

HOMOPHENOUS WORDS

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Ila Mae Roback

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HOMOPHENOUS WORDS

by

Ila Mae Roback

AN ABSTRACT

Submitted to  
Michigan State University  
in partial fulfillment of the requirements  
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Department of Speech

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## ABSTRACT

### HOMOPHENOUS WORDS

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It has been estimated that fifty per cent of the words in the English Language look alike on the lips. These are called homophenous words.

Exactly what occurs in the production of many of the homophenous words is not fully known. It is evident that there are similarities among certain words, however, it has not been shown that the lip movements are identical.

It appears that memorization and contextual association are important in the recognition of homophenous words.

The problem under investigation in this study was to determine the ability of viewers to correctly identify homophenous words. The viewers were college students not formally trained in lip reading. The homophenous words were presented by speakers on a silent film. Viewers indicated their responses on a multiple choice test form.

Results of the study revealed that viewers were able to select only some of the words correctly. In the test that contained seventy-five items and four parts to each item, correct selection by chance alone would yield a score of 18.75.

The Chi Square statistic was applied to determine whether viewers were able to function above chance level in correct selection of the homophenous words uttered by speakers.

It was observed that the viewers were able to select correctly the homophenous words more frequently than would be expected by chance alone.

The "t" tests for unrelated measures were employed to measure the difference in performance among speakers. The results show that there were some observable differences in speaker performance.

Analysis of the data indicates that homophenous words, even though highly similar, are not produced exactly alike on the lips. A study investigating measurements of the facial movements associated with the production of homophenous words is indicated in order to specify the visible differences among them.

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## CHAPTER I

### STATEMENT OF THE PROBLEM

#### Introduction

There are certain sounds that are quite similar visually, such as (p-b-m), (t-d-n), (s-z), (k-g), et cetera. These sounds are referred to as homophenous. That is to say, they look alike on the lips. When, for example, the acoustic components of (p, b, m) are not available to the viewer-auditor he must derive his information of what has been uttered from the visible signal. Since (p, b, m) and the other homophenous sounds are highly similar visually, confusion often arises.

At the turn of the twentieth century, attention began to be directed toward homophenous words by educators of the deaf. Long lists were made for the acoustically handicapped student to memorize. Emma Snow<sup>1</sup> in 1901 composed a list for lipreading practice. In all there were 9,744 homophenous words which were arranged in twenty-six lists. Edward Nitchie<sup>2</sup>

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<sup>1</sup>Emma Snow, "My List of Homophenous Words," Association Review, Vol. 5 (1903), pp. 29-40, 119-131, 241-253.

<sup>2</sup>Edward B. Nitchie, Lip Reading Principles and Practice (Philadelphia and New York: Frederick A. Stokes Co., 1912).

utilized Snow's list in his arrangement that consisted of two to fourteen words in a group, and Martha Bruhn,<sup>3</sup> in her book, included two parts on homophenous words.

It is estimated that approximately fifty per cent,<sup>4,5,6</sup> of the words in the English language have one or more words homophenous to them. It would be impractical and unrealistic for the acoustically handicapped to attempt memorization of these combinations of words. However, memorization and context association are means by which homophenous words can be understood. This is indicated by Nitchie<sup>7</sup> in his statement:

The fact that the sounds in certain consonant groups have the same visible movement gives rise to a considerable body of homophenous words, that is, words that appear alike on the lips. . . . The more familiar the lip-reader is with words of homophenous formation the better will he understand conversation. One of the things for him to do, therefore, is to memorize with each lesson the words that look alike.

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<sup>3</sup>Martha E. Bruhn, The Muller-Walle Method of Lip Reading for the Deaf (Lynn, Mass.: Thomas P. Nichols and Son, Co., 1920).

<sup>4</sup>Martha E. Bruhn, Elementary Lessons in Lip Reading (Lynn, Mass.: Thomas P. Nichols and Son, Co., 1927), p. vii.

<sup>5</sup>Agnes Stowell, Estelle Samuelson, and Ann Lehman, Lip Reading for the Deafened Child (New York: The Macmillan Co., 1928), pp. 24-25.

<sup>6</sup>Cora Elsie Kinzie and Rose Kinzie, Lip-Reading for Juniors Grade III (n.p., 1947), p. x.

<sup>7</sup>Nitchie, op. cit., pp. 176, 178.

Goldstein<sup>8</sup> states that:

There are many words which appear alike to the eye of the speech-reader . . . letters and words which could not be differentiated by the eye alone unless brought into association with other words of a phrase, or sentence.

Anna Bunger<sup>9</sup> in speaking of the importance of contextual association states:

Here again, is the associating of sound, pictures, and sensation. Homophenous words and syllables will always be confused when they are spoken alone and are not heard. . . . They must always be distinguished because of context.

Stowell, Samuelson, and Lehman<sup>10</sup> support the Bunger assumption in the following statement:

As there are a number of different sounds that are revealed by the same movement, we have many words that differ widely in meaning, spelling, and sound, but look exactly alike as they are seen on the lips. The only way they can be distinguished one from another is by the context.

Martha Bruhn,<sup>11</sup> in both the 1927 and 1949 editions of her book, suggests the importance of understanding homophenous words through contextual association:

Homophenous words are words that look alike on the lips. . . . They must be distinguished by the thought or context of the sentence in which they are used.

<sup>8</sup>Max A. Goldstein, M.D., Problems of the Deaf (U.S.A., Laryngoscope Press, 1933), p. 297.

<sup>9</sup>Anna M. Bunger, Speech Reading--Jena Method (Danville, Illinois: The Interstate, 1932), p. 52.

<sup>10</sup>Stowell and Others, op. cit., p. 40.

<sup>11</sup>Martha Bruhn, The Mueller-Walle Method of Lip Reading for the Hard of Hearing (Boston, Mass.: M. H. Leavis Pub., 1949), p. 13.

As one peruses the early literature, statements similar to the ones above appear frequently. It seems in recent literature that many teachers of lip reading overlook the problem of homophenous words.

There is still much to be known about the variables related to the study of homophenous words. Scientific research is necessary to evaluate the relationship between homophenous words and visual discrimination of them. Jacoby<sup>12</sup> indicates this in the following statement:

I would like to ban from every book on lip reading the introductory remarks that help to reinforce unhealthy attitudes towards acquisition of the skill! Almost every lipreading book starts out with a statement to the effect it is not possible for even the most skillful lipreader to comprehend 100 percent of what is said because so many sounds in English look alike on the lips. The statement isn't true. It may be partly true. Many English sounds do look alike--grossly alike. But they do not look identical. For twenty-five years, the written textbooks on lipreading have been emphasizing gross discrimination. Isn't it time that we learned from our Audiological experts and turned our attention to fine visual discrimination? It can be taught. And it can be learned. Despite all the statements made to the contrary by Nitchie and his followers. . . . Most differences that can be apprehended by the ear can be apprehended by the eye. To teach fine discrimination, you must be able to direct the lipreader's eye to the significant visible elements.

#### Statement of the Problem and Purpose of the Study

The problem under investigation in this study was to determine the ability of viewers to correctly identify homophenous words. The homophenous words were presented by

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<sup>12</sup>Beatrice Jacoby, Ph.D., "Lipservice to Lipreading," Hearing News, Vol. 25 (September, 1959), p. 18.

speakers on a silent film. Viewers indicated their responses on a multiple choice test form. The following questions were proposed:

1. Is it possible for college students without formal training in lipreading to lip read homophenous words presented on a silent film?
2. Does the recognition of homophenous words by college students (not formally trained in lipreading) occur significantly beyond chance expectancy?

### Importance of the Study

Systematic evaluation of the visual intelligibility of homophenous words will yield additional information concerning the visual components of oral language. In the main it has been taught that homophenous words look exactly alike on the lips. It is the contention of this investigator that since no two things are exactly alike, it is reasonable to assume that homophenous words appear somewhat different to viewers. If it is found that viewers do select correctly above chance occurrence the homophenous words that are presented, hard of hearing persons need no longer labor under the false assumption that their only method of understanding the homophenous words is one of contextual associations. This in no way, however, would serve to minimize the importance of contextual associations.

### Definition of Terms

Homophenous sounds.--Sounds whose visible pattern on the face of the speaker appear similar.

Example:<sup>14,15</sup>

{P}, {b}, {m}, {mp-mb}  
 {f}, {v}, {ph-gh}  
 {wh}, {w}  
 {s}, {z}, soft {c}  
 {sh}, {zh}, {ch}, {j}, and soft {g}  
 {t}, {d}, {nt-nd}  
 {k}, {c--hard}, {g--hard}, {ng}  
 {nk}, {ck}

Homophenous words.--Words whose visible pattern on the face of the speaker appear similar.

Sample test.--Four groupings of four homophenous words that were employed to provide practice for the viewing subjects.

Homophenous word test.<sup>16</sup>--Seventy-five groupings of four homophenous words. In this study it is the test employed in examining the lip reading ability of college students. An example follows:

- |          |          |
|----------|----------|
| 1. axe   | 1. money |
| 2. hacks | 2. muddy |
| 3. hags  | 3. putty |
| 4. hangs | 4. bunny |

Viewer subjects.--College students not formally trained in lip reading.

<sup>14</sup>Nitchie, op. cit., p. 177.

<sup>15</sup>Bruhn, The Mueller-Walle Method of Lip-Reading for the Deaf, op. cit., p. 164.

<sup>16</sup>Herbert Oyer, "Homophenous Word Test," 1958, The Ohio State University, Columbus, Ohio (unpublished).

Speaker subjects.--The two men and two women who were ~~were~~ filmed while speaking the homophenous word lists.

Cue tract.--Single system film with sound tract for editing purposes only.

Single system.--Combination sound tract and celluloid film.

Sixteen millimeter--tri--X-reversal film.--Black and white single system motion picture film.

L. C. Auricon Super 1200 camera.--Motion picture camera model employed for filming.

Twenty-five millimeter lens.--One inch lens used in the camera.

Context.--The environment in which a word is used in a sentence or in a thought.

Visible pattern.--Movements of the lips and other facial muscles as perceived through the sense of sight.

Lip reading.--The ability to comprehend speech by the visible movements of the lips and other movements of the head and body.

Speech-reading.--A term used by some authorities in place of lip reading.

Chance.--The number of correct responses that will occur through the law of averages. Because of the fact that there are seventy-five items in the test with four parts to each item, chance occurrence would be 18.75.

### Organization of the Thesis

Chapter I has included an introduction to the problem of homophenous words, the purpose of the study, the questions asked, the importance of the study, the definition of terms, and the organization of the thesis.

Chapter II consists of a survey of the literature pertinent to the study of homophenous words.

Chapter III will describe the subjects, equipment, and testing procedures employed in this study.

Chapter IV will discuss the analysis and results of the study.

Chapter V will contain the summary of the study and the conclusions.

## CHAPTER II

### SURVEY OF THE LITERATURE

Early in the twentieth century, attention was directed toward the study of homophenous words by educators of the deaf.

In 1894, Sarah Warren Keeler<sup>1</sup> gave her objective in teaching of the deaf. Her objective was.

The restoration to society of the deaf by training the sense of sight to perform the office of the sense of hearing.

She suggested:<sup>2</sup>

In giving a vocabulary list of words . . . it has been found of practical value to place in the same connection words formed in similar position, the pupil thus acquiring a list of possible words from which to choose and the sooner learning to avoid the confusion of similar words as well as practice in substituting one for another.

This material was reprinted in the 1905 Association Review.

In 1901, White<sup>3</sup> recognized the problem of homophenous sounds and described her method of teaching these sounds.

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<sup>1</sup>Sarah Warren Keeler, "A Method of Teaching Speech-Reading to the Adult Deaf," Association Review, VII (February, 1905), p. 22.

<sup>2</sup>Ibid., p. 4.

<sup>3</sup>Stella K. White, "The Home Instruction of a Little Deaf Child," Association Review, III (December, 1901), pp. 418-427.

The term homophenous, however, was not used. White states:<sup>4</sup>

Though (m) or (l) in themselves were not hard to get, there were difficulties in the way as the child advanced in this science, because the eye alone cannot distinguish the difference between many of the phonetic sounds as (m), (b), and (p); (t), (d), (n), and (l); (f) and (v); etc. Did you ever think how much alike they are? If not, look in the mirror, and say to yourself without voice, man, ban, and pan. . . . The sense of touch was called into play to differentiate these. The little pupils' hand was placed in front of the mouth to catch the breath sounds . . . placing the hand on the chin, also was a help in distinguishing (b) from (p), as well as (d) from (t) . . . in fact, the mirror has always played an important part . . . for without that, she could not see whether she were imitating the teacher's lip-movement perfectly or not.

The first reference in literature to the term homophenous was found by the writer in the 1903 volume of the Association Review. A study of the problem, and twenty-six word lists were developed in 1901 by Emma Snow,<sup>5</sup> a person not professionally trained as an educator of the deaf. She suggested memorization and context association for better lip reading comprehension. These lists were later utilized by teachers interested in the problem of homophenous words.

Snow decided to compose a list of homophenous words because of her own experiences in interpreting words similar in appearance. The work enabled her to understand the movements of the lip and tongue, and to judge more efficiently the selection of the correct word. The completed work

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<sup>4</sup>Ibid., p. 420.

<sup>5</sup>Snow, op. cit., pp. 29-48, 119-131, 241-253.

contained twenty-six lists, arranged in alphabetical order, and in cross-reference style. There were 9,744 words in all. Snow stressed context association as one means by which these words could be understood. She used the (t), (d), (n), (l), (p), (b), (m), (f), (v) (ph), (s), (c), (z), (g), (k), (ch), (sh), (j), (q), (w), sounds as the bases for her lists. The method employed in learning these words was explained by Snow as follows:<sup>6</sup>

If the homophenous words in each line were formed in phrases and sentences by the deaf learner, it would be of very great assistance. After he has mastered the elementary sounds, the practice of these exercises would certainly forward final success in considering the context, and being able to decide which word of the several possible words . . . the one actually used.

The time element in learning these words was not disclosed. From the extensive list, and number of words, it would appear to be a time consuming practice. She commented as follows for those who found it difficult to memorize the words:<sup>7</sup>

I believe also that those who do not immediately apprehend the similarity between the given words in any instance, will soon discover it for themselves by repeating the words before a mirror or having them pronounced by some one without voice.

An editorial in the same volume describing Snow's works seems to give the impression that some of these words can

<sup>6</sup>Ibid., pp. 30-31.

<sup>7</sup>Ibid., p. 31.

be distinguished out of context:<sup>8</sup>

A review of this list with the aid of an expert lip-reader has demonstrated to us that many of the words given as similar, while having the same, or approximately the same appearance so far as lip-formation goes, can be recognized, without any context by the expression of the face and by certain movements of the muscles of the throat and cheeks. By pronouncing the words before a mirror adult lipreaders will learn to note these differences for themselves and thus come to distinguish the words more readily and cultivate the closeness of observation that is essential to proficiency in the art.

It seems that visual discrimination was encouraged in this 1903 editorial, but only in general terms. The lip reading teachers during this period did not investigate all the properties of homophenous words.

Edward Nitchie,<sup>9,10</sup> in 1912, utilized Snow's lists in his writings. The later revisions made by his wife, Elizabeth Helm Nitchie<sup>11</sup> were similar in context. Nitchie describes the movements of speech as follows:<sup>12</sup>

Watch the mouth of anyone who is speaking, and you will see many clearly defined movements of the lips, perhaps

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<sup>8</sup>Editorial, Association Review, V (February, 1903), pp. 92-93.

<sup>9</sup>Nitchie, op. cit.

<sup>10</sup>Edward B. Nitchie, "Homophenous Word Lists," Association Review, Vol. 18 (July, 1916).

<sup>11</sup>Elizabeth Helm Nitchie, New Lessons in Lip Reading (New York and Philadelphia: J. B. Lippincott Co., 1940, 1947, 1950).

<sup>12</sup>Edward B. Nitchie, Lip Reading Principles and Practice, op. cit., p. 14.

even of the tongue. The eye trained to associate certain movements with certain sounds has the power of interpreting these movements into words and sentences.

Nitchie<sup>13</sup> believed that the difficulties of lip reading are caused by the obscurity of many movements of speech which cannot be eliminated by eye training alone. In his methods, Nitchie<sup>14</sup> advises the lip reader to study the movements in words or sentences because some sounds can not be identified unless in context, and "one movement often modifies the appearance of another." He emphasizes that stress should be placed on the "accuracy of perception of the easier movements, leaving the mind to supply the harder movements."

Nitchie seems to have covered the problem of homophenous words more completely than other teachers in the field, and later writers appear to have used his material in their works. The following states succinctly his viewpoint in the matter:<sup>15</sup>

The fact that the sounds in certain consonant groups have the same visible movements gives rise to a considerable body of homophenous words, that is, words that appear alike on the lips. The two sounds of (f) and (v) in "few" and "view" appear exactly the same when the words are spoken naturally. . . . These words must be distinguished by the thought or context in which they are used. There can be no question about the difficulty of telling these words apart, as words, when spoken naturally, rapidly and without exaggeration. It is the best evidence that no eyes, no matter how well trained, could ever successfully read the lips

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<sup>13</sup>Ibid., p. 17.

<sup>14</sup>Ibid., pp. 17-18.

<sup>15</sup>Ibid., pp. 175-176.

without help from the mind. But when the words are put into sentences the mind readily supplies the right word.

Later in the text Nitchie states:<sup>16</sup>

When making up, or finding, the homophenous words of a group it must be kept in mind that all movements (not letters) in the word must be alike. If the word begins with (p), (b), or (m), then all other words in the group must begin with p, b, or m.

Actual memorization of homophenous words is recommended by Nitchie:<sup>17</sup>

The more familiar the lipreader is with the words of homophenous formation the better will he understand conversation. One of the things for him to do, therefore, is to memorize with each lesson the words that look alike.

In describing his method of memorization he suggests recognition of the homophenous formation.<sup>18</sup>

He should also try each group of words before the mirror, and verify on his lips their homophenous formation. Then he should practice the sentence with the mirror; . . . and should compose as many sentences as are naturally suggested by the words. . . . The ability to quickly substitute another word with the same movements when a sentence is not understood, greatly increases the ease with which a lip-reader can follow conversation.

An additional chapter on homophenous words is included in Nitchie's book. In abbreviated form he repeats his beliefs and methods.<sup>19</sup>

<sup>16</sup>Ibid., pp. 177-178.

<sup>17</sup>Ibid., p. 178.

<sup>18</sup>Ibid., pp. 179-180.

<sup>19</sup>Ibid., p. 317.

Practice with homophenous words gives the best all around training in lip-reading that can be had. The student should memorize the words in each group of an assignment for a lesson, and then have some one put the words into sentences. He should be shown the first word of the group, so that he may have a clue, and then all the words should be used in sentences. . . . If the sentences are given quickly, one after another, the student will get training in the power of association . . . in thought-getting, in quickness, alertness and concentration.

It is of interest to note that Nitchie does not particularly emphasize skill in visual discrimination.

The Mueller-Walle method described by Martha Bruhn<sup>20</sup> in 1920 does not include lessons for teaching homophenous words. However, context association is recommended for learning and using "words which look alike." She states:<sup>21</sup>

There are many words which look alike when pronounced by themselves, but these are rarely mistaken in a sentence where the meaning helps to distinguish the same . . . a systematic drill of well-arranged syllables by an experienced teacher is necessary to train the eye to distinguish the most insignificant movements of the lips which are necessary in order to follow long and difficult sentences.

In the above statement Bruhn seems to advocate visual discrimination. However, later in the book she employs a negative approach to visual discrimination and homophenous word practice. Bruhn suggests:<sup>22</sup>

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<sup>20</sup>Bruhn, The Mueller-Walle Method of Lip-Reading for the Deaf, op. cit.

<sup>21</sup>Ibid., p. 6.

<sup>22</sup>Ibid., p. 17.

Letters that look alike are not used in the same group; for example (m), (b), (p), or (f), (v) or (k), (g), (c). They are not distinguishable . . . never try to see any difference between co and go or ki and guy. If go is practiced later in a sentence like "will you go with me?" it will be correctly read. Occasionally a sentence like "will you bake a cake?" might be mistaken for "will you make a cake?" but this error is too slight to deserve any notice here.

Bruhn appears to contradict her own statements. For instance, she describes the difference of some sounds already established as homophenous:<sup>23</sup>

In (n) the point of the tongue is placed behind the upper gum. The teeth are only slightly separated, the degree of opening depending upon the vowel that follows. There is only a very slight visible outward movement. It is very similar in appearance to (t) and (d), but these have more jaw movement and are shorter. . . . It is this movement that we see in the lower jaw which is the visible characteristic. We have the same movements for (k), (hard c) and (g), but in (t) and (d) it is somewhat plainer.

It appears that Bruhn did have an understanding of homophenous words, but discontinued her investigation before all the variables were tested. She used existing beliefs to describe the problem of homophenous words. In the 1930 edition of her book Bruhn states:<sup>24</sup>

My twenty-five years' experience in teaching lip reading have convinced me that syllable drills are the most logical and sequential way of training the eye to be accurate, to be quick, and to do its work subconsciously . . . a strong argument . . . in favor of the

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<sup>23</sup>Ibid., pp. 79, 142.

<sup>24</sup>Bruhn, Elementary Lessons in Lip Reading, op. cit. (1930 edition), "Introduction," pp. vi-vii.

Mueller-Walle method of syllable practice is that it requires only one mental process, while the individual word practice requires two. Give a list of words to a pupil and he must not only first recognize the movements, but he must next find some word in his vocabulary for which those movements stand. Considering the fact that about fifty per cent of the words in the English language have one or more words that are homophenous to them, it is only natural that the wrong ones are often given. The student watching the movements has endeavored to search his mind for some word that "looks like" the one the teacher has spoken, and has divided his attention between the movement and the meaning. On the other hand, in a syllable drill, the pupil's attention is entirely upon the movement, and this, once having been mastered, the knowledge is later easily applied to sentence practice. Then his mind unconsciously recognizes the movement while his attention is directed to the thought, just as one unconsciously recognized letters in a written sentence, while thinking of the reading as a whole. If he can recognize syllables in the abstract, with no context, he surely can recognize them with the background of sentences. This is building the foundation for lip-reading.

Bruhn states in the 1930 and 1949 editions:<sup>25,26</sup>

The word "homophene" was coined to express to lipreaders a word that has the same appearance (with respect to the visible vocal organs) as another word. . . . Homophenous words must be distinguished by the thought or context of the sentence in which they are used.

An extensive review of the literature seems to reveal that many teachers of lip reading have utilized Nitchie, Snow, and Bruhn's principles and methods of homophenous words.

Morgenstern's methods are similar to earlier teachers of lip reading. In 1926 she stated:<sup>27</sup>

<sup>25</sup>Ibid., pp. 163-164.

<sup>26</sup>Bruhn, The Mueller-Walle Method of Lip Reading for the Hard of Hearing, op. cit. (1949 edition), p. 13.

<sup>27</sup>Louise I. Morgenstern, Lip Reading for Class Instruction (New York: Noble and Noble Pub., 1926), p. xxv.

Homophenous words may also be introduced to advantage. This practice aims at developing in the pupils' minds the power of building up the whole sentence from the parts they have been able to recognize by sight. The sentences should, therefore, be so constructed that their context leaves no doubt as to which of the words of the homophenous group have been employed.

In 1928, Stowell, Samuelson, and Lehman advise:<sup>28</sup>

As there are a number of different sounds that are revealed by the same movement, we have many words that differ widely in meaning, spelling, and sound, but look exactly alike as they are seen on the lips. The only way they can be distinguished one from the other is by the context.

The aims in this book suggest memorization and context association:<sup>29</sup>

Immediate aim. To have the children able to write all the homophenes of a given word that involve only the letters (p), (b), and (m).

Remote aim. To have the children sure of their ability to find out by themselves all the homophenes of a given word.

In regard to the number of homophenous sounds, these aims would be difficult to accomplish.

Bunger,<sup>30</sup> in 1932, stressed the negative approach to development of visual discrimination and lip reading of homophenous words. She states:

Homophenous word and syllables will always be confused when they are spoken alone and are not heard. But in composite speech, they are not often spoken alone. They must always be distinguished because of the context. In the syllable drill, everyone must understand that it is really quite all right to mistake (b) for (p), (f) for (v), (wh) for (w), (t) for (d).

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<sup>28</sup>Stowell, Samuelson, and Lehman, op. cit., p. 40.

<sup>29</sup>Ibid., p. 42.

<sup>30</sup>Bunger, op. cit., p. 52.

Goldstein<sup>31</sup> in 1933 recognized the importance of eye training and the ability to analyze the movements of speech. However, he accepts the established beliefs about homophenous words. He says:

There are many words which appear alike to the eye of the speech-reader . . . letters and words which could not be differentiated by the eye alone unless brought into association with other words of a phrase or sentence and the facial physiology which accompanies the expressed thought. . . . The pantomime of language is as vital to the speech-reader as is the formation of the lips.

Goldstein adds one point other writers neglected, that is, the importance of facial movements.

Leavis<sup>32</sup> indicated that homophenous sounds are exactly alike:

Show that (b) and (p) look like (m). They are made the same way. . . . They look just alike on the lips.

Little explanation is given homophenous words in the text.

Leavis states:<sup>33</sup> "For children just say some words look alike on the lips."

The 1941 objectives for lip reading training in the New York public schools would appear to be based on the principles reviewed in the literature:<sup>34</sup>

<sup>31</sup>Goldstein, op. cit., p. 297.

<sup>32</sup>Mary Hadnutt Leavis, Beginning Lip Reading (Boston, Mass.: 386 Commonwealth Ave., n.d.), p. 19.

<sup>33</sup>Ibid., p. 31.

<sup>34</sup>Acoustically Handicapped Children, The Committee for the Care and Education of Physically Handicapped Children, A Report prepared by the Public Schools (New York City: Board of Education, 1941), pp. 64-65.

The training should include sufficient practices in the mastery of thought context material as a whole and eye training and visualization of the basic movements.

Berry and Eisenson's<sup>35</sup> description of homophenous words concurs with other writers in the field:

Through vision alone, sounds overtly alike, such as (m), (b), (p), could not be differentiated from one another. It is clear then that vision alone limits the individual in his speech learning. . .

Davis<sup>36</sup> in 1947 agrees with the context association method, but adds other variables (clues), which are not investigated:

It may seem impossible to read speech when only one-third of the sounds are visible, but we are all accustomed to the same sort of confusion to a lesser degree. Two or more words like "ice" and "eyes" . . . may look alike or nearly so, and the speech reader must recognize by the context and other clues which one is intended.

The Kinzies<sup>37</sup> in 1947 presented material that was similar to earlier teachers of lip reading. Their lesson plans consist mainly of the descriptions of the movements of speech and sentences for practice. The Kinzies describe homophenous words by stating that these words are alike in movements and can not be identified by the eye alone. They discuss the difficulties encountered as follows:<sup>38</sup>

<sup>35</sup>Mildred Berry and Jon Eisenson, The Defective in Speech (New York and London: Appleton-Century-Crofts, Inc., 1942), p. 322.

<sup>36</sup>Hollowell Davis, Hearing and Deafness (New York and Toronto: Murray Hill Books, Inc., 1947), pp. 259-260.

<sup>37</sup>Kinzie, op. cit., pp. ix-x.

<sup>38</sup>Ibid., p. x.

- a) The obscurity of many of the movements . . . Perhaps fifty per cent of the sounds in ordinary speech are formed by obscure movements and are consequently incapable of identification even when uttered perfectly.
- b) The rapidity of all the movements. The average number of sound movements per second in ordinary speech is thirteen, while the eye is capable of seeing consciously eight or at best nine or ten movements per second. In ordinary speech, therefore, the eyes would be unable to see consciously more than about three-fourths of the movements even if all were plainly visible.
- c) The homophenity of many of the sounds.
- d) The variation of movements and of mouths.

West, Kennedy, and Carr<sup>39</sup> in 1947 were among the few to use a more positive approach to the problem of homophenous words:

The first task of the student of lipreading is to become thoroughly familiar with the positions. . . . Those that have similar positions must be learned, and if possible distinguished from one another. The next step is to become familiar with the individual sounds that involve movement. . . . The third step is to teach monosyllabic words. Here may be introduced the problem of homophenes, or words whose visible patterns are the same or almost so.

Fiedler's<sup>40</sup> description and methods of teaching lip reading in 1952 coincides with earlier studies stressing a negative approach:

It becomes obvious that, without knowing context, it is impossible to distinguish these homophenous words by lipreading alone . . . if we know the subject that

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<sup>39</sup>Robert West, Lou Kennedy, and Anna Carr, The Rehabilitation of Speech (New York and London: Harper and Brothers, Pub., 1947), pp. 249-250.

<sup>40</sup>Marian F. Fiedler, Deaf Children in a Hearing World (New York: The Ronald Press Co., 1952), p. 304.

is being talked about as well as hearing some and looking some and putting them all together, then we have a more complete picture.

In 1957, Silverman<sup>41</sup> briefly described the problem of homophenous words:

Lip-reading is further complicated by the ambiguities that result from hidden movements . . . from homophenous words (words that look alike on the lips, smell and spell) and from the difficulty of appreciating patterns of stress, intonation, and phrasing.

An interesting study done by Fusfeld,<sup>42</sup> in 1958, relates the views of lip reading persons with those of the previously cited authorities. However, there were variables not considered in the experiment. The method in which these deaf persons were trained, and the amount of stress put on visual discrimination. Fusfeld felt, from the testimony gathered, and from the per cent of homophenous words, that the most skillful lip reader could not comprehend every word spoken.

General statements made by the lip readers advocated context association, key words, advance clues, skill, and natural ability as most important to lip reading attainment. Fusfeld's<sup>43</sup> conclusions to the study were:

<sup>41</sup>S. Richard Silverman, "Clinical and Educational Procedures for the Deaf," Handbook of Speech Pathology, ed. L. Travis (New York: Appleton-Century-Crofts, Inc., 1957), p.414.

<sup>42</sup>Irving S. Fusfeld, "Factors in Lipreading as Determined by the Lipreader," American Annals of the Deaf, Vol. 103 (March, 1958), pp. 229-239.

<sup>43</sup>Ibid., p. 237.

Lip movements visibly are the same or nearly so for many sounds, a point long conceded as a baffling factor. But the vision of moving lips is normally only one element in the reception of speech.

It appears in this study that the popular beliefs about homophenous words were accepted and lip readers were not encouraged to develop visual discrimination.

Recent literature in the 1950's and 1960's indicate that the ability for visual perception is again being investigated. These studies might have some influence on an evaluation of homophenous words. A survey of the literature did not reveal any studies being conducted on the properties of homophenous sounds or words, except where the homophenous sounds were included in studies of visual perception on lip reading ability.

A study was conducted by DiCarlo and Kataja<sup>44</sup> in 1951 concerning standardized achievement tests of lip reading ability. Homophenous words were considered only in the relationship to lip reading that they interfered with the results. The belief was that homophenous sounds and words provided another uncontrolled obstacle to the study. The writers suggested the following:<sup>45</sup>

It can be seen that those items which have low difficulty indices also tend to be the ones with small discriminating powers. Conversely, the easier items

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<sup>44</sup>Louis M. DiCarlo and Raymond Kataja, "An Analysis of the Utley Lipreading Test," American Journal of Speech and Hearing, Vol. 16 (September, 1951), pp. 226-240.

<sup>45</sup>Ibid., p. 240.

are the ones that discriminate more sharply. The replacement by more suitable items of those which can be answered by only relatively few people might result in a more valid and operationally efficient instrument.

In 1954 O'Neill<sup>46</sup> utilized the 1939 "Visibility Study of Consonants and Vowels" conducted by the W. P. A. of the New York City Board of Education. His analysis concerning the vowels and consonant sounds under investigation was as follows:<sup>47</sup>

There was no apparent correspondence between the relative visibility of either vowels or consonants . . . and the visibility values that are attributed to them by the study of the New York City Board of Education.

As a result of this study, O'Neill questioned the validity of visibility ratings assigned by other teachers of lip reading. The results of this study were compared with those of Black.<sup>48</sup> O'Neill states:<sup>49</sup>

Black found that the voiceless continuants had greater amounts of air pressure than the other types of consonants. Of the four voiceless consonants that he studied (p), (t), (f), (s) all but the (t) were identified most frequently. . . . From these results it might be tentatively postulated that pressure differences assist in the visual identification of some consonants.

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<sup>46</sup>John J. O'Neill, "Contributions of the Visual Components of Oral Symbols to Speech Comprehension," Journal of Speech and Hearing, Vol. 19 (December, 1954), pp. 429-439.

<sup>47</sup>Ibid., p. 433.

<sup>48</sup>J. W. Black, "The Pressure Component in the Production of Consonants," Journal of Speech and Hearing Disorders, Vol. 15 (1950), pp. 207-210.

<sup>49</sup>O'Neill, op. cit., p. 438.

The results found in O'Neill's study would appear to support the importance of visual discrimination. He summarizes:<sup>50</sup>

Individuals with normal hearing made appreciable use of visual cues (lipreading) to gain information in some communication channels. Visual recognition was always greater than non-visual recognition . . . vision contributed 44.5% to the understanding of vowels, 72% for consonants, 64.1% for words, and 25% for phrases. . . . There were significant differences in the visibility and audibility of speech symbols. It would appear that vision had the greatest apparent effect on the identification of consonants, and lesser effects, in order, on the recognition of vowels, words, and phrases.

Donald Harris<sup>51</sup> concurs with this principle, and believes the eye is capable of responding to the same degree of stimuli as the ear.

As one reviews the literature of the 1960's, there appears to be a continuation of the experiments of the late 1950's. The emphasis is placed on lip reading ability, visual lip movements, visual memory span, visual perception, and discrimination ability. There has been little significant contributions to lip reading materials on homophenous words. However, there is evidence from the research that many of the problems being investigated might influence studies pertaining to homophenous words. It also appears that this is one of the few areas of lip reading that remains a mystery, and in which existing principles and methods are accepted without

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<sup>50</sup>Ibid., pp. 438-439.

<sup>51</sup>J. Donald Harris, Some Relations Between Vision and Audition (Springfield, Illinois: Charles C. Thomas Pub., 1950), pp. 3-5.

question. In many of the studies the problem of homophenous words is listed as an obstacle that can not be controlled. A scientific investigation of this area might prove valuable to related experiments in the field of lip reading.

Jacoby,<sup>52</sup> although there may be others, is the only published reference this writer has found that questioned the existing principles and methods of homophenous words.

Oyer<sup>53</sup> constructed a homophenous word test because he doubted the principle that any two words were exactly alike.

A research program designed to apply structural linguistics to the problems of visual perception was conducted by Woodward and Barber<sup>54</sup> in 1961. The long-range objectives were:

To develop . . . a definition of the units of visual perception of oral-aural stimuli and of the relationships among these units in a system of oral-visual communication. To establish the relationship of the visually-perceived symbols to the underlying linguistic system.

Test materials consisting of 229 syllable pairs were filmed for presentation. The subjects were to designate similar and contrasting pairs. Sentences were not used because they

<sup>52</sup>Beatrice Jacoby, "Lipservice to Lipreading," Hearing News, September, 1959, pp. 7-8, 18, 20.

<sup>53</sup>Herbert Oyer, "Homophenous Word Test," 1958, The Ohio State University, Columbus, Ohio (unpublished).

<sup>54</sup>Mary F. Woodward and Carroll G. Barber, "Phoneme Perception in Lipreading," Journal of Speech and Hearing Research, Vol. 3 (September, 1960), p. 212.

would be difficult to control. The homophenous word problem is one variable stressed as difficult to control. Woodward and Barber state:<sup>55</sup>

The lipreader might discriminate for example between the words "pill" and "bill" when these forms occur in such utterances as "he swallowed the pill" and "he paid the bill," but it is not justifiable to infer from this that the lipreader has actually distinguished the contexts in which the two words occur. That the lipreader can sometimes discriminate between forms distinguished by the voiceless-voiced consonants of English, then, does not necessarily mean that he can see the articulatory differences between them.

It was hypothesized that the (p), (b), (m), (f), (v), (hw), (w), (r), (ch), (zh), (sh), (j), and (y) were highly visible. The (t), (d), (n), (l), (s), (z), (th), (k), (g), (h) were barely visible. The authors continue:<sup>56</sup>

While these units contrast visually with each other, they are internally homophenous, that is, the members of each unit look alike to the lipreader.

It was felt that only four visually-contrastive units are available consistently to the lip reader. The authors are in accord with existing principles regarding perceptual confusion among speech sounds. The homophenous words, however, were not included in this study.

Visual word recognition is another area that is under investigation. Although the research does not include a study of homophenous words, it is useful as background information to those investigating the lip reading process.

<sup>55</sup>Ibid., p. 213.

<sup>56</sup>Ibid., pp. 219-222.

Doehring and Rosenstein<sup>57</sup> experimented in the area of visual word recognition. They concluded from their study that:

Accuracy of visual recognition of verbal material by the older children was dependent upon an estimate of the probability of occurrence of the verbal stimulus rather than upon the more frequency of prior visual and auditory stimulation.

Familiarity of words was investigated by Owens.<sup>58</sup> The results of research show that in visual perception words of greater familiarity were significantly easier to recognize than words of lesser familiarity.

A recent study that would have direct bearing on the problem of homophenous words was done by Wong and Fillmore<sup>59</sup> in 1961. The study was conducted for hearing persons to determine the effect various vowels have on consonant sounds and the cue they afford the listener in recognizing sounds. These cues might also be applicable to lip reading homophenous words. Wong and Fillmore state:<sup>60</sup>

In some American dialects, vowel duration has already become the primary cue for word-pairs such as "ladder-latter," "bidder-bitter," and similar pairs, when the (d) and (t) are both flaps, and such as "his-hiss," "eyes-ice," and similar pairs, when the (z) is unvoiced.

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<sup>57</sup>Donald G. Doehring and Joseph Rosenstein, "Visual Word Recognition by Deaf and Hearing Children," Journal of Speech and Hearing Research, Vol. 3 (December, 1960), p. 326.

<sup>58</sup>Elmer Owens, "Intelligibility of Words Varying in Familiarity," Journal of Speech and Hearing Research, Vol. 4, (June, 1961), p. 115.

<sup>59</sup>William Wong and Charles J. Fillmore, "Intrinsic Cues and Consonant Perception," Journal of Speech and Hearing Research, Vol. 4 (June, 1961), pp. 130-136.

<sup>60</sup>Ibid., p. 130.

The effects of the vowels on the homophenous sounds may have a bearing on the ability to discriminate between them while lip reading. This would be one variable to consider in a study of homophenous words.

The authors felt that previous experiments had shown that voicing was not a crucial feature in distinguishing the (p,t,k) from (b,d,g) in the initial position. The results of the research revealed:<sup>61</sup>

Results of correct identification of initial consonants suggest that vowel amplitude, degree of formant bend, and vowel nasalization are significant parameters in the vowel for identifying the consonant which precedes it.

If this is true with hearing persons, it could be with the hard of hearing. However, the properties of the vowel in relation to homophenous words would have to be evaluated.

O'Neill and Oyer<sup>62</sup> stress the importance of visual training in their text:

In fact, the relationship of visual skill to lip-reading ability is one of the frontier areas of research. The eye should be brought back into the lipreading picture!

Included in this text is a review of Marie K. Mason's<sup>63</sup> "Visual Hearing Films for the Visual Comprehension

<sup>61</sup>Ibid., p. 136.

<sup>62</sup>John J. O'Neill and Herbert J. Oyer, Visual Communication for the Hard of Hearing (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1961), p. 69.

<sup>63</sup>Marie K. Mason, "Visual Hearing Films," cited in John J. O'Neill and Herbert J. Oyer, Visual Communication for the Hard of Hearing (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1961), pp. 147-153.

of Speech." Mason's definition of "Visual Hearing" is as follows:<sup>64</sup>

Visual hearing is the comprehension of spoken thought through the interpretation of visual stimuli when response to auditory stimuli is inadequate or entirely lacking.

The filmed tests consist of phonetic content, script context, and objectives. Film number VII contains a test of homophenous words. It is described as follows:<sup>65</sup>

| <u>Film Number</u>      | <u>Phonetic Content</u>                                           | <u>Script Content</u>                                                                                                                          | <u>Objectives</u>                                                                                                                               |
|-------------------------|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| VII<br>(Female Speaker) | Homophenous words (words having identical visible speech aspects) | Series of two or more unrelated sentences, each containing words differing in sound and spelling but having identical visible characteristics. | To achieve visual alertness in detecting, discriminating, and memorizing the visibly identical phenomena which make one word look like another. |

Mason appears to concur with Wong and Fillmore's<sup>66</sup> belief that the vowels do modify the consonant sounds. Five films pertain to the influencing factors of the vowels on other consonants. Mason also includes a film on the effect of consonants on other consonants. An example follows:<sup>67</sup>

<sup>64</sup>Ibid., p. 147.

<sup>65</sup>Ibid., p. 149.

<sup>66</sup>Wong and Fillmore, op. cit.

<sup>67</sup>Mason, op. cit., p. 149.

| <u>Film<br/>Number</u>      | <u>Phonetic Content</u>                                                                              | <u>Script Content</u>                                                              | <u>Objectives</u>                                                                                                                                                                             |
|-----------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VIII<br>(Female<br>Speaker) | Group I of the<br>Post dental<br>sibilant conson-<br>ants: (s) as in<br>"seal," (z) as<br>in "zeal." | Unrelated sen-<br>tences in<br>which these<br>consonants<br>occur frequent-<br>ly. | To familiarize the<br>student with the<br>varying visible<br>speech character-<br>istics of (s) and<br>(z), when preceded<br>or followed by<br>vowels of widely<br>different appear-<br>ance. |

As one reviews the literature of the 1950's and 1960's, it appears that extensive research is being conducted on the variables influencing lip reading ability. Little research has been done on homophenous words. However, there is evidence that attention is being directed toward an evaluation of homophenous words by educators of the deaf.

## CHAPTER III

### SUBJECTS, EQUIPMENT, AND PROCEDURES

#### Introduction

The problem under investigation in this study was to determine the ability of viewers to correctly identify homophenous words presented on a silent film. One hundred viewer subjects participated in this study. They were students without formal lip reading training.

#### Subjects

Selection of speaker subjects.--Four subjects were selected as speaker subjects. The criteria employed in the selection of the four subjects were sex and dialect. Two were men and two were women with "General American"<sup>1</sup> dialect. Three of the subjects were actively engaged in the field of speech and hearing and the fourth in music.

Selection of viewer subjects.--Twenty-three male and seventy-seven female subjects participated in this study. They were enrolled in summer school in the College of

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<sup>1</sup>Charles Kenneth Thomas, Phonetics of American English (New York: The Ronald Press Co., 1947), p. 144.

Education or Communication Arts. The only criteria employed in the selection were educational level and absence of formal lip reading training.

### Equipment

The following equipment was employed in this study:

L. C. Auricon Super 1200 model motion picture camera.

Twenty-five millemeter lens.

Tri-X-Reversal film; black and white.

Conventional standard flood lamps.

Bell and Howell projector. Model A. V. Filmsound Specialist 399. Jewelled sapphire movement; 1000 watt, 117 V. A. C. or ten amps D. C.

Da-Lite Picture King projection screen. V. A. glass beaded, A. A. 580.

Three hundred cue cards of homophenous words.

Seventy-five number cards.

Homophenous Word Test.<sup>2</sup>

### Procedures

Filming situation.--The filming of the speaker subjects saying the homophenous words was accomplished at the Michigan State University Film Production Studio.

The speaker subjects were seated seven feet from the camera. Conventional standard flood lamps were employed with

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<sup>2</sup>Oyer, op. cit. (see Appendix pp. 49-50).

a light to shadow ratio of three to one. As an assistant held up a cue card on which a word was printed, the speaker was filmed as he spoke twice the word printed on the card. Voice was employed. Each speaker's list was comprised of seventy-five words that were different from the other three lists. The sound track was employed in order that editing might be accomplished more easily.

Four seconds of film was allowed for each word presentation. Six seconds of film were left between stimuli. The total filming time was forty-eight minutes and twenty seconds.

Response forms.<sup>3</sup>--The response forms were comprised of four test sheets and one sample test sheet. The four test sheets contained seventy-five groups of four words each. One sheet was employed for each speaker participating in the film. The sample test sheet consisted of four groups of four words each and was used during the practice period. This test was printed one on a sheet on the original. There was one sheet for each speaker subject--a total of four sheets.

Testing situation.--The filmed "Homophenous Word Test"<sup>4</sup> was presented to a total of one hundred college students in groups ranging in size from fourteen to fifty-six subjects.

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<sup>3</sup>See Appendix pages 51-54.

<sup>4</sup>Oyer, op. cit.

The following directions were given to the viewers:

You will be given a test in lip reading. I will show a silent film with four speakers, two are men and two are women. You have a sheet for each one and a half sheet for practice. Look at your answer sheet. There are seventy-five groups of four words each on each page. Use sheet number one for the first speaker, number two for the second speaker, number three for the third speaker, and number four for the fourth speaker. The speaker will say a word two times. Be sure to watch the speaker repeat the word twice. Draw a circle around the number and word you think is correct. Be sure to mark only one word in each group. But be sure to mark one word in each group. If all the groups are not marked, the test will be invalid. The purpose of this test is to gain insight into the problems confronting the deaf. It will also give you a better understanding of the confusion and frustration experienced by the deaf and hard of hearing. Would you like to practice? Watch my lips carefully and I will say without voice one word from the four lists on the sample test sheet. Tip, bring, bunny, in. Let us proceed with the test.

A practice period was given before the film presentation in order to acquaint the viewers with the task that was to follow.

In all instances, tests were administered in classrooms. The distance between the viewers and the screen ranged from approximately ten to twenty-five feet.

## CHAPTER IV

### ANALYSIS AND DISCUSSION

#### Results

A basic question to be answered was whether or not subjects who viewed the four filmed speakers were able to select correctly the words that were spoken. A second question raised by the investigation was whether recognition of words occurred significantly above that to be expected by chance. Upon inspection of the raw data in Table I, it is noted that viewers were able to select only some of the words correctly. In a test with seventy-five items and four parts to each item, correct selection by chance alone would yield a score of 18.75. For speaker number one, only thirteen viewers made a score of chance or below. For speaker number two only eleven viewers made scores of chance or below; for speaker three, fourteen; and for speaker four, sixteen.

Upon inspection of the data it can be observed that there is some difference in the degree to which individual speakers can be successfully lip read. Although speaker differences were expected, it was of interest to determine whether these differences were statistically significant. Therefore a "t" test for unrelated measures was employed.

TABLE 1  
CORRECT VIEWER SCORES BY SPEAKER SUBJECTS

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

TABLE 1--Continued

| Viewers | Speaker 1 | Speaker 2 | Speaker 3 | Speaker 4 |
|---------|-----------|-----------|-----------|-----------|
| 44      | 21        | 24        | 23        | 24        |
| 45      | 29        | 21        | 19        | 22        |
| 46      | 29        | 23        | 22        | 20        |
| 47      | 21        | 16        | 21        | 24        |
| 48      | 21        | 29        | 22        | 26        |
| 49      | 18        | 27        | 17        | 22        |
| 50      | 23        | 28        | 24        | 30        |
| 51      | 23        | 31        | 23        | 13        |
| 52      | 17        | 25        | 27        | 33        |
| 53      | 22        | 17        | 25        | 26        |
| 54      | 26        | 24        | 22        | 19        |
| 55      | 14        | 15        | 23        | 21        |
| 56      | 22        | 17        | 17        | 21        |
| 57      | 19        | 24        | 20        | 22        |
| 58      | 24        | 27        | 22        | 23        |
| 59      | 25        | 23        | 19        | 17        |
| 60      | 14        | 22        | 21        | 15        |
| 61      | 20        | 22        | 21        | 23        |
| 62      | 18        | 21        | 19        | 29        |
| 63      | 15        | 20        | 23        | 16        |
| 64      | 19        | 21        | 28        | 30        |
| 65      | 19        | 20        | 19        | 21        |
| 66      | 22        | 21        | 22        | 23        |
| 67      | 22        | 20        | 23        | 25        |
| 68      | 26        | 25        | 15        | 21        |
| 69      | 29        | 16        | 21        | 27        |
| 70      | 24        | 14        | 21        | 14        |
| 71      | 26        | 25        | 29        | 25        |
| 72      | 22        | 23        | 21        | 17        |
| 73      | 20        | 23        | 25        | 16        |
| 74      | 22        | 20        | 24        | 16        |
| 75      | 23        | 27        | 24        | 20        |
| 76      | 20        | 24        | 20        | 18        |
| 77      | 29        | 30        | 27        | 18        |
| 78      | 28        | 23        | 15        | 25        |
| 79      | 25        | 29        | 29        | 29        |
| 80      | 27        | 23        | 25        | 22        |
| 81      | 22        | 19        | 20        | 23        |
| 82      | 18        | 21        | 22        | 22        |
| 83      | 25        | 17        | 18        | 26        |
| 84      | 23        | 23        | 24        | 21        |
| 85      | 21        | 21        | 24        | 24        |
| 86      | 24        | 23        | 13        | 22        |
| 87      | 26        | 22        | 24        | 25        |
| 88      | 20        | 23        | 17        | 25        |

TABLE 1--Continued

| Viewers | Speaker 1 | Speaker 2 | Speaker 3 | Speaker 4 |
|---------|-----------|-----------|-----------|-----------|
| 89      | 24        | 33        | 24        | 31        |
| 90      | 19        | 23        | 19        | 26        |
| 91      | 25        | 19        | 19        | 28        |
| 92      | 30        | 19        | 30        | 27        |
| 93      | 28        | 28        | 23        | 27        |
| 94      | 21        | 23        | 21        | 20        |
| 95      | 24        | 22        | 20        | 20        |
| 96      | 23        | 19        | 22        | 22        |
| 97      | 19        | 19        | 22        | 21        |
| 98      | 27        | 23        | 27        | 28        |
| 99      | 27        | 25        | 26        | 20        |
| 100     | 25        | 27        | 20        | 18        |

As shown by the results on Table 2 there were some differences among speakers relative to the ease with which they were lip read by the subjects. The reader will note there were significant differences in the lip readability of speakers one and two, also one and four. No significant differences were noted between speakers one and three, two and three, two and four, and three and four.

In order to determine whether viewers were able to function above chance level in correct selection of the homophenous words uttered by speakers a Chi Square Test was applied. The test was applied to each of the one hundred measures representing the mean performance of the four speakers. Table 3 presents the results of these tests.

As can be observed, the viewers were able to select correctly the homophenous word that was spoken more frequently than would be expected by chance alone.

TABLE 2  
RESULTS OF "t" TEST FOR DIFFERENCES BETWEEN SPEAKERS

| Speakers | Means       | t    | df | Level*          |
|----------|-------------|------|----|-----------------|
| 1 and 2  | 25.6 - 22.6 | 3.06 | 99 | 1 per cent      |
| 1 and 3  | 25.6 - 21.7 | .493 | 99 | non significant |
| 1 and 4  | 25.6 - 22.6 | 2.47 | 99 | 5 per cent      |
| 2 and 3  | 22.6 - 21.7 | .136 | 99 | non significant |
| 2 and 4  | 22.6 - 22.6 | .008 | 99 | non significant |
| 3 and 4  | 21.7 - 22.6 | .951 | 99 | non significant |

\*For significance at the .05 per cent level a "t" of 1.95 is required, and for the .01 per cent level, 2.57.

TABLE 3  
RESULTS OF CHI SQUARE TEST

| Speaker             | $\chi^2$ * | df* | Level |
|---------------------|------------|-----|-------|
| 1                   | 152.02     | 99  | .01   |
| 2                   | 153.33     | 99  | .01   |
| 3                   | 116.23     | 99  | .01   |
| 4                   | 188.97     | 99  | .01   |
| 1-2-3-4<br>Combined | 93.87      | 99  | .01   |

\*For df = 99,  $\chi^2$  = 50.89 for .01 level of significance.

Discussion

With this data at hand, one may conclude that those who state that homophenous words look the same on the lips are not completely accurate even though the words may appear to be highly similar. This does not, however, discredit any emphasis a teacher may place on the importance of contextual association for discerning the homophenous words. It does, however, arouse curiosity with regard to the subtle differences that are perceived by viewers of these homophenous configurations that are so highly similar. A thorough study involving measurement of the facial movements associated with the production of homophenous words is indicated in order to specify the visible differences among them.

## CHAPTER V

### SUMMARY AND CONCLUSIONS

#### Summary

It has been estimated that approximately fifty per cent<sup>1,2,3</sup> of the words in the English language have one or more words homophenous to them. That is to say, they look alike on the lips. There are certain sounds that are quite similar visually, such as (p-b-m), (t-d-n), (s-z), (k-g), et cetera. Teachers of lip reading have frequently stated that these homophenous words appear alike on the lips; however, it has never been shown that the lip and facial movements are identical.

It appears from reviewing the literature that memorization and contextual association are methods employed in teaching lip reading of homophenous words to the acoustically handicapped.

The problem under investigation in this study was to determine the ability of viewers to correctly identify homophenous words. The viewers were college students not

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<sup>1</sup>Bruhn, Elementary Lessons in Lip-Reading, op. cit., p. vii.

<sup>2</sup>Stowell, Samuelson, and Lehman, op. cit., pp. 24-25.

<sup>3</sup>Kinzie and Kinzie, op. cit., p. x.

formally trained in lip reading. The homophenous words were presented by speakers on a film. Viewers indicated their responses on a multiple choice test form.

In view of the fact that there were seventy-five items in the test with four parts to each item, chance occurrence was 18.75.

The results of the Chi Square analysis of data reveals that correct selection of homophenous words as seen on a speaker's lips occurs above that which is expected from chance alone.

### Conclusions

On the basis of the data derived in this study, the following conclusions appear to be warranted:

1. College students without formal training in lip reading are able to lip read some homophenous words when presented by speakers on a silent film.
2. College students not formally trained in lip reading can recognize homophenous words correctly a greater number of times than what is expected by chance alone.

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## APPENDIX

# HOMOPHENOUS WORD SAMPLE TEST

## No. 1

1. dim
2. dip
3. nip
4. tip

## No. 3

1. money
2. muddy
3. putty
4. bunny

## No. 2

1. brick
2. bring
3. prick
4. prig

## No. 4

1. kid
2. hit
3. in
4. it

## Sheet No. 1

Name \_\_\_\_\_ date \_\_\_\_\_ Class \_\_\_\_\_ Subject \_\_\_\_\_ Sex:   
 M \_\_\_\_\_   
 F \_\_\_\_\_

## HOMOPHENOUS WORD TEST

|                                                           |                                                        |                                                          |                                                                                      |                                                                                      |                                                                                 |
|-----------------------------------------------------------|--------------------------------------------------------|----------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| No. 1<br>1. axe<br>2. backs<br>3. hags<br>4. hangs        | No. 8<br>1. bays<br>2. base<br>3. maze<br>4. pays      | No. 15<br>1. blade<br>2. plain<br>3. platae<br>4. played | No. 22<br>1. brick<br>2. bring<br>3. prick<br>4. prig                                | No. 29<br>1. come<br>2. cup<br>3. <del>tit</del> <i>cube</i><br>4. <del>tinger</del> | No. 36<br>1. tame<br>2. dame<br>3. name<br>4. tape                              |
| No. 2<br>1. at<br>2. add<br>3. had<br>4. hat              | No. 9<br>1. bead<br>2. beat<br>3. peat<br>4. meat      | No. 16<br>1. bleat<br>2. bleed<br>3. plead<br>4. pleat   | No. 23<br>1. buck<br>2. bug<br>3. pug<br>4. mug                                      | No. 30<br>1. came<br>2. cape<br>3. game<br>4. gape                                   | No. 37<br>1. dead<br>2. debt<br>3. den<br>4. ten                                |
| No. 3<br>1. bag<br>2. back<br>3. bang<br>4. pack          | No. 10<br>1. back<br>2. beg<br>3. peck<br>4. peg       | No. 17<br>1. boat<br>2. mode<br>3. moat<br>4. moan       | No. 24<br>1. bud<br>2. but<br>3. pun<br>4. mud                                       | No. 31<br>1. crab<br>2. cram<br>3. grab<br>4. gram                                   | No. 38<br>1. did<br>2. din<br>3. tit<br>4. tin                                  |
| No. 4<br>1. bad<br>2. mad<br>3. bat<br>4. mat             | No. 11<br>1. bed<br>2. bet<br>3. met<br>4. pet         | No. 18<br>1. bob<br>2. mob<br>3. pop<br>4. mop           | No. 25<br>1. cab<br>2. cap<br>3. gab<br>4. gap                                       | No. 32<br>1. crane<br>2. great<br>3. grade<br>4. grain                               | No. 39<br>1. died<br>2. tide<br>3. tight<br>4. dine                             |
| No. 5<br>1. batch<br>2. badge<br>3. match<br>4. patch     | No. 12<br>1. band<br>2. mend<br>3. meant<br>4. pant    | No. 19<br>1. bold<br>2. bolt<br>3. mold<br>4. polled     | No. 26<br>1. cot<br>2. cod<br>3. got<br>4. god                                       | No. 33<br>1. creed<br>2. green<br>3. greed<br>4. great                               | No. 40<br>1. dig<br>2. tick<br>3. nick<br>4. dick                               |
| No. 6<br>1. bait<br>2. made<br>3. mate<br>4. paid         | No. 13<br>1. bid<br>2. been<br>3. mitt<br>4. pit       | No. 20<br>1. bound<br>2. pound<br>3. mount<br>4. mound   | No. 27<br>1. clamor<br>2. clabber<br>3. clapper<br>4. <del>glam</del> <i>glamour</i> | No. 34<br>1. cud<br>2. cut<br>3. gun<br>4. gut                                       | No. 41<br>1. dim<br>2. dip<br>3. nip<br>4. tip                                  |
| No. 7<br>1. batter<br>2. banner<br>3. manner<br>4. matter | No. 14<br>1. birch<br>2. merge<br>3. purge<br>4. perch | No. 21<br>1. brood<br>2. brute<br>3. prune<br>4. prude   | No. 28<br>1. coat<br>2. cone<br>3. goat<br>4. code                                   | No. 35<br>1. dab<br>2. dam<br>3. tap<br>4. tab                                       | No. 42<br>1. <del>come</del> <i>come done</i><br>2. dope<br>3. tome<br>4. gnome |

Sheet No. 1--Continued\*

|                         |           |           |                         |          |
|-------------------------|-----------|-----------|-------------------------|----------|
| No. 43                  | No. 51    | No. 59    | No. 67                  | No. 75   |
| 1. don                  | 1. fade   | 1. snag   | 1. boon                 | 1. cord  |
| 2. dot                  | 2. feign  | 2. snack  | 2. mood                 | 2. corn  |
| 3. tot                  | 3. vain   | 3. stack  | 3. mood                 | 3. cort  |
| 4. not                  | 4. fate   | 4. stag   | 4. boot                 | 4. gourd |
| No. 44                  | No. 52    | No. 60    | No. 68                  |          |
| 1. done                 | 1. fight  | 1. spied  | 1. bubble               |          |
| 2. ton                  | 2. vine   | 2. spite  | 2. bumble               |          |
| 3. nun                  | 3. fine   | 3. spine  | 3. mumble               |          |
| 4. nut                  | 4. vied   | 4. smite  | 4. pommel               |          |
| No. 45                  | No. 53    | No. 61    | No. 69                  |          |
| 1. doom                 | 1. guild  | 1. tackle | 1. bum                  |          |
| 2. dupe                 | 2. guilt  | 2. tangle | 2. mum                  |          |
| 3. tomb                 | 3. killed | 3. taggle | 3. pup                  |          |
| 4. tube                 | 4. kilt   | 4. dangle | 4. pub                  |          |
| No. 46                  | No. 54    | No. 62    | No. 70                  |          |
| 1. doubt                | 1. hid    | 1. nine   | 1. bus                  |          |
| 2. down                 | 2. hit    | 2. night  | 2. buzz                 |          |
| 3. town                 | 3. in     | 3. dine   | 3. pus                  |          |
| 4. noun                 | 4. it     | 4. tine   | 4. muss                 |          |
| No. 47                  | No. 55    | No. 63    | No. 71                  |          |
| 1. dub                  | 1. cane   | 1. toad   | 1. <del>dies</del> dice |          |
| 2. dumb                 | 2. gain   | 2. dote   | 2. dies                 |          |
| 3. tub                  | 3. gate   | 3. tone   | 3. ties                 |          |
| 4. numb                 | 4. kate   | 4. tote   | 4. nice                 |          |
| No. 48                  | No. 56    | No. 64    | No. 72                  |          |
| 1. dude                 | 1. palate | 1. train  | 1. money                |          |
| 2. dune                 | 2. ballot | 2. drain  | 2. muddy                |          |
| 3. toot                 | 3. mallet | 3. trade  | 3. putty                |          |
| 4. tuna                 | 4. pallid | 4. trait  | 4. bunny                |          |
| No. 49                  | No. 57    | No. 65    | No. 73                  |          |
| 1. duck                 | 1. peddle | 1. whine  | 1. pad                  |          |
| 2. dug                  | 2. metal  | 2. wide   | 2. pat                  |          |
| 3. <del>Id</del> tongue | 3. medal  | 3. wine   | 3. man                  |          |
| 4. tug                  | 4. petal  | 4. white  | 4. pan                  |          |
| No. 50                  | No. 58    | No. 66    | No. 74                  |          |
| 1. fan                  | 1. puzzle | 1. arbor  | 1. mind                 |          |
| 2. fad                  | 2. bustle | 1. harbor | 2. pint                 |          |
| 3. van                  | 3. muscle | 3. harper | 3. bind                 |          |
| 4. vat                  | 4. muzzle | 4. armor  | 4. bite                 |          |

\*The original homophenous word test was all on one sheet, with a separate sheet for each speaker, a total of four sheets.

## SPEAKER LIST No. 1--HOMOPHENOUS WORD TEST

|      |        |      |        |      |        |
|------|--------|------|--------|------|--------|
| 1-4  | hangs  | 26-4 | god    | 51-2 | feign  |
| 2-1  | at     | 27-1 | clamor | 52-3 | fine   |
| 3-3  | bang   | 28-3 | goat   | 53-2 | guilt  |
| 4-2  | mad    | 29-4 | gum    | 54-4 | it     |
| 5-1  | batch  | 30-4 | gape   | 55-4 | kate   |
| 6-4  | paid   | 31-3 | grab   | 56-3 | mallet |
| 7-3  | manner | 32-4 | grain  | 57-4 | petal  |
| 8-1  | bays   | 33-1 | creed  | 58-4 | muzzle |
| 9-3  | peat   | 34-4 | gut    | 59-2 | snack  |
| 10-2 | beg    | 35-1 | dab    | 60-2 | spite  |
| 11-2 | bet    | 36-4 | tape   | 61-4 | dangle |
| 12-2 | mend   | 37-3 | den    | 62-3 | dine   |
| 13-3 | mitt   | 38-1 | did    | 63-1 | toad   |
| 14-2 | merge  | 39-2 | tide   | 64-1 | train  |
| 15-4 | played | 40-2 | tick   | 65-3 | wine   |
| 16-3 | plead  | 41-1 | dim    | 66-4 | armor  |
| 17-2 | mode   | 42-3 | tome   | 67-3 | moon   |
| 18-1 | bob    | 43-4 | not    | 68-4 | pommel |
| 19-2 | bolt   | 44-1 | done   | 69-2 | mum    |
| 20-2 | pound  | 54-4 | tube   | 70-4 | muss   |
| 21-1 | brood  | 46-4 | noun   | 71-4 | nice   |
| 22-4 | prig   | 47-2 | dumb   | 72-3 | putty  |
| 23-3 | pug    | 48-4 | tune   | 73-2 | pat    |
| 24-3 | pun    | 49-1 | duck   | 74-2 | pint   |
| 25-3 | gab    | 50-4 | vat    | 75-4 | gourd  |

## SPEAKER LIST NO. 2--HOMOPHENOUS WORD TEST

|      |        |      |         |      |        |
|------|--------|------|---------|------|--------|
| 1-2  | hacks  | 26-3 | got     | 51-1 | fade   |
| 2-2  | add    | 27-2 | clabber | 52-2 | vine   |
| 3-2  | back   | 28-4 | code    | 53-1 | guild  |
| 4-3  | bat    | 29-3 | cub     | 54-1 | hid    |
| 5-3  | match  | 30-1 | came    | 55-3 | gate   |
| 6-3  | mate   | 31-4 | gram    | 56-1 | palate |
| 7-1  | batter | 32-1 | crane   | 57-1 | peddle |
| 8-4  | pays   | 33-4 | greet   | 58-3 | muscle |
| 9-2  | beat   | 34-2 | cut     | 59-4 | stag   |
| 10-1 | beck   | 35-3 | tap     | 60-1 | spied  |
| 11-3 | met    | 36-2 | dame    | 61-2 | tangle |
| 12-3 | meant  | 37-4 | ten     | 62-2 | night  |
| 13-2 | been   | 38-4 | tin     | 63-4 | tote   |
| 14-1 | birch  | 39-1 | died    | 64-3 | trade  |
| 15-3 | plate  | 40-4 | dick    | 65-4 | white  |
| 16-4 | pleat  | 41-3 | nip     | 66-1 | arbor  |
| 17-1 | boat   | 42-2 | dope    | 67-2 | mood   |
| 18-3 | pop    | 43-1 | don     | 68-1 | bubble |
| 19-3 | mold   | 44-3 | nun     | 69-3 | pup    |
| 20-4 | mound  | 45-1 | doom    | 70-3 | pus    |
| 21-4 | prude  | 46-2 | down    | 71-3 | ties   |
| 22-3 | prick  | 47-4 | numb    | 72-2 | muddy  |
| 23-2 | bug    | 48-1 | dude    | 73-1 | pad    |
| 24-4 | mud    | 49-4 | tug     | 74-3 | bind   |
| 25-1 | cab    | 50-1 | fan     | 75-1 | cord   |

## SPEAKER LIST NO. 3--HOMOPHENOUS WORD LIST

|      |        |      |                     |      |        |
|------|--------|------|---------------------|------|--------|
| 1-3  | hags   | 26-1 | cot                 | 51-4 | fete   |
| 2-4  | hat    | 27-3 | clapper             | 52-4 | vied   |
| 3-4  | pack   | 28-2 | cone                | 53-3 | killed |
| 4-1  | bad    | 29-1 | come                | 54-3 | in     |
| 5-4  | patch  | 30-2 | cape                | 55-2 | gain   |
| 6-1  | bait   | 31-2 | cram                | 56-4 | pallid |
| 7-2  | banner | 32-3 | grade               | 57-2 | metal  |
| 8-3  | maze   | 33-2 | green               | 58-2 | bustle |
| 9-1  | bead   | 34-1 | cud                 | 59-1 | snag   |
| 10-4 | peg    | 35-2 | dam                 | 60-3 | spine  |
| 11-4 | pet    | 36-1 | tame                | 61-3 | taggle |
| 12-1 | bend   | 37-1 | dead                | 62-4 | tine   |
| 13-4 | pit    | 38-3 | tit                 | 63-2 | dote   |
| 14-3 | purge  | 39-3 | tight               | 64-4 | trait  |
| 15-1 | blade  | 40-3 | nick                | 65-1 | whine  |
| 16-2 | bleed  | 41-4 | tip                 | 66-2 | harbor |
| 17-3 | moat   | 42-4 | gnome               | 67-1 | boon   |
| 18-4 | mop    | 43-3 | tot                 | 68-2 | bumble |
| 19-4 | polled | 44-2 | ton                 | 69-1 | bum    |
| 20-1 | bound  | 45-2 | dupe                | 70-2 | buzz   |
| 21-3 | prune  | 46-1 | doubt               | 71-2 | dies   |
| 22-1 | brick  | 47-3 | tub                 | 72-1 | money  |
| 23-4 | mug    | 48-2 | dune                | 73-4 | pan    |
| 24-2 | but    | 49-3 | tongut <sup>e</sup> | 74-4 | bite   |
| 25-2 | cap    | 50-2 | fad                 | 75-3 | court  |

## SPEAKER LIST NO. 4--HOMOPHENOUS WORD LIST

|      |                          |      |         |      |        |
|------|--------------------------|------|---------|------|--------|
| 1-1  | axe                      | 26-2 | cod     | 51-3 | vain   |
| 2-3  | had                      | 27-4 | glamour | 52-1 | fight  |
| 3-1  | bag                      | 28-1 | coat    | 53-4 | kilt   |
| 4-4  | mat                      | 29-2 | cup     | 54-2 | hit    |
| 5-2  | badge                    | 30-3 | game    | 55-1 | cane   |
| 6-2  | made                     | 31-1 | crab    | 56-2 | ballot |
| 7-4  | <del>matter</del> matter | 32-2 | great   | 57-3 | medal  |
| 8-2  | base                     | 33-3 | greed   | 58-1 | puzzle |
| 9-4  | meat                     | 34-3 | gun     | 59-3 | stack  |
| 10-3 | peck                     | 35-4 | tab     | 60-4 | smite  |
| 11-1 | bed                      | 36-3 | name    | 61-1 | tackle |
| 12-4 | pent                     | 37-2 | debt    | 62-1 | nine   |
| 13-1 | bid                      | 38-2 | din     | 63-3 | tone   |
| 14-4 | perch                    | 39-4 | dine    | 64-2 | drain  |
| 15-2 | plain                    | 40-1 | dig     | 65-2 | wide   |
| 16-1 | bleat                    | 41-2 | dip     | 66-3 | harper |
| 17-4 | moan                     | 42-1 | dome    | 67-4 | boot   |
| 18-2 | mob                      | 43-2 | dot     | 68-3 | mumble |
| 19-1 | bold                     | 44-4 | nut     | 69-4 | pub    |
| 20-3 | mount                    | 45-3 | tomb    | 70-1 | bus    |
| 21-2 | brute                    | 46-3 | town    | 71-1 | dice   |
| 22-2 | bring                    | 47-1 | dub     | 72-4 | bunny  |
| 23-1 | buck                     | 48-3 | toot    | 73-3 | man    |
| 24-1 | bud                      | 49-2 | dug     | 74-1 | mind   |
| 25-4 | gap                      | 50-3 | van     | 75-2 | corn   |

# ROOM USE ONLY

~~DEC 4 1962~~

~~DEC 2 1962~~

~~FEB 10 1964~~

~~MAR 20 1964~~

~~MAY 28 1964~~

~~DEC 17 1964~~

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