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**AN INVESTIGATION OF THE RELATION BETWEEN
PERFORMANCE ON A FILMED LIPREADING TEST AND ANALYSIS
OF THE VISUAL ENVIRONMENT**

By

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ABSTRACT

AN INVESTIGATION OF THE RELATION BETWEEN PERFORMANCE ON A FILMED LIPREADING TEST AND ANALYSIS OF THE VISUAL ENVIRONMENT

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Audiologists and speech pathologists hold major roles in the rehabilitation of the aurally handicapped. The development of lipreading ability has been identified by these clinicians as being one of the major components of a successful aural rehabilitation program. However, the results of empirical studies have not yet defined for these clinicians the variables they need to manipulate in order to improve an individual's ability to read lips.

The purpose of the present study was to investigate the relationship between an individual's field independency and his ability to read lips. A review of the literature suggested that lipreading ability would be related to an individual's tendency to perceive his visual environment analytically.

The Utley Lipreading Test (Form A) was used as the measure of lipreading ability and the Hidden Figures Test was used as the measure of analysis of the visual environment. Both tests were administered to twenty volunteer male undergraduates at Michigan State University. All subjects possessed normal hearing and normal vision.

Reliability estimates of the test measures were obtained through use of the split-half method. The corrected reliability estimates were .73 for the total Utley Test and .61 for the total Hidden Figures Test. The relationship between performances on the two measures was analyzed through calculation of a Pearson Product Moment Correlation Coefficient. The resulting coefficient of .46 was significant at the .025 level and indicated that performance on the Utley Test is positively related to performance on the Hidden Figures Test.

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CHAPTER 1

INTRODUCTION

There is a long standing controversy in the field of aural rehabilitation concerning one of the prerequisites to successful lipreading. One position in the controversy indicates that successful lipreaders rely on synthetic ability.¹ Alternatively, the other side of the controversy indicates that successful lipreaders rely on analytic ability.² Kitchen,³ Kitson,⁴ and Simmons⁵ are among those who have empirically presented a relation between synthetic ability and lipreading ability. Logic, however, suggests that before an individual can synthesise (construct a whole from its parts) in the lipreading situation, he must first identify and extract the relevant parts (i.e., analyse the stimuli). There has been no empirical research reported which has investigated the role of analysis in lipreading performance.

¹Edward B. Nitchie, Lip-Reading, Principles and Practice (New York: Frederick A. Stokes Company, 1912), p. 9.

²Martha E. Bruhn, The Mueller-Walle Method of Lipreading for the Deaf (Lynn, Mass: The Nichols Press, 1929), pp. 2-6.

³Dale W. Kitchen, "The Relation of Visual Synthesis to Lipreading Performance," (unpublished Ph.D. dissertation, Michigan State University, 1968).

⁴H. D. Kitson, "Psychological Tests for Lipreading Ability," The Volta Review, XVII (1915), 471-476.

⁵Andrey A. Simmons, "Factors Related to Lipreading," Journal of Speech and Hearing Research, XI (December, 1959), 340-352.

Purpose

The purpose of the present study was to investigate a perceptual variable which was presumed to be related to lipreading ability. The present study investigated the relationship between an individual's skill at reading lips and his tendency to perceive his visual environment analytically.

Hypothesis

The following relation was hypothesized:

Performance on a filmed lipreading test is positively related to performance on an embedded figures test.

Importance of the Study

Lipreading instruction is considered to be a vital component of an effective program of rehabilitation or habilitation for the acoustically handicapped. In fact, at a recent conference of the American Speech and Hearing Association (ASHA) it was asserted that "all patients who fail to achieve optimal auditory comprehension or have poorly developed speech reading should receive a program of speech reading instruction."¹ The most widely known methods of lipreading instruction were developed early in the twentieth century by individuals who were themselves auditorily handicapped. O'Neill and Oyer² present a survey of the methods and philosophies of these early

¹ Report of a Conference on Hearing Aid Evaluation Procedures, Herbert J. Oyer, Chairman (Washington, D.C., ASHA Publication, 1967), p. 54.

² John J. O'Neill and Herbert J. Oyer, Visual Communication for the Hard of Hearing (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1961), pp. 16-18.

writers. In the 1940's these methods or adaptations of them were still the most popular methods of lipreading instruction; however, they were considered "old" and it was felt there was a need for further research.¹ Twenty years later, Avery² indicated that there was still no proven way to develop lipreading ability. The absence of a universal method may be a result of the fact that research conducted in an attempt to identify important individual difference factors related to lipreading ability has, for the most part, demonstrated insignificant results. For example, empirical studies have not found significant relations between lipreading ability and total scores on either intellectual tests or personality tests. Comprehensive coverage of the results of the historical lipreading studies is presented by O'Neill and Oyer.³ It is felt that the results of the present study will contribute to the understanding of the nature of the lipreading process. A greater understanding of the lipreading process is required before it can be determined whether lipreading instruction attempts can be more successful.

¹Harriet Montague, "Lipreading - a Continuing Necessity," Journal of Speech and Hearing Disorders, VIII (September, 1943), 267.

²Charlotte B. Avery, "Visual Aspects of Aural Habilitation and Rehabilitation" (paper presented at a Conference for Aural Rehabilitation of the Acoustically Handicapped, East Lansing, Michigan, March, 1966), p. 71.

³O'Neill and Oyer, Visual Communication for the Hard of Hearing, pp. 36-49.

Definition of Terms

Throughout this report the following terms will be used as they are defined below:

- Field dependency: the tendency of an individual to rely on visual cues from a background field to aid in the perception of a focal object.
- Field independency: the tendency of an individual to rely on internal cues to aid in the perception of a focal object.
- Lipreading ability: the skill an individual exhibits in understanding verbal communication through visual observations, as measured by performance on a filmed lipreading test.
- Analytic ability: the skill an individual exhibits in breaking down the stimulus complex in his visual environment as measured by performance on an embedded figures test.

Limitations of the Study

The ability to lipread as a behavioral characteristic is necessarily dependent upon a total complex of variables. The major limitation of this study is that it considers only one of the possible parameters.

Another restriction of the present study concerns the subjects employed. An attempt was made to concentrate on a restricted ability range in order to reduce the performance variables. Therefore, the subjects employed were all of the same sex, approximate age level, educational level and all possessed normal vision and normal hearing. Because of these limitations, caution must be exercised that the results of this study are not generalized either to the entire normal hearing population or to the hard of hearing population.

The chosen lipreading task also places restrictions upon the present study. The majority of stimuli contained in the Utley Test are presented by a single speaker. To the extent that observance of different speakers affects lipreading performance, this study is limited. Also, the present study is restricted since performance on a motion picture lipreading test has not been adequately demonstrated to be an appropriate measure of everyday face to face lipreading ability. One dimension which could especially have implications for the present study is that different perceptual factors or abilities may be involved in perceiving stimuli in two dimensions (filmed material) as opposed to three dimensional viewing (face to face presentations).

CHAPTER 2

REVIEW OF PERTINENT LITERATURE

The intent of this chapter is to provide background literature relevant to the stated purpose of the present study. The developmental history of field dependence - independence tests is traced within the theoretical framework on which the embedded figures test is based. The empirical data which suggest a relation between lipreading performance and analysis of the visual environment are presented. Literature describing the tests of choice for the present study is reviewed along with the data which suggests a need for restrictions to be placed on the subject pool employed in the present study.

Field Dependence - Independence Assessment

The Embedded Figures Test (EFT) is one of a series of tests which were developed to measure field dependency and field independency. These tests evolved from a research program which began in 1942 under the direction of Witkin.¹ The purpose of the program was to determine the factors responsible for an individual's maintenance of the proper orientation toward the upright position in space. Upright positions

¹Herman A. Witkin, et al., Personality Through Perception, (New York: Harper & Brothers, 1954), p. 3.

are normally attained while an individual is perceiving a visual cue (in that some objects in the surrounding environment are upright) and a simultaneous gravitational cue. Witkin's research was designed to investigate if maintenance of the upright position was due to the individual's reference to the visual framework in the environment, to his body position, or to both the visual framework and body position. In the late 1940's Witkin¹ presented standardizations of the Rod and Frame Test (RFT) and of the Tilting Room and Tilting Chair Test (TRTC). Through these tests, the perception of an object in its field, the perception of an individual's body in a field, and the perception of a field could each be studied. In each test the subject was required to adjust a focal object (a rod, a room, or the subject's own body) to an upright position when the object was surrounded by a field which conflicted with the requirements of the task (either visually or kinesthetically).

In the RFT, the subject is placed in a darkened room and views a luminous frame enclosing a luminous rod. The experimenter can independently adjust the rod and the frame to various angles. The subject's task is to adjust the rod (through directions to the experimenter) to an upright position, regardless of the angle of the frame. The TRTC Test consists of two independent tests each of which makes use of a room and a chair, either of which the experimenter can tilt a number of degrees. In the Body Adjustment Test (BAT) the subject

¹ Herman A. Witkin, The Effect of Training and of Structural Aids on Performance in Three Tests of Space Orientation, Report Number 80 (Washington, D.C.: Civil Aeronautics Administration, Division of Research, 1948).

is required to adjust his own body to an upright position (through directions to the experimenter) after both his body and the room have been independently tilted by the experimenter. In the Room Adjustment Test (RAF) the subject is required to adjust the room to an upright position after both the room and the chair have been independently tilted.

The normative data from the standardisations of these tests indicated that subjects varied widely in their ability to perform each task although each subject's performance was consistent over all three tasks. Subjects who were successful in bringing one of the central objects to an upright position were also able to bring the other two central objects to an upright position. Subjects who failed one task, failed all three.

Witkin hypothesized that the consistent individual differences shown between subjects across the three tests were due to differences in the ability of the subjects to perceive the central or focal object independent of the surrounding field (which he suggested presented an embedding context). To test this hypothesis more directly, Witkin¹ developed the Embedded Figures Test (EFT). In the EFT, the subject is required to locate simple geometrical figures which are hidden in more complex designs.

The EFT consists of twenty-four complex figures and five simple figures. Witkin used figures which had been developed by

¹Herman A. Witkin, "Individual Differences in Ease of Perception of Embedded Figures," Journal of Personality, XIII (September, 1950), 1-15.

Gottschadt¹ to measure the role of past experience in perception.

Also, Witkin colored the figures to make them more difficult. In the EFT the subject is shown a complex figure followed by a simple figure.

He is then asked to trace the simple figure in the complex one. Subjects are not given the opportunity to view both figures simultaneously.

A subject's score on the EFT is determined by the time it takes for the identification of all of the simple figures. A five minute time limit is set on the identification of each figure in a particular design.

The results of the normative data from the EFT standardisation indicated that subjects who were able to locate the simple figures (i.e., were able to analyse the visual field) were the same subjects who were able to bring an object to an upright position in the RFT, BAT or RAT. The intercorrelations of these tests suggest that the RAT is the least predictive measure and, therefore, it was removed from the series.²

On the basis of these data, Witkin classified subjects as being either field dependent or field independent if they scored on the extremes of the EFT, RFT, or BAT. Witkin suggested that the field independent subjects used internal cues which enabled them to react to the focal objects as items distinct from the background (i.e., they were able to separate the object from its field). Witkin suggested that the field dependent subjects, however, used irrelevant cues from the surrounding field in reacting to the focal objects. He asserted that the field dependent subjects perceived the field as a whole and did not break it down and analyse its separate parts.

¹Eurt Gottschadt, "Über den Einfluss der Erfahrung auf die Wahrnehmung von Figuren," Psychologische Forschung, VIII (1926), 261-317.

²Herman A. Witkin, et. al., Psychological Differentiation (New York: John Wiley and Sons, Inc., 1962), p. 45.

Empirical Relations of Lipreading to Field Independence

Significant results have been obtained in studies relating lipreading performance to scores on performance tasks which load on perceptual factors. O'Neill and Davidson,¹ employing normal hearing subjects and using the Mason Filmed Lipreading Test, found a significant relation between lipreading performance and performance on the Hanfmann-Kasavin Test. The subject task on the Hanfmann-Kasavin Test is to sort twenty-two blocks of five different colors and four different shapes into four different categories. Fielder,² employing deaf subjects, showed lipreading performance as determined by school achievement in an oral school for the deaf to be significantly related to performance on the Marbleboard Test. The subject task on the Marbleboard Test is to copy designs made with colored marbles. Simmons,³ employing hard of hearing subjects, found a significant relation between performance on the Block Design Subtest of the Wechsler - Bellevue Adult Intelligence Scale (WAIS) and lipreading performance as measured by both the Utley Filmed Lipreading Test and an interview. The subject task on the Block Design Subtest is to copy designs made with colored blocks.

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

²Miriam F. Fielder, "Good and Poor Learners in an Oral School for the Deaf," Exceptional Children, XXXII (April, 1957), 291-295.

³Simmons, "Factors Related to Lipreading," 340-352.

One factor reported as antecedent to the successful reproduction of designs is the ability to "break up the reference."¹ The subject must be able to analyse the field, to take each part individually and independently out of the total context. Analytic ability, therefore, is needed for the successful completion of each of the tests presented above: Hanfmann-Kasavin, Marbleboard and Block Design.

In an unpublished study, Johnson,² employing normal hearing subjects, found that lipreading performance as measured by the Utley Sentence Test was significantly correlated with auditory discrimination of monosyllabic words embedded in a white masking noise. This auditory discrimination task also presupposes the ability to separate a focal object from its background.

As an analytic measure, the EFT has been found to correlate significantly with the Block Design Subtest of the Wechsler - Bellevue Intelligence Scale for Children (WISC).³ In an unpublished doctoral dissertation, Jackson⁴ found that the EFT was also significantly correlated with the ability of male subjects to identify monosyllabic words embedded in a white masking noise.

¹Donald R. Goodenough and Steven A. Karp, "Field Dependence and Intellectual Functioning," Journal of Abnormal Psychology, LXIII (September, 1962), 241.

²Kenneth R. Johnson, "Correlations Between Visual and Auditory Discrimination" (unpublished study, Michigan State University, 1968).

³Vaughn J. Crandall and Carol Sinkalden, "Children's Dependent and Achievement Behaviors in Social Situations and Their Perceptual Field Dependence," Journal of Personality, XXXII (March, 1964), 1-22.

⁴Douglas N. Jackson, "Stability in Resistance to Field Forces" (unpublished Ph.D. dissertation, Purdue University, 1955).

The above studies suggest an empirical relation between analysis of the visual environment and lipreading performance, based on the parallel results of the EFT and lipreading studies. In addition, performance on the EFT and on lipreading tasks has been shown to correlate more highly with the Performance IQ scores of the WISC and WAIS than with either Total IQ scores or Verbal IQ scores.^{1,2,3} EFT and lipreading performance also significantly correlates with performance on the Digit Symbol Subtest of the WAIS.^{4,5,6}

Test Selection

Throughout the twentieth century a wide variety of formats for lipreading tests have been developed. O'Neill and Oyer⁷ present a detailed discussion of each of these tests. One of the formats employed in these tests has been the use of filmed stimuli presentations.

¹John J. O'Neill, "An Exploratory Investigation of Lipreading Ability Among Normal Hearing Students," Speech Monographs, XVIII (November, 1951), 309-311.

²Crandall and Sinkeldam, "Children's Dependent and Achievement Behaviors in Social Situations and Their Perceptual Field Dependence," 1-22.

³Witkin, Psychological Differentiation, p. 61.

⁴O'Neill, "An Exploratory Investigation of Lipreading Ability Among Normal Hearing Students," 309-311.

⁵Simmons, "Factors Related to Lipreading," 340-352.

⁶David Fitzgibbons, Lee Goldberger, and Harris Eagle, "Field Dependence and Memory for Incidental Material," Perceptual and Motor Skills, XII (December, 1965), 743-749.

⁷O'Neill and Oyer, Visual Communication for the Hard of Hearing, pp. 22-28.

In 1940, the Heiders,¹ employing a personally developed lipreading test, estimated the reliability of filmed tests to be sufficiently high to justify their use.

Because of the standardization advantage of using filmed material, this format of test presentation was chosen for the present study. The Utley Lipreading Test (Form A) was the test of choice for the present study and is the only lipreading test discussed further in this chapter. The Utley Lipreading Test (Form A) consists of three parts. Part I is a sentence test and contains thirty-one sentences and common expressions. Part II is a word test of thirty-six words taken from Thorndike's Teacher Word List. Part III consists of six short stories with five questions following each story.

The Utley Test has been found to discriminate between levels of lipreading performance within separate groups of normal hearing and hearing impaired individuals.^{2,3} Using the split-half method for estimating reliability, Utley⁴ reported a corrected reliability estimate of .94 for the total test (Parts A and B combined). Utley calculated her reliability estimate from scores on 761 deaf and hard of hearing individuals who ranged in reading level from third grade competence to

¹Fritz K. Heider and Grace M. Heider, "Studies in the Psychology of the Deaf," Psychological Monographs, LII (1940), 123-133.

²Jean Utley, "A Test of Lipreading Ability," Journal of Speech and Hearing Disorders, XI (June, 1946), 109-116.

³Louis M. DiCarlo and Raymond Kataja, "An Analysis of the Utley Lipreading Test," Journal of Speech and Hearing Disorders, XVI (September, 1951), 226-240.

⁴Utley, "A Test of Lipreading Ability," 109-116.

adult comprehension. DiCarle and Kataja¹ have made the most complete independent analysis of the Utley Test. They reported a corrected reliability estimate of .96 calculated from the scores of fifty-seven mentally handicapped children and adults. They conclude that the Utley Test is too difficult to be clinically useful, based on their obtained mean percentage of correct identifications of 19%.

The field independence measure chosen for the present study was an embedded figures test, with a multiple choice format which allowed the test to be administered to a group of subjects. The validity of using group embedded figures tests to measure analytic visual perception was determined by Jackson, Messick and Myers.² Their results indicated that the group embedded figures test with a multiple choice format correlated at the .01 level with the individually administered EFT developed by Witkin. Part I and II of the Hidden Figures Test (HFT) were employed in this study.³

Each form of the HFT consists of sixteen achromatic complex designs and five simple figures. The format is multiple choice with the five simple figures appearing at the top of each page. The subject is required to indicate which simple figure is contained in each complex design.

¹DiCarle and Kataja, "An Analysis of the Utley Lipreading Test," 226-240.

²Douglas H. Jackson, Samuel Messick and Charles T. Myers, "Evaluation of Group and Individual Forms of Embedded Figures for Field Independence," Educational and Psychological Measurement, XLIV (Summer, 1964), 177-192.

³The Hidden Figures Test is from the Kit of Reference Tests for Cognitive Factors available through the Educational Testing Service.

Reliability estimates of the HFT were not available. The reliability of Witkin's original test, however, has been repeatedly estimated by the split-half procedure to be in the low nineties.¹ The reliability of group embedded figures tests with a multiple choice format was estimated by Jackson, Messick and Myers² to be in the low eighties. They cautioned, however, that the estimate could be spuriously high since they used the Kuder-Richardson 21 formula to calculate the estimate and the tests used were timed.

Subject Restrictions

Research done on field dependence - independence measures has identified a small but significant sex difference in performance on the perceptual tasks. Witkin accepts this difference based on his own research and the results of other writers.³ Although similar individual differences are obtained within groups of either sex, males are consistently shown to be more field independent than are females. The same sex difference as found in the perceptual task would be expected in performance on lipreading tasks if analysis of the visual field is truly a major parameter of lipreading ability. Such a difference in lipreading performance, however, has not been

¹Witkin, Psychological Differentiation, p. 40.

²Jackson, Messick, and Myers, "Evaluation of Group and Individual Forms of Embedded Figures for Field Independence," 177-192.

³Witkin, Psychological Differentiation, pp. 214-221.

reported in the literature. In fact, clinical experience suggests that females are better lipreaders than males. This apparent theoretical contradiction cannot be explained within the limits of the present study. It does, however, point to an area for further research. To simplify the analysis and collection of data therefore, subjects of only one sex were used in the present study.

Although lipreading is defined as a visual behavior, little has been written on the relationship of visual acuity to lipreading ability. In a paper presented at the 1968 ASHA convention Hardick, Oyer and Irlen reported that "there is a relationship between lipreading performance and visual acuity and that people with relatively minor acuity problems will obtain significantly lower scores on a lipreading test than those with normal acuity."¹ This conclusion was based on a study employing normal hearing college students. The purpose of the study was to investigate the relation between scores on the Utley Test and the results of an optometric examination. The results of the above study suggest that visual acuity should be considered in assessing lipreading performance. In the present study, therefore, all subjects were screened for normal visual acuity.

¹Edward J. Hardick, Herbert J. Oyer, and Philip Irlen, "Lipreading Performance as Related to Measurements of Vision," (paper presented at the Convention of the American Speech and Hearing Association, Denver, Colorado, November, 1968), p. 7.

CHAPTER 3

METHODOLOGY

The hypotheses of the present study have been presented along with the background literature relevant to the state purpose. The intent of this chapter is to identify the methodology under which the data for the present study were gathered.

Subjects

Twenty male volunteers from an undergraduate psychology course at Michigan State University were used as subjects. All subjects possessed normal hearing and normal vision. The mean age of the subjects was nineteen years and nine months. The age range was from seventeen years and eleven months to twenty-six years and one month. The subjects were screened for hearing at 20 dB ISO at all octaves from 250 Hz through 2000 Hz and at the half octave of 3000 Hz. Screening was done in a quiet classroom. Subjects needed a Snellen Chart score of 20/20 for visual acuity clearance. The subject's affirmation that he had received no prior lipreading instruction or experience with either the Utley Test or an embedded figures test was also required.

Equipment and Materials

The following items were employed in the collection of the data:

Pure Tone Audiometer	(Beltone, Model 10C)
16 mm Projector	(Bell and Howell, Model 302M)
Screen	
Smaller Visual Acuity Test Card	
16 mm Silent Color Film	(Utley Test "How Well Can You Read Lips?")
Hidden Figures Test	

Data Collection

All qualified subjects were tested in small groups of six or less. All testing was done in one session for each group. Subjects were seated within a rectangular area in front of the screen. The leading edge of the rectangle was not more than three feet from the screen and the back edge was no more than nine feet from the screen. The length of the rectangle was no more than six feet. The Utley Test was administered first to all groups, followed by Part I and then Part II of the Hidden Figures Test. No oral instructions were given for either instrument. Instructions for the Utley Test are presented on the beginning of the film. Instructions for the Hidden Figures Test are printed on the first page of the test booklet.

Analysis of Data

The tests used in the present study were scored in the following manner. The Utley Test was scored by giving one point for each correct word in Part I and one point for each correct answer in Parts II and III.

Homophenous words were accepted as correct only in Part II. The maximum score was 191. Each form of the Hidden Figures Test was scored by giving one point for each correct identification within a ten minute time limit. The scores were then corrected for guessing through use of the following formula: right minus wrong divided by four. The raw scores from the two measuring instruments were then analyzed through the results of a Pearson Product Moment Correlation Coefficient.¹

Summary

It has been shown empirically that lipreading performance may be related to analysis of the visual environment. The lipreading studies that were reviewed suggested that good lipreaders will be more successful in analyzing their visual environment than will poor lipreaders. The studies on perceptual tendencies that were reviewed suggested that the individuals who are better able to analyze their environment will be identified as field independent by having the ability to identify simple geometrical figures hidden in complex designs. Within this framework, subjects were chosen and the empirical data were analyzed.

¹William L. Hayes, Statistics for Psychologists (New York: Holt, Rinehart and Winston, 1963), pp. 905-906.

CHAPTER 4

RESULTS AND DISCUSSION

The main consideration of this study was to investigate the relation between lipreading ability as measured by a total score on the Utley Lipreading Test and analytic ability as measured by a total score on the Hidden Figures Test. The analysis of data, however, includes information on each part of both measuring instruments. This information is included in order to present a more complete investigation of the relation between lipreading ability and field independence.

Description of Distributions

Summaries of the descriptive statistics calculated on the obtained data are presented in Tables I and II. Table I provides the mean, median, range and standard deviation for each distribution. Table II indicates the percentage of total possible points obtained on the average by all subjects and by the subject scoring the highest on each distribution.

Inspection of Table II indicates that on the average the subjects were able to identify only 21% of the stimuli presented in the Utley Test. This low percentage of correct identifications (only 29% for the best lipreader) adds further evidence in support of DiCarlo and Kataja's conclusion that the Utley Test is difficult (see

TABLE I
MEASURES OF CENTRAL TENDENCY AND DISPERSION

	Mean	Median	Range	Standard Deviation
Total Utley Test	39.30	41.50	41	11.86
Part I	30.00	30.50	34	9.89
Part II	4.15	4.10	8	2.06
Part III	5.15	4.50	9	2.60
Total Hidden Figures Test	10.11	8.875	23.75	6.50
Part I	4.90	4.500	12.00	3.51
Part II	7.80	3.375	16.75	4.90

TABLE II
PERCENTAGE OF CORRECT IDENTIFICATIONS

	Maximum Possible Score	Average Percentage	Highest Percentage
Total Utley Test	191	21%	29%
Part I	125	24%	36%
Part II	36	12%	22%
Part III	30	17%	33%
Total Hidden Figures Test	32	35%	75%
Part I	16	30%	75%
Part II	16	49%	88%

above, p. 14). The results of this study also suggest that the three parts of the Utley Test are not equal in average difficulty. The highest mean percentage of correct identifications (34%) was obtained on Part I (sentences and common expressions). Following Part I in average percentage of correct identifications came the total Utley Test, then Part III (stories). Part II of the Utley Test (isolated words) gave the lowest mean percentage of correct identifications (12%). As Part I was administered first to all subjects, the better performance on this section does not seem attributable to either a learning factor or to adjustment to the test situation. The poorer mean performance on the other two parts of the Utley Test, however, may have been obtained because the material presented in these parts is more difficult than the material presented in Part I or there may be a frustration factor developing as the test proceeds. In any event the low percentage of correct identifications does indicate that the Utley Test is a difficult test. In fact, the difficulty level of the test could have easily biased the results of this study by allowing significant relations which are not due to true differences in lip-reading ability.

Mean averages from other empirical studies were not available on the Hidden Figures Test. However, in comparison with the Utley Test the HFT appears to be an easier test considering the mean percentages of correct identifications for each test section. The highest percentage of correct identifications (73%) for the total HFT suggests also that field independent subjects are able to achieve more success on the HFT than the better lipreaders experience on the Utley Test.

A comparison of Part I and Part II of the HFT suggests that equivalent performance was not shown on each form. This nonequivalence could be due to any of the following alternatives. Part I and Part II of the HFT may not have equal difficulty levels. Data on the difficulty levels of each form were not available. This discrepancy between forms could also suggest that the forms are not measuring the same attribute. A final alternative would be the presence of a practice effect. The results of other empirical studies concerning field independence as measured by an embedded figures test have shown the presence of a warm up factor. The results of Within's standardization of the EFT¹ showed that significantly less time was needed for identification of embedded figures as the task proceeded. Using an extended series of sixty-eight embedded figures, Goldstein and Chance² reported that all subjects showed improvement with practice. In correlating group embedded figures tests with individually administered tests, Jackson, Messick, and Myers³ also found that additional experience with embedded figures led to faster solution times. Because of this practice effect, Jackson, Messick and Myers realized that tests administered to subjects who were not familiar with the embedded figures task and tests administered to subjects who had practiced with the embedded figures task could be measuring different underlying abilities. Therefore, they presented

¹Within, "Individual Differences in Ease of Perception of Embedded Figures," 1-15.

²Alvin S. Goldstein and June E. Chance, "Effects of Practice on Sex-Related Differences in Performance on Embedded Figures," Psychonomic Science, III (October, 1965), 361-362.

³Jackson, Messick and Myers, "Evaluation of Group and Individual Forms of Embedded Figures for Field Independence," 177-192.

the group EFT first half of the time and the individual EFT first the other half of the time. They found a correlation of .75 between individually administered items and the multiple choice group test. They concluded that if the underlying ability that was being measured did change with practice and if practice was corrected for, the results would only serve to increase the correlation. To check the influence of a learning factor, the two parts of the Hidden Figures Test should be administered alternately. The alternation was not done in the present study.

Reliability Estimates

Reliability estimates were calculated on the total Utley Test, the total Hidden Figures Test, and Part I and Part II of the HFT. Table III presents a summary of these results.

TABLE III

RELIABILITY ESTIMATES

	Total Utley Test	Total HFT	Part I HFT	Part II HFT
Split-Half Estimate ^a	.73	.81	.67	.94
Parallel Forms Estimate		.13		

^aCorrected by Spearman-Brown¹

The reliability of the Utley Test was estimated through use of the split-half method. In this method a Pearson Product Moment Correlation Coefficient was calculated between the scores on the even items and scores on the odd items. The coefficient obtained was corrected

¹G. C. Halmstadter, Principles of Psychological Measurement (New York: Appleton-Century-Croft, 1964), p. 68.

for length by using the Spearman Brown Prophecy Formula. The corrected reliability estimate for the Utley Test of .73 is lower than previous reported reliability estimates for the test (see above, pp. 13-14). The difference in these estimates may be due to differences in the studies concerning the subjects used. In the present study, the subject pool was restricted in terms of auditory and visual acuity levels, sex, age, and educational level. Also in the present study, only part A of the Utley Test was administered. Because of these methodological differences, the lower reliability estimate obtained in this study would be expected.

The reliability of the total HFT was estimated by using the parallel forms method and the split-half method. The parallel forms reliability estimate was determined since the total test consisted of two separately timed parts. The estimate was calculated by obtaining the Pearson Product Moment Correlation Coefficient between scores on Part I and scores on Part II of the HFT. The resulting coefficient of .13 suggests that the forms are not equivalent. Possible reasons for this nonequivalence have been discussed earlier in this chapter (see above, pp. 22-24). Because the equivalence of the two test parts was in question, a second reliability estimate employing the split-half technique was calculated. (This estimate would not have been made if the two parts of the HFT could have been presumed to be equally difficult.)

Concerning the use of the split-half technique on the HFT, Thorndike indicates that this method will give spuriously high reliability estimates when it is used with a timed test, to the

extent that the test is a speed test rather than a power test.¹ The theory behind the HFT, however, suggests that not all subjects are able to identify the hidden simple figures regardless of the amount of time they are given. To the extent this theory is true, the HFT should be considered a power test. However, as the possibility that the HFT is a speed test was not disproved within this study, the odd-even method of calculating a split-half reliability estimate was used. Thorndike² identifies the odd-even method as the most valid way to obtain a split-half reliability estimate on a speed test. Knowing that the split-half estimate is a high estimate, the real reliability of the HFT is in question. If the two parts of the HFT are truly not identical, the real reliability of the test more likely approaches the split-half estimate than the parallel forms estimate.

Inspection of Table III does indicate that the results of the corrected split-half correlations are all within minimally accepted limits for reliability estimates.³

Significance Tests

Given that the measuring instruments were reasonably reliable, the following hypothesis was tested:

¹Robert L. Thorndike, "Reliability," in Educational Measurement, ed. by E. F. Lindquist (Menasha, Wis: George Banta Publishing Company, 1951), p. 582.

²Ibid.

³G. C. Hainstatter, Principles of Psychological Measurement, p. 84.

Performance on a filmed lipreading test is positively related to performance on a group embedded figures test.

Pearson Product Moment Correlation Coefficients were calculated between performance on the Utley Test and performance on the HFT to test this hypothesis. The intercorrelations found for the two measures are presented in Table IV.

TABLE IV

INTERCORRELATIONS BETWEEN PERFORMANCE ON THE UTLEY
LIPREADING TEST AND PERFORMANCE ON THE HIDDEN FIGURES TEST

	Total HFT	Part I HFT	Part II HFT
Total Utley Test	.46***	.19*	.47***
Part I	.38**	-.25*	.43***
Part II	.62*****	.11*	.54*****
Part III	.13*	-.01*	.09*

Significance levels ***** .001
 **** .01
 *** .025
 ** .05
 * Not significant at .05 level

Inspection of Table IV indicates that at the .05 level of confidence performance on the total Utley Test, Part I of the Utley Test and Part II of the Utley Test are each significantly related in the predicted direction to performance on the total HFT and Part II of the HFT. Part I of the HFT, however, was not significantly related to any of the score distributions of the Utley Test. The low reliability

of this form and its nonequivalence with Part II have been discussed earlier in this chapter (see above, pp. 22-25).

The results listed in Table IV also show that the HFT correlated the highest with Part II of the Utley Test (significant at the .001 level). In this section of the Utley Test the lipreader is given isolated words, which are presented with background cues, to identify. Part I presents a whole sentence for identification and in Part III, the subject is required to grasp only ideas from conversations taking place within an appropriate background setting. Since the observer receives the fewest associated visual cues in Part II, this section would necessarily be considered the most analytic section of the Utley Test. Thus, the high correlation of this section with the HFT would be as predicted. The significant correlation of the HFT with the sentence section of the Utley Test indicates that an analytic ability is important in identifying the sentences presented in the Utley Test. The nonsignificance of the correlation between the HFT and Part III of the Utley Test suggests that the lipreader is required to perform some overriding task besides analyze lip movements.

In interpreting the significant positive relationship between performance on the total HFT and performance on the Utley Test, the limitations presented in the introduction of this study need to be recalled. First, field independence needs to be realized as being only one variable which is related to the complex behavior involved in lipreading. Second, the sample used in this study was of a restricted ability range. Third, the results of this study must not be over-emphasized even for the population to which the sample

belongs since the study employed a filmed test which by itself imposed additional restrictions.

The calculated Pearson Product Moment Correlations (see above, p. 27) indicate that analytic ability is significantly related to performance on both Part I and Part II of the Utley Test. Since these two parts of the test comprise 84% of the total test, it could be assumed that 84% of the Utley Test requires prerequisite analytic ability to a significant degree. Therefore, this study has implications for suggesting either that the Utley Test is an analytic measure of lipreading ability or that good lipreaders are field independent. Based on the results of the present study, both of these possibilities are seen as areas strongly needing further research.

As there have been no previously reported studies investigating the relation of lipreading to field independence, this study has necessarily been exploratory in nature and needs further validation. The results also need to be viewed in light of the inconsistencies present in the background literature relative to this study. First, the area of sex differences needs further investigation (see above, pp. 15-16). Second, the results of this study are in conflict with commonly accepted clinical beliefs which are based on prior research suggesting that lipreading is related to an individual's ability to synthesize. These inconsistencies can be solved only through additional research.

CHAPTER 5

SUMMARY, CONCLUSIONS, SUGGESTIONS FOR FURTHER RESEARCH

The research problem has been described and the purpose of the present study has been stated. Background literature relevant to this stated purpose has been reviewed. Methodological procedures have been discussed. The data have been analyzed and the implications have been considered. The intent of the present chapter is to summarize the proceedings, list the final conclusions and present implications for further research which have evolved from the present study.

Summary

Audiologists and speech pathologists hold major roles in the rehabilitation of the orally handicapped. The development of lip-reading ability has been identified by these clinicians as being one of the major components of a successful oral rehabilitation program. However, the results of empirical studies have not yet defined for these clinicians the variables they need to manipulate in order to improve an individual's ability to read lips.

The purpose of the present study was to investigate the relationship between an individual's field independency and his ability to read lips. A review of the literature suggested that

lipreading ability would be related to an individual's tendency to perceive his visual environment analytically.

The Utley Lipreading Test (Form A) was used as the measure of lipreading ability and the Hidden Figures Test was used as the measure of analysis of the visual environment. Both tests were administered to twenty volunteer male undergraduates at Michigan State University. All subjects possessed normal hearing and normal vision.

Reliability estimates of the test measures were obtained through use of the split-half method. The corrected reliability estimates were .73 for the total Utley Test and .81 for the total Hidden Figures Test. The relationship between performance on the two measures was analyzed through calculation of a Pearson Product Moment Correlation Coefficient. The resulting coefficient of .46 was significant at the .025 level and indicated that performance on the Utley Test was positively related to performance on the Hidden Figures Test.

Conclusions

Within the limits imposed by the instruments used in this study and the subjects who participated, the following conclusions seem warranted.

1. Performance on a filmed lipreading test is positively related to performance on an embedded figures test at a significant level.
2. The high difficulty level of the Utley Test may serve to mask out true differences between lipreaders.

Suggestions for Further Research

In the past, concern for perceptual abilities has not defined a major area of research for those interested in predicting or improving lipreading ability. The significant results found in the present study, however, strongly suggest a need for further research. This research should first be concerned with cross-validating the results of the present study. Other lipreading tests should be correlated with field independence measures to determine whether requisite analytic ability is needed for general lipreading or only for the Utley Test. Further research should then be concerned with the sample population employed. The study should be repeated using normal hearing female subjects and hearing impaired subjects.

If the results of this study upon further testing are assumed to be valid, further research areas would be defined by the results of factor analytic studies and correlational studies which have been extensively carried out on the field independence - dependence measures.

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RAW SCORES

WILEY TEST

HIDDEN FIGURES TEST

Subject Number	Part I	Part II	Part III	Part I	Part II
1	40	7	9	9.50	14.00
2	44	5	4	4.75	7.00
3	40	5	6	8.00	13.00
4	43	4	3	1.00	8.00
5	39	3	8	1.00	11.00
6	35	4	6	5.00	1.75
7	32	7	5	6.00	10.00
8	34	3	7	12.00	1.00
9	39	4	5	3.25	1.00
10	28	6	8	4.50	9.00
11	31	5	5	4.75	1.00
12	28	8	3	3.75	8.50
13	26	2	10	6.00	-2.75
14	27	6	5	7.50	0.00
15	30	1	6	0.00	0.75
16	24	4	2	11.00	7.00
17	23	3	2	0.25	-0.50
18	16	2	1	4.00	4.00
19	11	0	7	0.00	2.50
20	10	4	1	6.00	2.75

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