score was derived. The sheet also contained sentence numbers and response lines (Appendix B).

Visual Stimulus Material.-- The test utilized in the study to measure lipreading ability was a lipreading test developed as part of an M.A. thesis at Michigan State University.¹ The test consists of two forms, each form containing sixteen unrelated sentences, with a Pearson Product Moment Correlation coefficient of .94, corrected for length, between forms.

Procedure

This study utilized, as talkers, two male graduate students enrolled in speech and hearing science at Michigan State University. Prior to the actual test situation, both talkers became familiar with the test material.

The subjects were brought to a waiting room in groups of three or four by institution personnel. They were then taken, one at a time, into the test room by the investigator, who introduced himself and the other talker. Each subject was asked his name, and was then instructed to sit in the chair which was provided for the test. The lights in the test room were then turned off. The lights in the control room provided sufficient illumination for the recording of responses. Responses

¹Terry Lee Katt, Masters Thesis in Progress, (Michigan State University, Department of Speech, 1964).

were recorded by a person in the test room with the subject. The investigator then gave the instructions pertaining to the test. The instructions were as follows:

"Mr. S----- is going to talk to you through this window, but you will not be able to hear him. Watch him closely and see if you can guess what he is saying."

At this point the talker utilized, as a trial sentence, "Boys play with baseball bats." If the subject responded, the investigator commented with appropriate praise, followed by the statement, "That is exactly what we want you to do. Watch closely, while Mr. S----- says the next one." The talker then proceeded with the test material with each subject response bringing a word of praise from the investigator. If the subject did not respond to the conditioning sentence he was told to watch while the talker said it again. The investigator then told the subject what was said. The sentence was then repeated a third time and the subject was encouraged to respond. The talker then proceeded with the test material. The investigator continued to alert the subject for each talker sentence by saying, "Watch closely and see if you can guess what he is saying." The investigator recorded each response verbatim on the score sheet, unless the subject responded correctly, in which case, a recording of "CK" was entered after the appropriate sentence number.

When the talker had given sixteen sentences, the subject then was informed that the investigator and the first talker would change places. The second form of the test material was given in the prescribed manner, exactly as the first form of the test material was delivered. This procedure was followed, exactly with all of the subjects that participated in the experiment.

CHAPTER IV

ANALYSIS AND DISCUSSION

Analysis

The data for this study are raw scores obtained on the lipreading test by each lipreader. These scores were derived by computing the percentage words correctly identified in each sentence and then taking the mean percentage of correct identifications over all sentences (Appendix C).

Since parametric analysis of variance requires the assumption of equal sample variances¹, a statistical test for homogeneity of variances was utilized. The null hypothesis tested was as follows: There is no difference between the greatest and the smallest variances found throughout the ten levels of intelligence. A test for homogeneity of variances can be made by taking the ratio of the largest sample variance to the smallest sample variance and utilizing the sampling distribution of F .² The value obtained from the data was $F = 123.9$. An F of 4.48 is required for significance at the .01 level of confidence with eleven degrees of freedom in each sample. Therefore, the null hypothesis of no difference between variances had to be rejected.

¹Blalock, op. cit., p. 249.

²H. M. Walker and J. Lev, Statistical Inference (New York: Holt Book Company, 1953). p. 192.

For the purpose of this study a nonparametric Kruskal-Wallis one way analysis of variance by ranks was employed.¹ The null hypothesis under test was: There is no difference in lipreading test scores among the ten levels of intelligence.

The value obtained for the Kruskal-Wallis Test was $H = 43.41$ corrected for ties. The value of H required for significance at the .01 level of confidence is 24.72. The null hypothesis was therefore rejected in favor of the hypothesis that a difference in lipreading ability does exist among the ten levels of intelligence.

Discussion

The analysis of the data indicates that a significant difference in lipreading scores exists among the I.Q. groups. In an effort to observe how this difference is related to the various I.Q. groups, seven percentile values were computed for each group and plotted graphically as in figure 1. The seven values obtained were: the first, fifth, twenty-fifth, fiftieth, seventy-fifth, ninety-fifth and ninety-ninth percentiles.

A study of Figure 1 reveals some interesting differences in the lipreading scores as intelligence increases. First, the source of the differences in variance among the ten groups which led to the significant value of H and subsequent rejection of the null hypothesis, is distributed over all of the I.Q. groups.² While this distribution is

¹S. Siegel. Nonparametric Statistics (New York: McGraw-Hill Book Company, Inc., 1956). pp. 184-193.

²In Figure 1, the distance between the curve representing the ninety-ninth percentile and the curve representing the first percentile is indicative of the variability, i.e. the greater the distance the greater the variability.

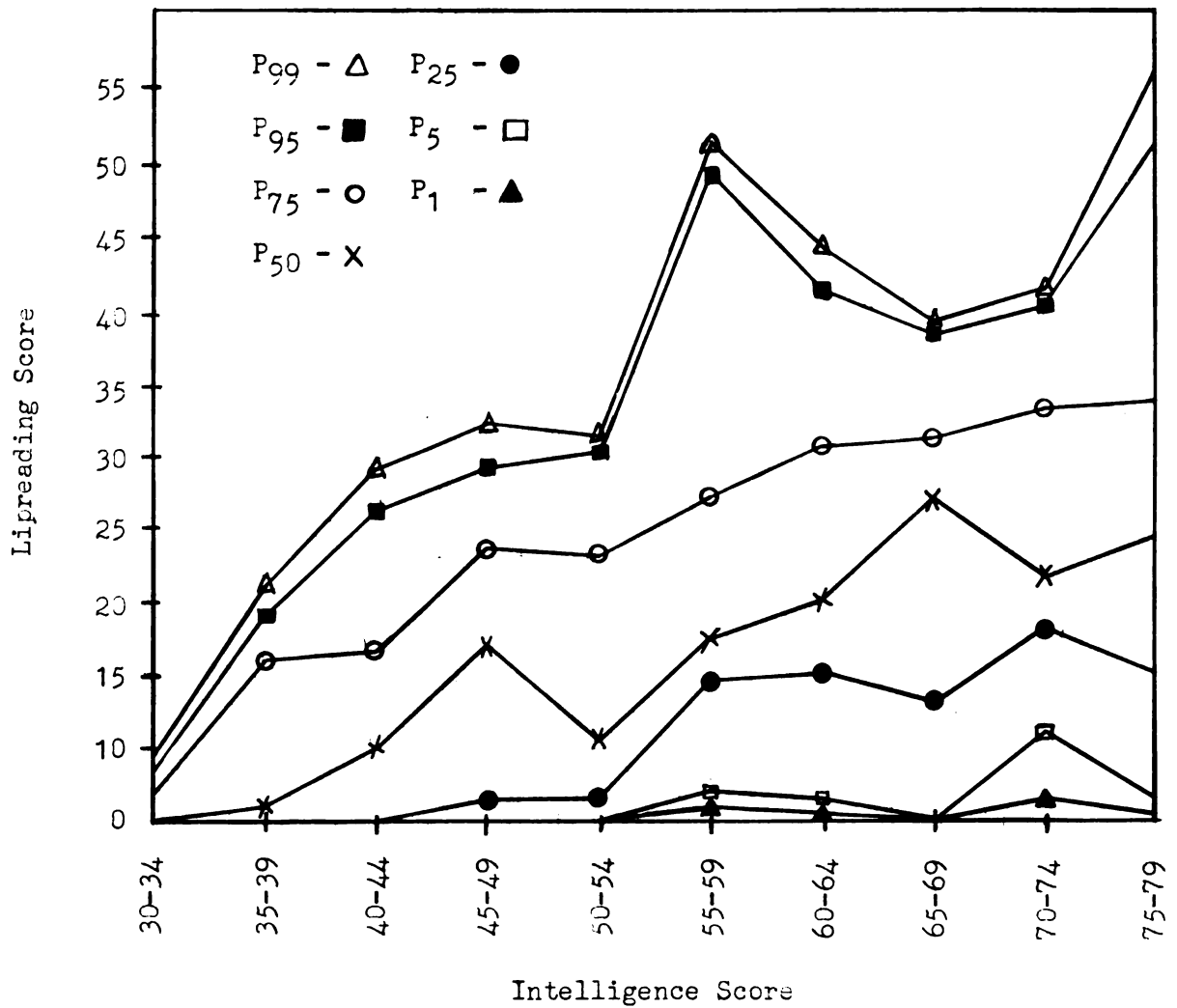


FIGURE I'

Lipreading score percentiles plotted at each of the ten intelligence levels.

not equal from one group to the next there seems to be a definite trend of increased variability of the lipreading scores as intelligence increases. The lowest group (I.Q. 30-34) shows the least variability of scores while the highest group (I.Q. 75-79) shows the greatest variability.

Another difference in the lipreading scores can be seen by noting the upward trend of all seven percentile curves as intelligence increases. By focusing attention on the fiftieth percentile (median) curve, one can observe the trend of improved lipreading scores with increases in intelligence. This improvement in lipreading scores is quite consistent from one I.Q. group to the next. The reversals found in the central tendency, as well as those in the variability, since they are few and small in magnitude, probably can be largely attributed to the limited number of subjects in each group.

The reader will recall that subjects were designated to the three lowest I.Q. groups on the basis of Stanford Binet, Forms L and M scores, while those above an I.Q. of forty-four were selected according to scores on the WAIS. None of the five percentile curves show discrepancies at the point where the basis for determining I.Q. was changed. This would seem to support the investigator's decision to employ the two measures of intelligence for this study.

The data analysis, along with a study of Figure 1, indicates a relationship between intelligence and lipreading ability in a population of institutionalized mental retardates. The results of this study seem to offer evidence that lipreading ability does vary directly as a function of intelligence, in this population of mental retardates.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

The possibility of intelligence as a factor related to lipreading ability has been explored by several investigators in the last fifty years. Both lipreading ability and intelligence have been measured by a variety of tests and subject to various statistical analysis. The results have been generally inconclusive. In summing up a discussion of lipreader intelligence, O'Neill and Cyer¹ conclude, "- - - that there is no definite established relationship between lipreading ability and intelligence as measured by a variety of tests."

An inspection of the research reveals that all of the studies have utilized subjects having near normal intelligence. This fact, coupled with recent emphasis on the problems of the mentally retarded, has prompted this study.

The purpose of the present study was to investigate the relationship between lipreading test scores, obtained in a face to face presentation, and varying intelligence levels among the mentally retarded.

One hundred and twenty lipreaders and two talkers were used in the investigation. The lipreaders consisted of adult mental retardates, ages sixteen through thirty-four, randomly selected according to scores on the WAIS or the Stanford Binet, Forms L and M. All of the subjects were institutionalized in state homes for the mentally

retarded. The talkers were two male graduate students enrolled in Speech and Hearing Science at Michigan State University.

Each lipreader was tested individually and his responses recorded by a person in the room with the lipreader. Two adjoining rooms with an observation window between them were utilized to allow the talker to use voice without being heard by the lipreader.

Each presentation consisted of thirty-two unrelated sentences, sixteen of which were spoken by the first talker and sixteen by the second talker. The lipreaders responded orally to what they thought the talker said from the visual clues they received. Their responses were recorded and the score for each lipreader was determined by the mean percentage of correct word identifications within each sentence.

The scores were analyzed using the Kruskal-Wallis one way analysis of variance by ranks. The results indicated a significant difference in test scores obtained among the intelligence classifications. A study of Figure 1 indicated that lipreading test scores tend to increase and group variance tends to increase as the intelligence level of the groups is increased.

Conclusions

From the results obtained by statistical analysis of the data, it was possible to reject the following null hypothesis at the .01 level of confidence: There is no significant difference in lipreading test scores among the various levels of intelligence. Therefore, it seems that the following conclusion is warranted: Lipreading performance, as measured by a face to face test, varies with the level of intelligence in the mentally retarded populations studied. With increased intelligence, lipreading performance is significantly improved.

Implications for Future Research

The significant difference in lipreading performance among the ten levels of intelligence indicate strongly the need for further research in this area. The lipreading ability of non-institutionalized mentally defectives should be explored to determine whether or not the relationship found in this study holds outside the institution. Also, this approach would allow the investigator to utilize intelligence levels up to, and including, normal intelligence.

Since the difference in lipreading ability does manifest itself over the various levels of intelligence, the following question comes to mind: What factors that have gone into giving an intelligence score are most closely related to lipreading ability among the mental retardates? The answer to this question would involve extensive investigation of scores on the subtests and comparing these subtest scores with lipreading performance.

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APPENDICES

APPENDIX A

Lipreading Test Sentences

Form 1

1. I cannot find him.
2. She looks lovely.
3. She wrote with pencil.
4. My salary is low.
5. She wears short skirts.
6. How fast will the car go?
7. Each of you was wrong.
8. Mary had a little lamb.
9. The weather is bad.
10. The dogs barked.
11. The cat caught the mouse.
12. I shall tell.
13. The team played well.
14. Don't run away.
15. I like pumpkin pie.
16. Good Morning, how are you?

Form 2

1. The child was crying.
2. I don't know!
3. My horse died.
4. Birds fly South for the Winter.
5. I am boastful.
6. He swam a mile.
7. His answers were foolish.
8. This house is for sale.
9. Mop the floor.
10. The speaker was nervous.
11. Have I ever met you before?
12. What's your name?
13. Come with me.
14. Oh boy!
15. The boys were noisy.
16. What time is it?

APPENDIX B

Answer Sheet

Name: _____ Sex: _____ Age: _____ I.Q. _____

Institution: _____ Intelligence Test: _____

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____

19. _____
20. _____
21. _____
22. _____
23. _____
24. _____
25. _____
26. _____
27. _____
28. _____
29. _____
30. _____
31. _____
32. _____

APPENDIX C

RAW SCORES

Intelligence Level				
30-34 Scores	35-39 Scores	40-44 Scores	45-49 Scores	50-54 Scores
0	0	16	1	6
2	13	0	18	5
3	0	11	22	5
0	12	12	0	0
0	0	1	17	8
4	16	9	5	14
3	2	0	27	0
0	10	6	22	3
0	6	0	16	22
0	0	0	8	26
0	0	4	1	24
0	0	25	2	0

Intelligence Level				
55-59 Scores	60-64 Scores	65-69 Scores	70-74 Scores	75-79 Scores
2	9	24	16	20
42	39	19	36	57
14	17	6	12	3
11	32	23	14	17
18	27	0	18	20
46	1	17	26	25
26	9	23	14	32
10	12	32	13	8
16	13	35	9	1
11	14	9	17	18
8	19	27	30	12
9	12	0	34	48

APPENDIX D

CLASSIFICATIONS OF MEASURED INTELLIGENCE*

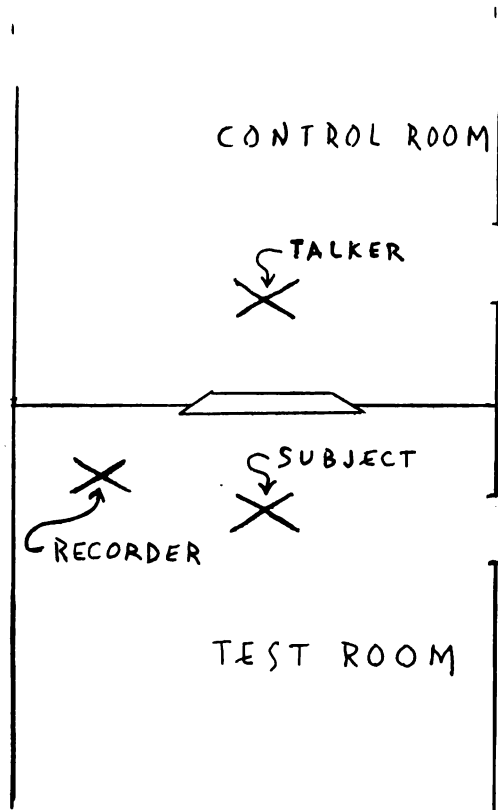
Classification	Intelligence Score		
	Stanford-Binet	WAIS	Standard Score
Borderline Retardation	70-84	70-84	-101 to -200
Mild Retardation	52-69	55-69	-201 to -300
Moderate	36-51	40-54	-301 to -400
Severe	20-35		-401 to -500
Profound	20		less than -501

*From E. Heber, "A Manual on Terminology and Classification in Mental Retardation." American Journal of Mental Deficiency, Monograph Supplement 2, 64, September 1961, p. 59

APPENDIX E

FLOOR PLAN

Scale: 1" = 3'



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