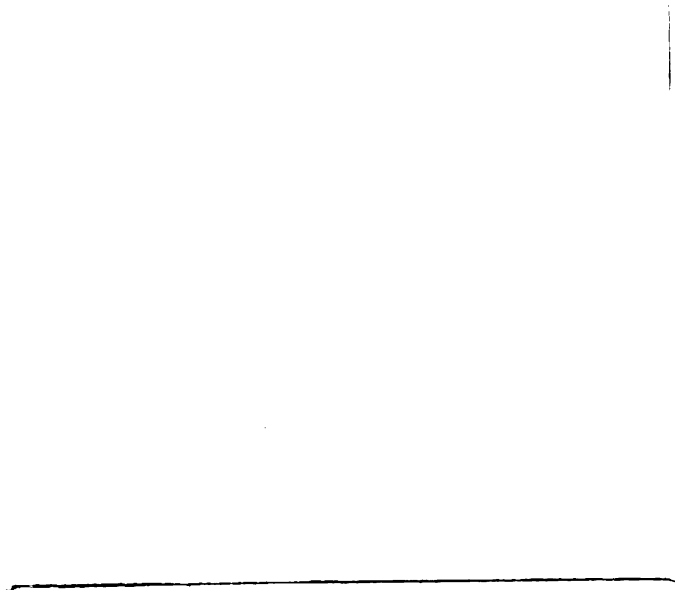




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LIPREADING PERFORMANCE AS A
FUNCTION OF CONTINUOUS
VISUAL DISTRACTIONS

Thesis for the Degree of M. A.
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Charles A. Miller
1965



ABSTRACT

LIPREADING PERFORMANCE AS A FUNCTION OF CONTINUOUS VISUAL DISTRACTIONS

By

Charles A. Miller

The purpose of this study was to analyze the effects of selected continuous visual distractions upon the lipreading performance of untrained subjects. The primary goals of the researcher were to determine which visual distraction had the greatest effect, if any, upon lipreading performance and to determine whether the lipreading subjects could adapt to visual distractions.

The subjects participating in this study were four male and ten female college students enrolled in speech courses at Michigan State University. All of the subjects had from two to five years of college education and all subjects were judged to have normal speech, hearing, and vision as determined by speech, hearing, and vision tests.

None of the subjects had lipreading experience or training prior to the study and they were not given any lipreading instruction or permitted to study the word lists for the lipreading tests.

One female adult presented all of the test words to all of the lipreading subjects. The test words were fifty single words randomly selected from Voelker's One Thousand Most Frequent Spoken Words.¹ The speaker pronounced a word every ten seconds to allow the subjects time to record each word they identified on an answer sheet. There were four lipreading tests for this study. The same vocabulary of fifty words was used for each test but the words were presented in a different random order for each test.

The lipreading experiment consisted of a presentation of fifty words at ten second intervals under a control and three experimental conditions. The first experiment consisted of a presentation of fifty words with no visual

¹Charles H. Voelker, "The One Thousand Most Frequent Spoken Words," Quarterly Journal of Speech, XXVIII (February, 1942), 189-197.

distractions. For the second experiment the same fifty words were presented in a different random order and a flashing light was introduced. The third experiment consisted of a presentation of the same fifty words in a different random order with the introduction of a spinning disc during the presentation of the words. The final experiment consisted of a nonpurposeful hand movement on the part of the speaker-sender during her presentation of the same fifty words in a different random order. In each experiment white noise was generated through a speaker-amplifier to mask the voice of the speaker-sender.

The findings of this study reveal that the non-purposeful hand movement on the part of the speaker-sender increased lipreading performance significantly. The reason for this significant increase in lipreading performance is unknown because the hand movement was intended to distract the lipreader. The lipreaders did not adapt to the visual distractions. They did appear to fatigue on three of the four tests with significantly lower scores on the second-half on one test.

LIPREADING PERFORMANCE AS A FUNCTION OF
CONTINUOUS VISUAL DISTRACTIONS

By
Charles A. Miller

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LIPREADING PERFORMANCE AS A FUNCTION
OF CONTINUOUS VISUAL DISTRACTIONS

CHAPTER I

STATEMENT OF THE PROBLEM

Introduction

The greatest loss to anyone who is deaf is the inability to understand speech. One who is unable to hear music or the voices of nature is certainly deprived, but inability to hear spoken language is a calamity, unless means other than the ear can be found to convey the message to the brain. This ability to understand the spoken language is a key to the pleasures of life.¹

¹Edward B. Nitchie, Lip-Reading Principles and Practice (New York: Frederick A. Stoiles Co., 1930), 14-15.

A deaf person or one who has little residual hearing must rely on some other method to receive and understand spoken language. Manual language or sign language was one of the early methods taught to the deaf and severely hard-of-hearing, and this method is being taught and utilized in some training centers at the present time. The exclusive use of the manual method, sign language, or finger spelling (communication with the hand) has a serious limitation. Communication with the use of the hand is limited to those who understand the language, and this limits the environment in which the deaf or hard-of-hearing person can communicate. Another time-tested method for understanding language is lipreading. Lipreading is the most widely used method practiced by the deaf and hard-of-hearing for understanding spoken language. Lipreading enables the person with the faculty of speech but with little or no hearing to communicate with normal hearing individuals. Goldstein,¹ in his discussion of the problems of the deaf, states that every human with defective

¹Max A. Goldstein, Problems of the Deaf (St. Louis: Laryngoscope Press, 1933), p. 267.

hearing should seek to become a fluent and accurate lip-reader and to make this asset his most dependable one.

Some individuals with sufficient residual hearing may find that a hearing aid is invaluable as a means for additional cues and as a means of identification with the world of sound, but lipreading is often recommended in addition to wearing a hearing aid.

To the partially or incurably deaf, the acquisition of lip-reading is a manifold blessing; it releases him from the constant handicap of his aural infirmity; it relieves the constant nervous strain and embarrassment of isolation from the rest of his fellows; it restores his social status and his means of communication with his fellow-men.¹

Lipreading as a substitute for hearing has its limitations. The lipreader may find occasions when his skill will be limited by conditions which are beyond his control. Rapid speech, obscure movements of speech, extraneous conditions of poor lighting, distance from the speaker, and view of the speaker may be serious handicaps to the lip-reader.²

¹Goldstein, op. cit., p. 296

²Irving Fusfeld, "Factors in Lipreading as Determined by the Lipreader," American Annals of the Deaf, CII (March, 1958), p. 240.

Lipreading, then, is not a cure for deafness, nor is it a cure for all the ills of deafness; but from some of the worst ills it is a true alleviation. It takes first place for the majority of occasions over all mechanical devices. For those completely deaf, or so deaf as to make mechanical devices out of the question, lipreading is the only resource.¹

Lipreading does require certain skills, and one of the primary requirements for lipreading is visual perception and visual concentration. Visual concentration, then, is one of the most valuable agents in the acquisition of lipreading.²

Inattention or a lack of visual concentration is one of the chief faults of lipreaders.³ Brandt states that there are many occasions when the task of the individual and distracting or interesting stimuli present themselves simultaneously and result in a conflict of "two brands of attention." One "brand" appeals to the senses in terms of the freedom and enjoyment of turning the attention to that which is distracting, and the other "brand" makes its appeals on the basis of purpose or

¹Nitchie, op. cit., p. 16.

²Goldstein, op. cit., p. 295.

³Nitchie, op. cit., p. 4.

duty.¹ Many authorities on the subject of lipreading mention the importance of the lipreader's ability to concentrate on the face and lips of the speaker, and several studies have been completed on the subject of various types of distractions including visual distractions. However, this researcher could not find a single study regarding lipreading as a function of visual distractions.

Statement of Problem and Purpose of Study

The purpose of this study is to investigate and analyze the effects, if any, of predetermined visual distractions upon the lipreading ability of a group of untrained subjects.

From the investigation and analysis it is hoped that the following general questions may be answered: Do visual distractions affect lipreading ability; and if so, which type of distraction has the greatest effect upon lipreading ability? Can the lipreader adjust to visual distractions and thus maintain high performance in lipreading?

¹Herman F. Brandt, The Psychology of Seeing (New York: The Philosophical Library, 1945), p. 194.

Null Hypotheses

1. There is no significant relationship between lipreading performance and visual distractions.
2. There is no significant difference between various types of continuous visual distractions and their effects upon lipreading performance.
3. There is no significant difference between first-half lipreading performance scores and second-half performance scores as a function of adaptation to visual distractions.

Importance of the Study

A few studies have investigated the relationship between lipreading performance and intelligence, lighting conditions, distance from the speaker, and auditory distractions; but this researcher could not find any evidence of a controlled study on the relationship between visual distractions and lipreading performance.

It is known that lipreading performance is related to the ability of the lipreader to concentrate his or her attention on the speaker. Speech therapists and teachers of the deaf are familiar with the problems of visual and auditory distractions during initial sessions of lipreading instruction. O'Neill and Oyer cite the need for research in controlled studies dealing with the effects of lighting, physical environment, distractions, and viewing distance.¹

Knowledge of the effects of visual distractions upon lipreading performance could have important implications for future methods in lipreading instruction because it is possible that sudden visual distractions may greatly affect learning rate and performance of lipreaders.

It is hoped that this study will provide groundwork for future investigations on the relationship between visual distractions and lipreading performance.

¹John J. O'Neill and Herbert J. Oyer, Visual Communication for the Hard of Hearing: History, Research, and Methods (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1961), p. 44.

Limitations of the Study

The subjects for this study were students enrolled in Speech 108 and Speech 373 at Michigan State University. All subjects were American born English speaking students who were judged to have normal speech and hearing as defined in this thesis.

1. All subjects must have 20-20 corrected vision in the poorest eye and must be able to pass the Snellen E Chart Vision Test.
2. All subjects must be able to hear pure tones at 15dB or less re audiometric zero at frequencies of 250 cps through 6,000 cps. Audiometric zero refers to the calibration standards set by the American Standards Association in 1951. The subjects were tested monaurally in each ear with earphones with a Beltone Model 12-A audiometer.
3. All subjects must have normal speech as judged by a Speech Therapist who is certified by the American Speech and Hearing Association.

4. The lipreading subjects will be tested on their ability to lipread a given vocabulary of fifty single isolated words at ten second intervals. The same vocabulary will be used in the control and experimental conditions with a different random word order for each test condition.
5. A subject with normal speech will present the test vocabulary to the lipreading subjects in a full-face forward position using quiet voice of a specified intensity and at a specified distance from the lipreading subjects. White noise masking will be introduced through a loud-speaker to prevent them from hearing auditory clues from the speaker-sender.
6. Specified visual distractions will be introduced in a predetermined schedule at a specified height and distance from the speaker.
7. The test room will be controlled as much as possible for ambient visual and auditory distractions.

Definitions of Terms

For the purpose of this study, the terms used are defined in the following manner:

1. Lipreading.--The ability of an individual to receive and comprehend specific words spoken by another person while being deprived of auditory components of speech.
2. Normal Hearing.--The ability to hear pure tones binaurally with earphones at 15dB re audiometric zero at frequencies of 250, 500, 1,000, 2,000, 3,000, 4,000, and 6,000 cycles per second.
3. Normal Vision.--Persons who have at least 20-20 corrected vision in the poorest eye.
4. Normal Speech.--Persons whose speech is free of distortions, omissions, substitutions, repetitions, and prolongations of speech sounds, syllables, or words and whose speech is judged as being within the norms of average speech by a certified speech therapist.

5. Normal Speaker.--A person whose speech is representative of normal speech in terms of articulation and has been trained to pronounce a specified vocabulary in a quiet voice without undue stress.
6. Vocabulary.--Fifty words chosen at random from a list of "The One Thousand Most Frequent Spoken Words."¹
7. Full-front View of Speaker.--The speaker will be directly facing the lipreading subjects so that face and lips of the speaker will be plainly visible to the lipreader.
8. Visual Distractions.--The visual distractions shall be 1) a flashing light oscillating at a rate of 4.5 cycles per second; 2) a spinning red on white archimedean spiral 18 inches in diameter, driven by a small quiet running motor; 3) a non-purposeful movement of the right hand of the

¹Charles H. Voelker, "The One Thousand Most Frequent Spoken-Words," Quarterly Journal of Speech, XXVIII (February, 1942), 189-197.

speaker from a relaxed position parallel with the body to a position with the forearm extended and the elbow near the body. This lifting and thrusting movement of the right arm will be performed by the speaker-subject at an approximate rate of one cycle per second.

Organization of the Thesis

Chapter I contained an introduction to the problem of lipreading and a statement of the problem which led to this study along with the purpose for which this study is being conducted. Specific questions were posed and null hypotheses were stated. The importance and limitations of this study were discussed, and major terms were defined.

Chapter II will contain a review of the literature which pertains to the subject of lipreading and factors related to lipreading ability as well as a discussion of various types of visual and auditory distractions.

Chapter III will include a discussion and description of the subjects, equipment, materials, and testing procedures employed in this study.

Chapter IV will consist of a discussion of the results of this study.

Chapter V will contain a summary, conclusions, and recommendations for further research.

CHAPTER II

REVIEW OF THE LITERATURE

Disagreement Concerning the Correctness of Terminology

The terms "lipreading," "speech reading," "visual communication," "visual hearing," and "visual listening" reveal that there has been considerable disagreement concerning the nature of the process whereby one person is able to understand the speech of another person without the benefit of auditory stimuli. Although the term "lipreading" has remained popular in the literature and with professional workers in the area of the aurally handicapped, several persons have challenged the validity of the word "lipreading." Mason attempted to discredit the terms "lipreading" and "speech reading" because she felt that these terms did not adequately describe the process of reception and interpretation of spoken language through the process

of visual observation.¹ She suggested the use of the term "visual hearing." O'Neill and Oyer suggest that the term "visual listening" might be even more accurate and descriptive. They believe the process of understanding speech by visual observation only has the need for an even broader term, and they use the term "visual communication."² Morkoven stated that one can readily recognize the inadequacy of the commonly accepted term "lipreading" and that this term is a misnomer because lip movements cannot be conclusive clues for speech.³ Muyskens questioned the term "lipreading" because he concluded that only 11 to 17 percent of the movements involved in speech were visible on the lips.⁴

¹Marie K. Mason, "A Cinematographic Technique for Testing Visual Speech Comprehension," Journal of Speech Disorders, VIII (September, 1943), 271-278.

²John J. O'Neill and Herbert J. Oyer, op. cit., 5-6.

³Boris V. Morkovin, "Rehabilitation of the Aurally Handicapped Through the Study of Speech Reading in Life Situations," Journal of Speech Disorders, XII (December, 1947), p. 363.

⁴John H. Muyskens, "The Building and Maintenance of Clear Speech for the Deaf," The Volta Review, XXXX (November, 1938), 655-656.

Factors Related to Lipreading Proficiency

A review of the literature concerning factors related to lipreading proficiency reveals that there is no one factor that fully accounts for lipreading proficiency. Many of the skills formerly associated with lipreading have been discredited because of a total lack of evidence.

Studies concerning the correlation between lipreading and intelligence, education, age, language, reading ability, synthetic ability, and perception of form and color can be found in the literature.¹ O'Neill and Davidson,² in their discussion of psychological factors related to lipreading, state that there is no significant relationship between lipreading and levels of aspiration, intelligence, reading comprehension, or digit memory span. They did find a significant relationship between lipreading ability and non-verbal concept formation.

¹Audrey Ann Simmons, "Factors Related to Lipreading," Journal of Speech and Hearing Research, II (December, 1959), 343-344.

²John J. O'Neill and JoAnn L. Davidson, "Relationship Between Lipreading and Five Psychological Factors," Journal of Speech and Hearing Disorders, XXI (December, 1956), p. 481.

Utley¹ states that lipreading ability cannot be predicted from reading level, school achievement, chronological age, age of onset of deafness, or grade placement in school. Brannon² found that there was little difference between skilled and unskilled lipreaders in visual identification of monosyllabic words, whereas the skilled lipreaders greatly excelled the unskilled lipreaders in lipreading sentences.

Byers and Lieberman³ studied rate as a variable of lipreading performance and concluded that there was no significant relationship between rate and lipreading performance. Nitchie,⁴ however, states in his book that it is necessary to speak slowly to the lipreader and that the

¹Jean Utley, "A Test of Lipreading Ability," Journal of Speech and Hearing Disorders, XXI (December, 1956), p. 481.

²John B. Brannon, Jr., "Speechreading of Various Speech Materials," Journal of Speech and Hearing Disorders, XXVI (November, 1961), 348-353.

³Vincent W. Byers and Lewis Lieberman, "Lipreading Performance and the Rate of the Speaker," Journal of Speech and Hearing Research, II (September, 1959), p. 275.

⁴Nitchie, op. cit., p. 10.

delivery should be smooth and not word by word. Black¹ found that word accent and the type of sounds within the words could account for certain words being easier to lip-read than other words. Lowell² found that parts of speech are factors related to lipreading. He states that the rank-order from the easiest to the most difficult parts of speech to lipread are as follows: pronouns, verbs, nouns, adverbs, adjectives, prepositions, and conjunctions. O'Neill³ studied the behavior and personality patterns of college lipreaders. He found no significant relationship between the ability to judge emotions and lipreading ability and no significant relationship between personality traits and lipreading ability. Kitson⁴ in his early

¹John W. Black, "Accompaniments of Word Intelligibility," Journal of Speech and Hearing Disorders, XVII (December, 1952), 409-417.

²E. L. Lowell, "New In-sight into Lipreading," Rehabilitation Record, II (July-August, 1961), p. 4.

³John J. O'Neill, "An Exploratory Investigation of Lipreading Ability Among Normal Hearing Students," Speech Monographs, XVIII (August, 1951), 309-311.

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

experiment found that there was a relationship between visual awareness and attention span and high performance on lipreading tests. Brannon¹ concluded that there is no great difference between male and female lipreading ability. O'Neill and Oyer,² in their summary of experimental studies of lipreading, state that while some studies show possible relationships between lipreading skills and personality or behavioral factors, there is no definite indication of what constitutes typical behavior of a good lipreader.

Factors in Lipreading--Point of View from
Good and Poor Lipreaders

Much of the literature on lipreading is written by normal hearing individuals who do not lipread or practice it as a skill simply because they do not need to acquire the skill. Certainly most of these people are well

¹Brannon, op. cit., p. 352.

²O'Neill and Oyer, op. cit., p. 40.

qualified as authorities on the subject, and their writings are based upon their experiences in teaching lipreading or upon research. However, as a dichotomy, it might be worthwhile to obtain some information from the lipreaders themselves. Some information may be gained from opinions of both good and poor lipreaders. Fusfeld¹ interviewed a panel of twenty lipreaders. All of the members of this panel were college graduates, and all of them were in a field of work requiring an intellectual background. The main difference was that ten of these college graduates were good lipreaders and ten of them had never been able to develop proficiency in lip-reading. The central question directed to these twenty lipreaders concerned the process of lipreading. Those who were good lipreaders listed the following factors: acquaintance with the subject matter or a preparatory set; awareness of current events; filling-in the obscure and hidden elements of speech; obtaining the thought of spoken communication through key words; striving for gross meaning instead

¹Irving S. Fusfeld, "Factors in Lipreading as Determined by the Lipreader," American Annals of the Deaf, CII (March, 1958), 229-242.

of isolated words; having a realistic attitude toward the difficulties of lipreading; having a dynamic personality; and a natural aptitude for lipreading as others may have an aptitude for art or music.

The poor lipreaders gave the following factors which they felt contributed to their inadequacies: lipreading is a shallow, artificial experience which is stripped of the emotionally satisfying experiences that go with normal speech; a lack of understanding often leads to feigning the ability to understand others; success in the classroom often leads to failure in the real world; lipreading is a compensatory activity with certain demands of aptitude; efficiency in lipreading is a prolonged and weary learning procedure, and fatigue is a deterrent to acquiring skill in lipreading; too often unfavorable conditions of extraneous nature such as uncertainties of light, position, movement and distance from the speaker make lipreading an uncertainty at best; residual hearing, vocabulary, and general intelligence are important; extroversion is a great help; many people enunciate poorly; and the lack of assurance from a lack of feedback makes the skill of lipreading self-defeating.

A quick review of the above factors which were listed by the groups of good and poor lipreaders will reveal that both groups generally agreed on the requirements for proficiency in lipreading and one of the main differences can be attributed to the backgrounds, attitudes, personalities, and driving forces of these individuals. For example, while both groups agreed that the skill of lipreading is not usually attained with ease, those who were good lipreaders found a challenge and with stubborn, persistent practice and experience were able to acquire the necessary skills. Those who were poor lipreaders found that the process of lipreading was so unrewarding, so fatiguing, and so self-defeating that they were discouraged to continue with the practice which is necessary for acquiring the necessary skills. From this survey it may also be seen that personality factors such as inherent qualities as well as desire to acquire the skill and a willingness to accept the challenge despite the unfavorable odds may also be a very important factor.

For the deaf person or one who has little residual hearing, lipreading can be compared to watching a movie

or T.V. when fifty percent of the picture is missing and it becomes necessary to fill in the missing parts in order to make any sense out of the total experience. For persons with normal hearing the initial process of lipreading might be compared with attempting to talk with another person in a background of extreme noise. Indeed, the process of lipreading involves many types of "noise" which serve as variables in the process of understanding spoken language solely by means of visual perception.

Attention Factors and Lipreading

Many books and articles on the subject of lipreading discuss the factors of visual perception and visual attention and their close relationship with lipreading ability. Tatoul and Davidson¹ state that one of the most promising variables for further study is that of synthetic ability which is the ability to anticipate the whole from

¹Corrine M. Tatoul and G. Don Davidson, "Lipreading and Letter Prediction," Journal of Speech and Hearing Research, IV (June, 1961), p. 178.

the knowledge of a few of its parts. Visual perception, which includes concentration and attention, is a very important factor in synthetic ability. Concentration is the first essential for the would-be lipreader and without it lipreading is impossible.¹ Ewing² states that lipreading does not involve staring but it does involve attentive watching. According to Bruhn,³ the lipreader must be trained in the art of noticing. Glorig⁴ states that not enough attention has been given to the teaching of visual awareness and that visual observation is the basis of good lipreading.

Few, if any, authorities on the subject of lipreading have questioned the importance of visual perception,

¹Introduction to Lipreading (Elmsford, New York: Sonotone Corporation, 1958), p. 22.

²Irine R. Ewing, Lipreading and Hearing Aids (4th ed.; London: Manchester University Press, 1962), p. 15.

³Martha Bruhn, The Mueller-Walle Method of Lipreading for Hard of Hearing (Boston: M. H. Leavis, 1947), p. 8.

⁴Aram Glorig, "Visual Aids in Speech Reading Instruction," Hearing News, XVII (1949), p. 1.

concentration, and observation. Yet, these factors demand a necessary state of attention. Berry and Eisenson have defined attention in the following way:

Attention is a state in which the individual becomes set to select and respond to a specific pattern or stimuli or to one situation to the exclusion of others. In order for an individual to be capable of selection, he must be able to inhibit potential responses to competing and at the moment extraneous (non-relevant) stimuli.¹

Various Types of Distractions and Performance Tasks

Since there are no known studies dealing with the relationship between visual distractions and lipreading performance, one must turn to the literature on the effects of various types of distractions upon lipreading performance as well as other performance tasks.

¹Mildred F. Berry and Jon Eisenson, Speech Disorders--Principles and Practices of Therapy (New York: Appleton-Century-Crofts, Inc., 1956), p. 394.

Vogel-Sprott,¹ in his study of the influence of peripheral visual distractions on perceptual motor performances, states that there is a real need for additional studies dealing with distractions in the periphery of visual focus. He states that most studies have been concerned with distracting stimuli in the central visual field or have been concerned with other sensory receptors such as touch or sound. For one thing, it is practical to study the effects of peripheral visual distractions because this situation occurs so frequently in our daily lives. A common example is automobile driving, with stimuli such as the passing landscape in the visual periphery continuously competing for the driver's attention.

Freeman,² in his study of changes in tension patterns and energy expenditure during adaptations to distracting stimuli, states that distracting stimuli temporarily

¹M. Vogel-Sprott, "Influence on Peripheral Visual Distractions on Perceptual Motor Performance," Perceptual and Motor Skills, XVI (June, 1963), p. 765.

²G. L. Freeman, "Changes in Tension-Pattern and Total Energy Expenditure During Adaptation to Distracting Stimuli," American Journal of Psychology, CII (July, 1939), 359-360.

unbalance the bodily economy and greater energy is expended to compensate for the distraction and the person becomes tired more readily. After a period of time, however, the body can readjust to the distraction and an economical pattern is reestablished. Cassel and Dallenbach¹ in their experiments with auditory distractions upon sensory reactions found that the effect of the distraction is dependent upon the nature of the distraction and the conscious attitude of the person being distracted.

There is considerable disagreement concerning the effects of auditory distractions upon various types of motor tasks as well as intellectual functioning. Many of the experiments with the effects of auditory distractions were not adequately controlled in terms of the variables that were controlled; and for this reason, the validity of many of the results of experiments must be questioned.

Morgan² found that although his subjects were distracted by noise while performing motor tasks, they were

¹E. E. Cassil and K. M. Dallenbach, "The Effect of Auditory Distraction Upon the Sensory Reaction," American Journal of Psychology, XXIX (April, 1918), 129-143.

²J. J. B. Morgan, "The Overcoming of Distractions and Other Resistances," Archives of Psychology, XXXV (February, 1916), p. 295.

able to adapt to the noise after a period of time. With increased tension and effort they were able to compensate for the distraction and perform as well in a condition of noise as they were in a quiet condition. Butler and Harlow¹ also found that monkeys can adapt to auditory distractions. They trained their monkeys to perform a simple task and then studied and analyzed the performance of the monkeys in a control condition and three experimental conditions. Monkey sounds, laboratory sounds, and white noise were introduced as three separate conditions; and in each experiment the researchers found that while there was a decrement of performance initially, the monkeys adapted to the noise and performed as well as they were able to do without the noise. Cassel and Dallenbach² found that auditory distractions had no given effect upon the reaction time of their subjects. In some cases, subjects had slower reaction times to visual stimuli in the presence of noise

¹Robert A. Butler and Harry A. Harlow, "The Effects of Auditory Distractions on the Performance of Monkeys," Journal of General Psychology, LIV (1956), p. 19.

²Cassel and Dallenbach, loc. cit., p. 143.

while other subjects increased the speed of their reaction time and others remained unchanged. Their research did indicate that the distractors which were the most resistant to habituation where intermittent distractions and that continuous distractions were adjusted to more readily.

Mech¹ studied the factors influencing the performance of routine tasks under conditions of verbal noise and found that noise of a given intensity did not have any effect upon the execution of routine tasks and states that his findings are compatible with the results of other studies. He does state that his subjects were able to adapt to noise but did not state whether there were any significant changes throughout his experiment. Dolch,² in his discussion of distractions and silent reading ability states that the school child is easily distracted by noise and movement about him and that the child must learn to ignore distractions, an ability which is accomplished by learning to pay continuous attention.

¹E. Victor Mech, "Factors Influencing Routine Performance Under Noise: The Influence of 'Set'," Journal of Psychology, XXXV (1953), p. 297.

²Edward William Dolch, Teaching Primary Reading, Champaign, Illinois: The Garrard Press (1960), p. 53.

Lipreaders have expressed the thought that paying attention to the speaker is vital to lipreading success and that the would-be lipreader must learn to pay attention as a conscious process. Unfortunately, the human being can only focus his attention on a given act or process for a short period of time, and the external visual distractions are constantly competing for the lipreader's attention. Furthermore, many of the visual distractions are intermittent and occur unexpectedly and with varying degrees of frequency and intensity. On the other hand, proficient lipreaders state that they can not and do not rely on seeing every word, and for this reason visual distractions may not be as detrimental to lipreading proficiency as it would appear.

CHAPTER III

SUBJECTS, EQUIPMENT, MATERIALS, AND

PROCEDURE

Subjects

Four male and ten female college students served as subjects for this experiment. The subjects were all enrolled in either Speech 108 or Speech 373. Their educational background ranged from two to five years of college. None of the subjects had lipreading experience or training prior to this study. The subjects were not given any lipreading instructions for this study, and their potential lipreading ability was not measured.

1. Speech Screening: Each subject was screened individually for speech proficiency by a certified speech therapist in conversational speech.
2. Vision Screening: Each subject was individually given a Snellen Vision Test using the Snellen E

Chart. Both eyes were tested individually for visual acuity as a function of distance. Each subject included in the lipreading study evidenced at least 20-20 vision in the poorest eye.

3. Hearing Screening: Each subject was individually given a hearing acuity screening test. Both the right and left ears were screened separately for hearing acuity at frequencies of 250, 500, 1,000, 2,000, 3,000, 4,000, and 6,000 cycles per second using a Beltone model 12-A audiometer. The subjects selected for this study were able to hear pure tones at the above frequencies at a level of 15 dB re audiometric zero.

Speaker

One female adult presented all of the test words to all of the subjects.

Equipment

The following equipment was used:

1. Allstate stop-watch (Hanhart model, 7 jewel, with sweep second hand) .
2. Ampex 620 speaker-amplifier (speaker 7 inches in diameter) .
3. Beltone 12-A audiometer (TDH-39 10z telephonics earphones) .
4. Bruel and Kjaer precision sound level meter (type 2203) .
5. Grason-Stadler white noise generator (model 455B) .
6. Hewlett-Packard low frequency audio oscillator (model 202 C) .
7. Indicator lamp (push button switch) .
8. Kodak slide projector (model 500-B) .
9. Sawyer slide projector (model 500R) .

10. Snellen E Chart (No. P318P).
11. Tone-operated relay for flashing light (four and one-half cycles per second).
12. Small battery operated motor (one and one-half volt, full power 1,000 RPM).
13. Rheostat (350 OHM, type J) for controlling motor speed to approximately 300 RPM.
14. One and one-half-volt batteries (three batteries connected for motor power source).
15. Six-volt batteries (three connected together for flashing light power source).
16. Two small, clear light bulbs (No. TS 1881, 3/8 inches in diameter) centered and mounted on a black cardboard 20 X 30 inches.
17. Black drape (seven feet by twelve feet).
18. Wooden stand for projectors and signal light (six feet high).

19. Metal table for placement of distraction devices (41-3/4 long by 26-1/4 inches wide by 30 inches high) .
20. Metal adjustable stool for speaker (seat adjusted to 30 inches from floor) .
21. Archimedean spiral (red-on-white, 18 inches in diameter) .
22. Fourteen desk chairs for lipreading subjects.
23. Fourteen #2 lead pencils.
24. Fifty-six scoring sheets.

Materials

Fifty single words were randomly selected from Voelker's One Thousand Most Frequently Spoken Words.¹
 Five words were randomly selected from each of the ten

¹Charles H. Voelker, op. cit., 189-197.

groups of one-hundred words were listed according to their relative frequency of occurrence in the spoken English language. The test words were composed of monosyllabic and disyllabic words. These lists of test words may be found in the **appendix**.

Procedure

Testing Procedures: The experiment was conducted in the Michigan State University Speech and Hearing Science Laboratory. The windows were closed, the shades were drawn, the doors were closed, and immediately before the test the ambient noise level in the test room ranged from 45 to 55 dB as measured by a sound pressure level meter at the position of the speaker. A black drape seven feet high and twelve feet long was hung on the front wall of the test room, two feet behind the speaker. This black drape also covered the table which was used for the distraction devices. The drape was used to minimize the effect of uncontrolled visual distractions near the speaker. The audio oscillator and batteries for the power supply of the visual

distractors were also placed behind the drape to minimize the effect that this equipment might have as a visual distraction. The speaker-sender was seated on a wooden stool near the center of the black drape and two feet in front of it. The lipreading subjects were seated in three rows of desk chairs which were staggered in position to give each subject the best view possible of the speaker-sender and the distraction devices. The three rows of chairs were positioned twenty-eight inches apart with the front row being six feet from the stool of the speaker-sender. The speaker amplifier, which was used for masking the quiet voice of the speaker-sender, was positioned three feet to the right of the lipreading subjects and in line with the back row of chairs. The two slide projectors which served as spotlights to be directed on the speaker subject and the distraction devices were located on a six foot high wooden stand at the back of the test room at a distance of eighteen feet from the speaker-sender, and in a nearly direct line with the speaker-sender. The red signal light which was used to cue the speaker-sender at ten second intervals was positioned between the two slide

projectors. This red signal light was turned on every ten seconds by the time keeper with a push button switch. The time keeper was equipped with a stop watch and was seated near the back of the test room behind the last row of lipreading subjects.

The experimenter read the following instructions to the lipreading subjects immediately before the beginning of the first lipreading experiment:

This experiment is designed to determine the effects of visual distractions, if any, upon lipreading performance. Your task is to lipread a vocabulary of fifty single monosyllabic and disyllabic words spoken in quiet voice by one female speaker who will be seated where I am now seated.

The single words will be presented at ten second intervals. You are to record the word which you believe you have identified in the correct space on your score sheet. You are to record this word immediately after each word has been presented by the speaker. A ten second interval will be provided for recording your responses. Spelling is not of great importance and should be no problem since all of the words presented are commonly spoken words. You are urged to guess at the words if you are unsure of the correctness of the word you think you have identified. If you can not identify the word, draw a line through the space provided for that word. This will enable you to record each word in the correct space. If you should require a new pencil

or if you become confused on the number of the word which was just presented, raise your hand and you will receive assistance.

This experiment will consist of four parts. In each experiment the same fifty words will be presented in a different random order. You will not be able to hear the quiet voice of the speaker because of masking noise which will be presented through a loud-speaker. Your eyes will be your primary source for communication.

Please do your best in attempting to identify the words presented by the speaker-sender. You are not expected to be able to identify all of the words correctly. Are there any questions?

Each lipreading subject was given a score sheet and a pencil. The speaker-sender took her position on the stool at the front of the room. The white noise generator was turned on to acquaint the lipreading subjects with this masking noise. The level of the white noise used for masking the voice of the speaker-sender was adjusted so that the fans on the slide projectors, the motor used for the distraction device, and ambient room noise were at a level of 80 dB with a sound pressure level meter. One slide projector was turned on and the beam of the light was centered on the face of the speaker-sender. The diameter of the spot was adjusted to approximately two feet in

diameter by placing into the slide projector a piece of cardboard 2" X 2" with a 5/8 inch hole in the center. The time keeper took his position two feet behind the back row of chairs provided for the lipreading subjects. The experimenter turned off the six overhead fluorescent lights and left on the three fluorescent lights in the back of the test room. This provided enough residual light for the subjects to be able to record their responses. The experimenter took a position at the back of the test room where the lipreading subjects, the speaker-sender, and timekeeper could be viewed; and the first lipreading experiment was ready to begin.

The first lipreading experiment served as the control condition. No visual distractions were introduced, and the objective of this experiment was to determine each subject's lipreading proficiency while peripheral visual and auditory distractions were controlled as much as possible.

The speaker-sender sat as motionless as possible looking straight ahead. The 500 watt beam from the slide projector was elevated slightly above the eyes of the

speaker-sender to avoid looking directly into the light source. Shadows were for the most part nonexistent except for a small shadow under the lower jaw of the speaker-sender. The speaker-sender's tongue and teeth were clearly visible during speech with open mouth sounds, and the lips and jaw were clearly visible at all times throughout the lipreading experiment.

Upon seeing the red signal light in the back of the room, the speaker-sender pronounced the first word and the following words were given at ten second intervals. The speaker-sender had a typed list of the test words on her lap and was able to glance down at the list while the lipreading subjects were recording their responses.

The duration of this experiment was eight minutes and twenty seconds. The score sheets were collected and identical new score sheets were handed out to the lipreading subjects. The lipreading subjects were then given a two-minute break so the second experiment could be set up.

The purpose of the second experiment was to determine whether a continuous flashing light affected lipreading performance. The second experiment served as the first

experimental condition. In this experiment, the environmental conditions remained the same as that of the first experiment, including the seating position of the lipreading subjects. On this experiment, however, the first visual distraction was introduced. Two small clear light bulbs mounted in the center of a piece of black cardboard 20 X 30 inches were positioned on a table, two feet to the right of the speaker subject. These light bulbs were mounted one inch apart in a vertical position and flashed on and off at a rate of four and one-half cycles per second. The rate of oscillation was controlled by an audio oscillator and the power supply was furnished by three six-volt batteries.

The speaker-sender again pronounced each single word at ten-second intervals using the same list of fifty words in a different random order. This experiment lasted eight minutes and twenty seconds. The score sheets were collected and new score sheets were handed out to the lipreading subjects. The lipreading subjects were then given a two-minute break while the third experiment was being set up.

The third experiment consisted of a presentation of the same vocabulary of fifty words in a different random order by the same speaker-sender. Each word was pronounced at ten second intervals. The environmental conditions remained the same with two exceptions. The flashing lights were replaced with a red-on-white Archimedean spiral eighteen inches in diameter. This spiral was driven by a small battery-operated motor. The speed of the motor was controlled by a rheostat so that spiral turned at the rate of approximately three cycles per second. The Archimedean spiral turned in a manner which made it appear that the red line was flowing in toward the center of the red-on-white disc.

During this experiment, a second slide projector was employed. This time the beam of the 500 watt bulb was directed on the Archimedean spiral to make it appear as prominent as that of the face of the speaker-sender. The red-on-white Archimedean spiral operated continuously at a rate of three cycles per second while the speaker-sender pronounced the list of fifty words at ten second intervals. At the termination of this experiment, the

score sheets were collected, new score sheets were handed out, and the lipreading subjects were given a two-minute break before the start of the fourth experiment.

The fourth and final experiment, which served as the third experimental condition, consisted of a presentation of the same list of fifty words in a different random order. During this experiment, the lipreading subjects remained in the same seating order, the speaker-sender remained in the same position as that of the other three experiments, and the only change introduced was a nonpurposeful hand movement of the speaker-sender.

This nonpurposeful hand movement consisted of a movement of the right hand of the speaker-sender. The elbow was held close to the body and forearm of the speaker-sender moved in a vertical lifting action with the palm of the right hand extended. In the position with the right hand lowered, the right hand rested on the right thigh of the speaker-sender, and in the raised position the right hand was at a level approximately even with the chin of the speaker. The right hand was raised and lowered at a rate of one cycle per second. During this experiment, the

beam of light directed on the speaker-sender was lowered slightly so that the hand of the speaker was illuminated as well as the face of the speaker.

This experiment lasted eight minutes and twenty seconds, and the score sheets were collected immediately after the termination of this experiment. The lipreading subjects were then dismissed.

Scoring and Recording: Each lipreading subject's list of words for each of the four experiments was examined and scored separately since each subject was compared only with himself concerning lipreading proficiency in the control and experimental conditions. A word was scored as correct only if it was recorded in the correct form with the correct suffix. Two scores were recorded for each score sheet: a total score was given for the total number of correct responses, and a first-half and second-half score was recorded to determine whether adaptation to the visual distractions occurred.

CHAPTER IV

RESULTS AND DISCUSSION

Results

The number of words that were correctly identified by the lipreading subjects were tabulated and recorded. Raw scores were derived for each lipreading subject for each of the four lipreading experiments.

The proportion of words identified correctly by the lipreading subjects was low. This was expected by the researcher since the subjects for this study were untrained lipreaders. They were requested to identify single words, and they were not permitted to see or study the test vocabulary of fifty words. The above procedures made the lipreading task more difficult, but they were employed by the researcher to minimize the learning effect since the same vocabulary of fifty words was presented in a different random order for each of the lipreading experiments.

Since considerable variability was expected from untrained lipreaders, this researcher was interested in individual test scores as well as group test scores in each of the test conditions. Tables 1 and 2 present the data which were obtained in response to the questions posed in Chapter I. The following three questions were posed by this researcher:

1. Do visual distractions affect lipreading performance?
2. If visual distractions affect lipreading performance, which distraction will produce the greatest effect?
3. Can the lipreader adjust to visual distractions and thus improve his test score during the second half of each test?

A t-test involving the difference between two means was employed to determine whether a significant difference existed in relation to the following questions:

1. Is there a significant difference between the test scores in the control condition of no distractions and the test scores in the experimental condition of flashing lights?
2. Is there a significant difference between the test scores in the control condition of no distractions and the experimental condition of a spinning red-on-white Archimedean spiral herein labeled a "spinning disc"?
3. Is there a significant difference between first-half test scores and second-half scores in the control condition of no distractions?
4. Is there a significant difference between the test scores in the control condition of no distractions and the experimental condition of a nonpurposeful hand movement?
5. Is there a significant difference between the first-half test scores and the second-half test scores in the experimental condition of a flashing light?

6. Is there a significant difference between the first-half test scores and the second-half test scores in the experimental condition of a spinning disc?
7. Is there a significant difference between the first-half test scores and the second-half test scores in the experimental condition of a nonpurposeful hand movement?

TABLE I

RESULTS OF t TESTS FOR EVALUATION OF DIFFERENCES
BETWEEN MEANS OF CORRECT IDENTIFICATION OF SINGLE
WORDS IN FOUR TEST CONDITIONS

Group*	Mean	df	t	Level of Confidence
I	9.00	13	.13	Not significant at .05
II	8.93			
I	9.00	13	1.69	Not significant at .05
III	9.78			
I	9.00	13	3.47	Significant at .01
IV	11.28			

*Key: I = Lipreading experiment with no visual distractions.
 II = Lipreading experiment with a distraction of flashing lights.
 III = Lipreading experiment with a distraction of spinning disc.
 IV = Lip reading experiment with a distraction of a hand movement.

TABLE II

RESULTS OF t TESTS FOR DIFFERENCES BETWEEN MEANS OF
FIRST-HALF AND SECOND-HALF TEST SCORES IN FOUR TEST
CONDITIONS

Test Condition	Portion of Test	Mean	df	t	Level of Confidence
No distraction	1st. half	4.64	13	.45	Not significant at .05
	2nd. half	4.36			
Flashing light	1st. half	4.14	13	.98	Not significant at .05
	2nd. half	4.78			
Spinning Disc	1st. half	6.57	13	5.10	Significant at .001
	2nd. half				
Hand Movement	1st. half	6.14	13	1.72	Not significant at .05
	2nd. half	5.14			

Discussion

Analysis of the data indicates that there is a significant difference between the mean number of correct words identified in the control condition of no distractions and the experimental condition of a hand movement. There was not a significant difference between the mean number of correct identifications of words in the control

condition of no distractions and the experimental condition of flashing lights. There was also no significant difference between the mean number of words identified correctly in the control condition of no distractions and the experimental condition of a spinning disc.

Examination of the raw scores of each subject in the control and experimental conditions reveals that only one subject had a lower score in the condition of a hand movement when compared with the condition of no distractions. Immediately this led the researcher to suspect a learning effect; however, further examination of the raw scores revealed that four subjects improved their scores by only one word when comparing the conditions of no distractions and a hand movement. Four subjects improved their scores by only two words, one subject improved his score by five words, three subjects improved their scores by six words, and one subject had equal scores. This reveals that four subjects were responsible for 71.8% of the total improvement. Furthermore, these four subjects did not show conclusive evidence of a learning effect because two of them did not evidence consistent improvement in

their test scores from the first lipreading test with no distractions to the last test with a hand movement. Only one subject demonstrated consistent improvement in the number of correct identifications in the successive lipreading experiments.

Evidence in favor of a learning effect is weak, and this researcher has drawn alternate conclusions. This researcher had concluded that the non-purposeful hand movement, which was thought to serve as a distraction device, did not constitute a distraction device at all. It is the contention of this researcher that the hand movement may have enhanced the lipreading proficiency of the subjects because it may have focused the attention of the lipreading subjects upon the speaker subject instead of serving as a visual distraction. There is some evidence to support this contention in the literature on general speech. Gauger,¹ in his study on listener comprehension, found that his high school subjects had higher scores when the

¹P. W. Gauger, "The Effect of Gesture and the Presence or Absence of the Speaker on Listening Comprehension of Eleventh and Twelfth Grade High School Pupils," Speech Monograph, XIX (1952), 116-117.

speaker used gestures as opposed to the speaker who used no gestures at all. Clark,¹ in his research on audience attitudes toward public speaking, suggested that perhaps speech with no gestures at all is abnormal. A review of other research studies on the values of gesture in speech delivery reveals that there is conflicting evidence concerning the relative importance of gestures and body movements in speech.

The second alternate conclusion drawn by this researcher is that some unknown factor may have been introduced during the lipreading experiment involving the non-purposeful hand movement. It is also possible that the significance which was found in favor of the hand movement was a chance event. In any case, this finding should be subjected to further study.

The data were examined to determine whether the subjects had adapted to the visual distractions and improved their scores on the second-half of the test or fatigued and thus decreased their scores on the second-

¹W. K. Clark, "A Survey of Certain Audience Attitudes Toward Commonly Taught Standards of Public Speaking," Speech Monograph, XVIII (1951), 62-69.

half of each test. The slightest difference between the number of words that were correctly identified on the first and second halves of each test occurred in the first experiment which served as the control condition with no distractions. The lipreading subjects as a group identified more words correctly in the first-half of the experiments involving the tests with no distractions, a spinning disc, and a hand movement. In the experiment involving the flashing light, the subject had slightly more correct identifications on the second-half of the test. Only in the experiment involving the spinning disc was there a significant difference in the number of correct identifications of words. This significant difference was in favor of the first-half of the test. Slightly more than one-half of the words were identified correctly on the first-half of the test. In the experiment involving the spinning disc, this researcher cannot attribute the magnitude of the difference between the first-half and the second-half scores to any specific factor. Certainly adaptation is not a contributing factor. Fatigue may have been the factor that contributed to this difference although the lipreading subjects had higher scores on the second-half of the

previous experiment. The lipreading subjects did have slightly more correct identifications on the first-half of two of the other experiments and this may tend to support the factor of fatigue even though the differences in these two experiments were not significant.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

There are many statements in the literature and in research reports on lipreading which point out the importance of visual perception, attention, and concentration which are necessary for success in lipreading. One does not need to search very long to find such statements as these: "Lipreaders must be trained in the art of noticing," "The teaching of visual awareness is the key for successful lipreading," and "Lipreaders must watch attentively." Most of these statements and similar ones found in lipreading literature carry the central theme that attention is necessary for lipreading and that distractions will decrease lipreading proficiency. The lipreader must be capable of selecting competing visual stimuli and attending to only those which aid him in the process of lipreading.

The purpose of this study was to examine lipreading performance as a function of visual distractions in order to determine whether visual distractions actually decrease lipreading proficiency.

The subjects for this study were four male and ten female college students who were enrolled in speech courses at Michigan State University. The subjects were screened for hearing, speech, and vision to assure that their speech skills were at least average, that they could see well enough to clearly observe the speaker-sender, and that their hearing was acute enough to make lipreading skill unwarranted.

The fourteen subjects were not trained lipreaders, were not given lipreading instruction, and were not given an opportunity to study the test vocabulary prior to the lipreading experiment. Their task was that of lipreading a vocabulary of fifty single words pronounced at ten second intervals by a female speaker-sender whose voice was masked by white noise delivered through a loud speaker system.

The lipreading subjects were presented the same vocabulary of fifty words in different random orders under four test conditions. The control condition was that of a presentation of fifty single words with no visual distractions. The experimental test conditions consisted of a presentation of the same vocabulary of fifty words in different random orders with the three following visual distractions: 1) a flashing light, 2) a spinning red-on-white Archimedean spiral, and 3) a non-purposeful hand movement by the speaker-sender.

The primary goal of this experiment was to determine the effect of visual distractions, if any, upon lipreading proficiency. The secondary goal of this experiment was to determine whether the lipreading subjects could adapt to the visual distractions.

Conclusions

The results of this study indicate that there was a significant relationship between lipreading performance and a nonpurposeful hand movement on the part of the

speaker-sender. This relationship was such that the hand movement which was intended to serve as a distraction device actually enhanced lipreading proficiency. This result would not be expected if the hand movement were distracting and if the lipreaders attended to this distraction. Although the learning effect cannot be positively ruled out, analysis of the data does not strongly point out the fact that learning took place on the part of the lipreading subjects. The researcher has therefore drawn the conclusion that the significant difference in lipreading performance may be attributed to the fact that the hand movement was not a distraction device but actually drew the attention of the lipreading subjects. This, in conjunction with a possible learning effect, may explain the findings of this study.

The second portion of this study was concerned with possible adpatation to the visual distractions. Analysis of the data revealed that the lipreading subjects did not appear to adapt to the visual distractions as reflected by their test scores on the first and second halves of each test. The lipreading subjects scored

slightly higher on the first-half of the test in the control condition with no distractions. The first-half scores of the test involving the hand movement were greater than those involving the test with no distractions, and the lipreading subjects scored significantly higher on the first-half of the test involving the spinning disc. These findings would lend support to the conclusion that the subjects became fatigued on the later portions of each test and therefore scored lower on the second-half of the test. This conclusion is contradicted by the fact that in the condition of the flashing light, the subjects scored higher on the second-half of the test.

From this study the researcher has concluded that there is a significant correlation between lipreading performance and hand movement, but the reason for this correlation is unknown. It was the conclusion of this researcher that there is a relationship between lipreading performance and fatigue, since the subjects scored lower on the second-half of three of the four tests, with significantly lower scores on the second-half of one test.

Implications for Further Research

Since there are no other known studies concerning the relationship between visual distractions and lipreading performance, the findings of this study cannot confirm or disagree with the findings of other research studies. We would not, however, expect to find a significant positive correlation between lipreading performance and a visual distraction by the very definition of the word distraction. That is, we would not expect the subjects to improve their lipreading scores if the visual stimuli were actually distracting and assuming that they attended to the distraction. The findings of this study do not support the idea that visual distractions should be kept at a minimum during lipreading instruction.

More extensive research concerning the relationship between lipreading proficiency and visual distractions is recommended. A valuable type of research in this area would be that of determining the relative strengths of certain visual distractions. It should also be determined whether hand movements and body

movements distract or aid the lipreader in visual communication. Practical distractions such as additional speaker-senders or other non-speaking subjects in the background as well as various facial expressions on the part of the speaker-sender should be investigated.

This type of research could have valuable implications for the purpose of lipreading instruction and could add to the body of knowledge concerning the process of lipreading and visual perception.

APPENDICES

APPENDIX A

LIPREADING VOCABULARY OF FIFTY WORDS PRESENTED IN
FOUR DIFFERENT RANDOM ORDERS

List No. 1

- | | |
|----------------|-----------------|
| 1. that | 26. create |
| 2. have | 27. institution |
| 3. all | 28. concerning |
| 4. as | 29. training |
| 5. know | 30. none |
| 6. us | 31. history |
| 7. now | 32. impossible |
| 8. over | 33. later |
| 9. example | 34. sister |
| 10. part | 35. brother |
| 11. right | 36. grown |
| 12. university | 37. wrong |
| 13. trained | 38. trees |
| 14. head | 39. youth |
| 15. business | 40. drive |
| 16. read | 41. standard |
| 17. yet | 42. allowed |
| 18. big | 43. characters |
| 19. finish | 44. junior |
| 20. future | 45. negro |
| 21. method | 46. pointing |
| 22. against | 47. population |
| 23. greater | 48. religion |
| 24. helped | 49. scene |
| 25. maybe | 50. type |

List No. 2

- | | |
|----------------|-----------------|
| 1. history | 26. impossible |
| 2. now | 27. business |
| 3. characters | 28. concerning |
| 4. youth | 29. big |
| 5. head | 30. drive |
| 6. none | 31. pointing |
| 7. finish | 32. institution |
| 8. example | 33. type |
| 9. trees | 34. know |
| 10. part | 35. right |
| 11. sister | 36. future |
| 12. as | 37. yet |
| 13. helped | 38. negro |
| 14. trained | 39. that |
| 15. training | 40. junior |
| 16. over | 41. create |
| 17. maybe | 42. population |
| 18. brother | 43. allowed |
| 19. greater | 44. have |
| 20. scene | 45. against |
| 21. all | 46. grown |
| 22. wrong | 47. later |
| 23. standard | 48. read |
| 24. religion | 49. method |
| 25. university | 50. us |

List No. 3

- | | |
|----------------|-----------------|
| 1. head | 26. yet |
| 2. brother | 27. allowed |
| 3. type | 28. against |
| 4. now | 29. as |
| 5. junior | 30. greater |
| 6. know | 31. scene |
| 7. create | 32. negro |
| 8. have | 33. read |
| 9. impossible | 34. standard |
| 10. youth | 35. part |
| 11. training | 36. method |
| 12. right | 37. example |
| 13. that | 38. future |
| 14. us | 39. religion |
| 15. drive | 40. grown |
| 16. big | 41. trees |
| 17. university | 42. maybe |
| 18. trained | 43. institution |
| 19. over | 44. characters |
| 20. pointing | 45. population |
| 21. sister | 46. concerning |
| 22. business | 47. helped |
| 23. later | 48. wrong |
| 24. all | 49. none |
| 25. finish | 50. history |

List No. 4

- | | |
|----------------|-----------------|
| 1. later | 26. future |
| 2. brother | 27. grown |
| 3. business | 28. finish |
| 4. maybe | 29. wrong |
| 5. right | 30. have |
| 6. head | 31. now |
| 7. negro | 32. training |
| 8. none | 33. all |
| 9. as | 34. concerning |
| 10. create | 35. sister |
| 11. greater | 36. religion |
| 12. allowed | 37. know |
| 13. example | 38. scene |
| 14. method | 39. characters |
| 15. type | 40. history |
| 16. against | 41. institution |
| 17. that | 42. helped |
| 18. yet | 43. drive |
| 19. university | 44. big |
| 20. us | 45. youth |
| 21. over | 46. impossible |
| 22. read | 47. pointing |
| 23. trees | 48. trained |
| 24. standard | 49. junior |
| 25. part | 50. population |

APPENDIX B

LIPREADING SCORE SHEET List No. 1
(Circle One) 1 2 3 4

Name: _____ Chair Number: _____

Please record the word which you believe was
spoken, by observing the visual clues of the speaker.

- | | |
|-----------|-----------|
| 1. _____ | 26. _____ |
| 2. _____ | 27. _____ |
| 3. _____ | 28. _____ |
| 4. _____ | 29. _____ |
| 5. _____ | 30. _____ |
| 6. _____ | 31. _____ |
| 7. _____ | 32. _____ |
| 8. _____ | 33. _____ |
| 9. _____ | 34. _____ |
| 10. _____ | 35. _____ |
| 11. _____ | 36. _____ |
| 12. _____ | 37. _____ |
| 13. _____ | 38. _____ |
| 14. _____ | 39. _____ |
| 15. _____ | 40. _____ |
| 16. _____ | 41. _____ |
| 17. _____ | 42. _____ |
| 18. _____ | 43. _____ |
| 19. _____ | 44. _____ |
| 20. _____ | 45. _____ |
| 21. _____ | 46. _____ |
| 22. _____ | 47. _____ |
| 23. _____ | 48. _____ |
| 24. _____ | 49. _____ |
| 25. _____ | 50. _____ |

APPENDIX C

RAW SCORES OF LIPREADING SUBJECTS, INDICATING THE
NUMBER OF WORDS IDENTIFIED CORRECTLY IN FOUR
LIPREADING TEST CONDITIONS

Subjects	No Distraction	Flashing Light	Spinning Disc	Hand Movement
#1	19	18	20	20
#2	9	8	10	10
#3	5	3	5	7
#4	14	13	13	16
#5	2	2	3	7
#6	8	10	12	14
#7	8	9	8	9
#8	4	7	6	5
#9	7	8	6	13
#10	9	9	11	15
#11	6	7	5	7
#12	17	17	17	19
#13	9	10	13	9
#14	9	4	8	7
Totals	126	125	137	158
Means	9.00	8.93	9.78	11.28

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