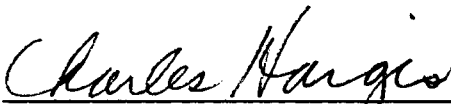
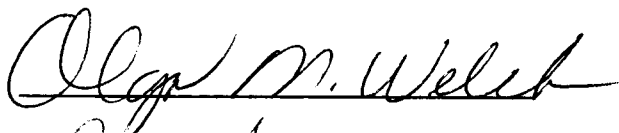
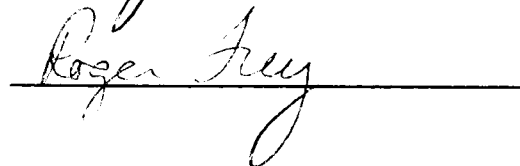


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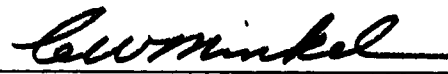
I am submitting herewith a thesis written by Dawn D. Tackett entitled "Effects of Imagery and Frequency on Recall of Controlled Vocabulary by Hearing-Impaired Students." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Special Education.


Charles Hargis, Major Professor

We have read this thesis and
recommend its acceptance:

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EFFECTS OF IMAGERY AND FREQUENCY ON RECALL OF CONTROLLED
VOCABULARY BY HEARING-IMPAIRED STUDENTS

A Thesis
Presented for the
Master of Science
Degree
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ABSTRACT

This study examines 15 hearing-impaired students' recall of vocabulary lists controlled for imagery and frequency levels. Four word lists were developed and each list contained eight words with high and low frequency levels and high and low imagery levels. The students (13 and 14 year olds) were tested on all four lists of words; however, they were asked to give written recall of only one list (eight words at a time). Each word on each word list was handprinted onto an overhead transparency. Each word was shown one at a time and was presented at the rate of five seconds per word.

A significant difference between words of high imagery and high frequency and words of low imagery and high frequency was found. This significance may indicate imagery as a factor to consider in vocabulary selection among high frequency words. The significant difference between high frequency and high imagery words and low frequency and high imagery words suggests that frequency may also be an important consideration in vocabulary instruction. This significance may indicate frequency as a factor to consider in vocabulary selection of words with high imagery levels. The more frequent occurring words may be more easily taught than those at a low frequency level. This combination of frequency and imagery characteristics may offer teachers another method of vocabulary selection.

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INTRODUCTION

Syntactical aspects of language may be divided into three major areas of development: lexicon (vocabulary), syntax (structural relationships between words) and figurative structures (Hargis, 1982). Hearing-impaired children, especially prelingually deafened children, exhibit serious deficiencies in all three areas. Because basal reading programs are based on the prerequisites of word knowledge and English syntax mastery, most hearing-impaired children are sentenced to failure in even the most primary reading experiences (Hargis, 1982).

In the area of lexical development for hearing-impaired children, Kretschmer and Kretschmer (1978) propose that concept formation is an important consideration in vocabulary teaching. To form a concept is not to focus on the similarities of a lexical item alone, but to explore and consider differences between words as well. It is important, according to Kretschmer and Kretschmer that vocabulary be introduced in sentences and using a variety of contexts to insure a more clear understanding of new lexical items.

One way to choose vocabulary that might be more easily conceptualized and generalized to many contexts would be to select vocabulary by imagery and frequency characteristics. Those words with high imagery value may better facilitate conceptualization while frequency characteristics would indicate the common occurrence of a word in printed English. Frequency characteristics could be a basis

for determining the usefulness or utility for learning a word because it will be encountered again and again in reading experiences.

CHAPTER I

STATEMENT OF THE PROBLEM

Purpose of the Study

The purpose of this study was to test the recall of vocabulary word lists controlled for imagery and frequency levels. These characteristics of high imagery and high frequency may have a facilitative effect on the recall of words containing these characteristics. However, words with low imagery and low frequency characteristics may be less easily recalled. The effects of imagery and frequency may suggest to teachers the importance of considering these characteristics when selecting vocabulary for teaching hearing-impaired students.

Need for the Study

According to Quigley and Paul (1984) vocabulary development is a major variable in language understanding. A large vocabulary is also related to reading skills and is a primary factor in the majority of intelligence tests (Quigley & Paul, 1984). For hearing-impaired learners vocabulary knowledge and general reading ability are areas of great difficulty. When given the Stanford Achievement Test-Hearing-Impaired Form (SAT-HI), hearing-impaired students are most likely to score the lowest on the vocabulary or word meaning subtest (Quigley & Paul, 1984).

Reading for meaningfulness is dependent on language sophistication that is beyond the abilities of the majority of six-year-old

hearing-impaired children (Streng & Kretschmer, 1978). It has been concluded by those studying the poor showing of hearing-impaired students on reading assessments, that hearing loss at an early age almost universally is associated with serious reading problems (Brooks, cited in Liben, 1978).

Johnson, Toms-Bronowski and Pittelmen (1982) describe a landmark study in which the researcher (Davis, 1942) examined the skills involved in reading comprehension. The researcher analyzed subskills from the Cooperative Reading Comprehension Test, Form Q. It was concluded from the analysis that word knowledge and reasoning in reading were responsible for 89% of the variance in scores. After examining the research data, Johnson, et. al. concluded that word knowledge is related to skill in recalling word meanings, whereas reasoning in reading was a combination of "weaving together ideas in the context, and drawing inferences from the content" (page 11). Without word knowledge as a foundation other processes necessary for comprehension and reading for meaning may not develop. Thus, word knowledge and linguistic competency are inexorably linked (Anderson & Freebody, cited in Johnson, et al., 1982).

CHAPTER II

REVIEW OF LITERATURE

Hearing-impaired adolescents who were prelingually deafened, having a sensorineural hearing-impairment of 90+ dB acquired before the age of two (Quigley, 1982) demonstrate a dramatic difference in reading vocabulary level when compared with typical hearing adolescents. It has been estimated that the average hearing high school senior has a reading vocabulary ability of approximately 15,000 words (Streng, Kretschmer, & Kretschmer, 1978). Thus, hearing students could acquire 1,000 to 1,500 new words every school year and have knowledge of not only one, but of the multiple meanings of these words. In addition, most hearing students are able to understand the idiomatic and figurative uses of words (Streng, et. al., 1978).

In contrast, hearing-impaired students consistently score the lowest on the vocabulary or word meaning subtest of the SAT-HI. This performance by hearing-impaired students on the word meaning subtest indicates the severe difficulties that English vocabulary presents to the hearing-impaired learners (Quigley & Paul, 1984).

According to a Office of Demographic Studies report from Gallaudet College (Trybus & Karchmer, 1977), the reading comprehension scores of hearing-impaired students on the SAT-HI will be one grade level higher than their vocabulary or word meaning subtest. Thus, if a hearing-impaired child scores on a third grade level on reading comprehension, the teacher should not give that child the third grade

level of the vocabulary subtest. According to Trybus and Karchmer, the third grade vocabulary subtest is too difficult and the student would begin guessing. They recommend that the student be given a vocabulary subtest at one grade level lower than their reading comprehension scores.

This gap between reading achievement and vocabulary level shown by typical hearing-impaired students is confirmed by a 1967 study by Moores. This study is described by Quigley and Kretschmer (1982) and is further evidence of the disparity in the abilities of hearing-impaired students. Moores used the cloze procedure to research the reading performance of 37 deaf subjects. These subjects were matched with a group of hearing students by using scores on the Stanford Achievement Test. Using 250 word passages selected from fourth-, sixth-, and eighth-grade reading texts, the subjects were asked to read the passages. Then they used their knowledge of vocabulary and syntax to replace the words omitted by the cloze procedure. Moores found hearing-impaired students performed substantially below their hearing comparison group even though the groups had been matched on reading scores.

Scores on the reading comprehension subtest of the SAT-HI have historically been discouragingly low across all age levels as compared to hearing children. The median reading score at age 20 was reported to be a grade equivalent of 4.5 (Trybus & Karchmer, 1977). It could be concluded that the median vocabulary level for

printed English words would be a grade equivalent of approximately 3.5, or one grade level lower than the reading comprehension score.

Similar deficiencies were found by Walter in a 1978 study. Walter was interested in determining the lexical abilities of hearing and hearing-impaired students. Using the Frequency Based Test of Vocabulary (FBTV) (Walter, 1978), the vocabulary ability of hearing and hearing-impaired children was compared. By using a specific word list the exact size and nature of vocabulary deficiency and ability could be determined. The FBTV used words based on their frequency in print and a multiple choice test format (only contentive words were chosen: nouns, verbs, adjectives, and adverbs, even though the function words such as pronouns, auxiliaries and prepositions are a large portion of the first 200 to 300 most frequently occurring words in English print). The meanings chosen were only the first meaning as shown in the American Heritage Dictionary; so the test did not estimate a student's knowledge of second or third word meanings.

Walter found that at age 14, the hearing-impaired students scored an English accuracy rate of 50-60% when given words between the 2000th and 5000th most frequently occurring words in printed English. This compares with a 95-97% accuracy rate for the hearing 14-year-old students. Hearing-impaired subjects at age 12 and under scored a little better than chance level for words at the 2000th word frequency and scored by chance at the 5000th level. It is

mentioned that Junior High materials are written with the regular use of words at the 10,000th frequency level, which all of the hearing subjects could master at the 66% accuracy level or above but few of the hearing-impaired. Walter suggests that a baseline level of performance for hearing-impaired students below 12 years of age could not be accurately assessed with current linguistic materials.

It is also mentioned by Walter (1978) that the hearing students might have an even larger vocabulary because they might not have known the graphic representation of a word but had it been given to them auditorially they could have known it. Thus, the gap between hearing-impaired students and their hearing counterparts is significantly greater given the auditory advantage of hearing students.

Because of the restricted ability to gain information in an auditory mode, hearing-impaired students are at a serious disadvantage. The primary means of acquiring information about English would be through the use of sign language or through experiences with printed English. Thus, the importance of learning words that are most often seen in printed form. If the auditory acquisition of vocabulary and language is not available to hearing-impaired students then other modalities must be used, such as the use of sign language and the ability to learn English through reading and understanding printed texts (Frumkin & Anisfeld, 1977 and Franzen-McGill & Gormley, 1980). Learning words that are frequently used in print is an important starting point for teachers. However, this is not to imply that

words that are less frequently printed are not important to learn (Nagy & Anderson, 1984). What frequency implies is the set of contexts where a word might be used. Those occurring most frequently then, would be those words used in a variety of contexts and which are useful across a multitude of semantic orientations. Nagy and Anderson also mention rate of frequency as being an indicator of the conceptual difficulty of the words. Those words occurring less frequently would be those whose appropriate contexts would be limited as in the word, quotient (Carroll, 1971) whose semantic context would most likely be found in the area of mathematics or the word, sacrament (Nagy & Anderson, 1984) which would be restricted within the realm of religious contexts.

A frequency based word list was developed with the assistance of a computer analysis of a corpus of approximately 5 million words. The words were selected from a variety of printed materials used in public schools from grades three through nine (Carroll, Davies & Richman, 1971). The researchers put the resulting corpus in a book The American Heritage Word Frequency Book (AHWFB) that presents the words in alphabetical, rank and subject order. Thus, teachers could select the vocabulary most likely to be encountered by their students in the printed texts and materials (recommended and required texts) throughout their school years. Walter (1978) used the rank list from the AHWFB to develop The Frequency Based Test of Vocabulary. The rank list from the AHWFB orders words by their frequency of

occurrence in printed materials, from the most frequently occurring words of the highest level of frequency per million, to those words at the lowest frequency. The rank of 25,000 represents those which occur at the lowest frequency level.

Words which are lowest in frequency of occurrence in printed English are within the lexical abilities of hearing students with an English accuracy rate of about 80% according to Walter. However, hearing-impaired students achieve only a 40% accuracy rate for words occurring at the rank of 5,000 and beyond. It is doubtful that the average hearing-impaired 14 year-old would have knowledge of the words beyond the 5,000th most frequently occurring word in printed English.

In selecting vocabulary for hearing-impaired students, frequency of occurrence in print may be an important consideration however, an understanding of a word's imagery level may be even more important. Paivio (1968) postulates that nouns vary in their ability to elicit mental images of things. He contends that some words do so in a quick way and with ease whereas others arouse the sensory experience (e.g., a mental picture or sound) with difficulty or not at all. Those words that quickly cause a mental image to form, such as "apple," are those with high imagery values. While a word such as "fact" would rate as low in imagery value (Paivio, 1968).

Imagery (I) can be defined as a word's rated capacity to elicit mental images (Craig, 1973). Paivio (1968) defined a mental image

as a "mental picture, sound, or other sensory experience" (page 3). Paivio uses the theory of imagery level to support a "dual coding" hypothesis (Paivio, 1969). This hypothesis states that there is an alternate coding process that takes place in addition to an auditory-motor coding. High-I words are coded in an auditory-motor code but according to Paivio these words are further transformed and coded into nonverbal images. Whereas, Low I words are stored presumably only in the auditory-motor code. Because of the availability of a dual code High I words are thought to be learned more quickly than those Low I words which are coded only in the single mode (Paivio, 1969).

Hearing-impaired learners in the absence of an auditory-motor code, utilize signability (with imagery) as an alternate coding system and thus may also exhibit this notion of dual coding (Bonvillian, 1983). Bonvillian selected stimulus words on the basis of imagery and signability to study immediate and delayed free recall of visually presented printed English words. He concluded that both ease of signability and imagery were important contributors in the word recall of hearing-impaired students. Hearing students were most able to recall words with high-imagery value and in fact, outscored the hearing-impaired students in both word type categories. Ease of signability resulted in no significant differences in recall ability of hearing subjects.

Bonvillian (1983) also asked the subjects to report the type of coding and rehearsal strategies they used in recalling the word

lists. Hearing-impaired subjects reported using fingerspelling, signing and visual imagery to remember the word lists. They did not report frequent use of subvocal rehearsal or speech. Bonvillian also mentions the hearing-impaired subjects were observed overtly rehearsing the stimulus words through the use of signs, fingerspelling and less often, spoken labels.

Bonvillian cites a (1970) study by Bower and Winzenz whereby the use of visual imagery and sentence formation were determined to be highly effective in facilitating recall. It is Bonvillian's assumption that these strategies may be more successful ones for hearing-impaired learners to use because sign language and fingerspelling techniques are relatively slow methods of rehearsal.

From Bonvillian's (1983) study and the associated research by Paivio (1969) and Bower and Winzenz (1970) the importance of strategies using the imagery value of a word can be seen. Furthermore the use of such strategies can be seen as a primary factor in the ability of subjects to recall stimulus words.

The frequency of a word occurring in print and the probability of a student having encountered a word often in printed English may be the impetus for more readily learning it. When familiarity, frequency and imagery are combined perhaps the end result will be greater recall because of the ease of conceptualization and previous experiences with the word in a variety of contexts in printed English.

CHAPTER III

METHODS AND PROCEDURES

The purpose of this study was to test the recall of vocabulary controlled for imagery and frequency. By analyzing and comparing scores on a recall test of controlled vocabulary the possible facilitative effects of frequency and imagery could be studied. The characteristics of imagery and frequency might be indicators for selection of vocabulary for teaching hearing-impaired students. New teaching strategies for improving the lexical abilities of hearing-impaired students may be inferred by determining if the characteristics of imagery and frequency facilitate recall of selected vocabulary.

Subjects

The subjects who participated in the study attend the Tennessee School for the Deaf. The subjects were selected on the basis of the following criteria:

1. a chronological age of 13 or 14 years of age (Walters, 1978)
2. a sensorineural hearing loss of 60 dB or more
3. prelingually hearing-impaired
4. no secondary handicapping conditions

Furthermore, of those subjects whose parents gave consent to participate, only those students whose reading ability, as judged by their language teacher, was considered adequate for the study task, were selected.

Pre-Testing Procedures

1. Parent consent forms were mailed out to parents of the 13 and 14 year old students in the 5th or 6th grade. Approximately 50 letters were mailed. Eighteen parents returned signed consent forms and 15 (fifteen) were selected to participate in the study.

2. Selection of nouns by frequency characteristics was accomplished by using the words from The Frequency Based Word List (Carrol, et. al., 1971). Ninety-eight nouns were selected from assigned high and low frequency levels. Frequency rates were determined by the performance of hearing-impaired students on the Frequency Based Test of Vocabulary (Walters, 1978). A high frequency word was assigned a rank level of 300 to 500. Words of a higher frequency than 300 were not chosen because the majority of those words are function words and therefore, are not nouns. The words selected for the study were nouns of high and low frequency and high and low imagery. Because of the disappointing performance of hearing-impaired students on the Frequency Based Test of Vocabulary (Walters, 1978), it was necessary to design a secondary selection procedure. As a result of the secondary selection procedure low frequency words were defined as words that 50-60% of the 13 and 14 year old hearing-impaired students would know. Walters suggests that to read printed materials a 66% word accuracy rate is required. If this suggested percentage is considered as a criterion for selecting vocabulary within the ability range of an average 13 or 14 year-old hearing-impaired student then

only a few hearing-impaired students could meet the 66% criterion for words at a word frequency level of 2,000 or beyond (Walters, 1978). Although this word level of 2,000 is a high-frequency level for hearing students, it would, however, become a "low frequency" word level for hearing-impaired students who may only know less than 50% of the words in that frequency level. Unknown words, regardless of frequency level, are unusable to any student. Therefore, to be certain that the words to be used in this study were within the vocabulary ability of the subjects, "low frequency" was selected to be within the ranks of 1400-1600 of the most frequently occurring words in English print.

In contrast, low frequency words for hearing students at the age of 13 or 14 would be at the 20,000 word frequency level as reported by Walters. At this frequency of 20,000, 13 and 14 year-old hearing students scored at approximately a 70% word knowledge level.

Of the words assigned high frequency range (ranks 300-500) and the assigned low frequency range (ranked 1400-1600) further selection for test words was made by considering imagery characteristics of the nouns in the chosen ranks. Approximately 25 words of high imagery value and approximately 25 words of low imagery value were selected from the high frequency rank. From the assigned low frequency rank 25 words of high imagery and 25 words of low imagery value were also selected. Thus a list of 100 nouns of varying degrees of imagery and frequency was compiled.

3. Imagery levels were initially determined by a panel of graduate students knowledgeable in the field of linguistics. To further check the ratings of the graduate students, 5 hearing-impaired adults were asked to rate the selected nouns for imagery or the ability to get a mental picture of the word. These adults were students at the Tennessee School for the Deaf and were 18-21 years of age. They were given directions similar to the original directions suggested by Paivio (1968) in the study of the imagery rating of 925 nouns. Only 4 nouns were chosen from Paivio's list of nouns because the majority of the nouns he rated were determined to be beyond the lexical abilities of the hearing-impaired students who were to participate in this study. The four nouns that were selected to be used were included to establish rater reliability. The hearing-impaired adult raters did rate those four nouns as being high and low in imagery value, as did Paivio's subjects in the original rating study.

The form used to rate the 100 nouns by the hearing-impaired adults was similar to the one used by Paivio. The raters were asked to mark out any word that was unknown to them, however, none of the raters marked any of the words out.

In addition to the imagery rating, the entire word list was screened by two teachers of the hearing-impaired. The teachers worked closely with the students who participated in the study. Words which the teachers felt were too difficult or unknown to their students were marked off the list. Seventeen words were marked out by the

teachers. Most of the words judged to be too difficult for the subjects were low imagery words of high and low frequency. The majority of the words (approximately ten) dropped from the imagery rating package were low frequency and low imagery nouns.

4. The final selection of the 32 words for the study was made by choosing 8 words of:

- high frequency and high imagery
- high frequency and low imagery
- low frequency and high imagery
- low frequency and low imagery

The final selection of words was determined by choosing those words most likely to be within the word knowledge ability of the subjects. Also, the determination of high and low imagery levels of the nouns was based on the judgement of the raters. The raters were very consistent in the determination of high imagery words. Most of those being rated as high imagery were rated as 6 or 7 on a scale of 1 to 7. However, some of the hearing-impaired raters gave a rating of 5 to those words the hearing raters rated as being low imagery with a rating of 1 or 2. (Bonvillian (1983) used high imagery words as those being 4.99 or less.) This seems to indicate that hearing-impaired raters are much more sensitive to mental pictures or mental images that may be formed in response to the printed noun than the hearing raters. Also, several of the hearing-impaired raters did not use many middle ratings of the nouns; for them it was either low imagery (1 or 2) or high imagery (7).

Procedure

The subjects chosen for the study were screened from the responses to the letters of consent sent to the parents. Of those who agreed to allow their children to participate, the language teacher further excluded those students she felt did not have sufficient skills in reading and language to fully participate in the study.

The students were tested in two groups during the language period of the school day. The students were asked to sign consent forms if they wanted to participate in the study. The directions for participating in the recall of vocabulary were signed to them by the language teacher. She also answered their questions about the consent forms and the study task.

Each student who agreed to participate in the study was given a response booklet that had 4 pages. One page was given for each word list and was numbered at the top (for example, page 1 would read List 1) and each page was numbered 1 to 8 down the left margin. The students could record their responses to each word list in any order.

Each word on each word list was hand printed onto an overhead projector transparency. Each word was shown one at a time and was presented at the rate of 5 seconds per word. After being shown one word list of eight words, displayed individually for five seconds, the students were given 1 minute for written recall. A transparency

with the word "READY" was used to signal the end of the recall period and the beginning of a new list. Two words from each word type category (high imagery-low frequency, low imagery-high frequency, high imagery-low frequency and low imagery-low frequency) were combined to make one list of eight words. Each student was given all four lists of words and a total of 32 words to recall. Table I illustrates how each word list was developed according to word type characteristics.

Table I. Word Lists for Tests of Vocabulary Controlled for Imagery and Frequency

Word Type	List 1	List 2	List 3	List 4
High imagery and High frequency (TOTAL = 8 words)	2 words	2 words	2 words	2 words
High imagery and Low frequency (TOTAL = 8 words)	2 words	2 words	2 words	2 words
Low imagery and High frequency (TOTAL = 8 words)	2 words	2 words	2 words	2 words
Low imagery and Low frequency (TOTAL = 8 words)	2 words	2 words	2 words	2 words
	8 words	8 words	8 words	8 words
TOTAL (for all four word lists) = 32 words				

CHAPTER IV

RESULTS OF THE STUDY

The test score results were statistically analyzed using the SAS statistical language. Each subject's score in recall of vocabulary type (1 - High frequency and high imagery; 2 - High frequency and low imagery; 3 - Low frequency and high imagery; 4 - Low frequency and low imagery) was the basis for the computer statistical analysis. A one way repeated measures analysis of variance (word type by subject) was conducted. The overall main effect of word type was significant ($F = 3.31, p < .05$) as is reported in Table II. The means for the word types are listed in Table III.

To locate the significant differences the Duncan's new multiple range test analyzed each pair of means to statistically determine if the two means are significantly different from the other. The following comparisons were made using the Duncan's new multiple range test:

H_4 : There is no significant difference between words with highimagery and high frequency and words with low imagery and high frequency (1 X 3: see Table IV).

The means were significantly different ($F = 6.99, p < .05$) which demonstrate that the hypothesis was rejected.

H_5 : There is no significant difference between words with high frequency and high imagery and words with low frequency and high imagery (1 x 2).

Table II. Analysis of Variance Summary for Scores as a Function of Imagery and Frequency Type

Source	DF	MS	F
Word Type	3	5.710	3.319*
Subject	14		
Subject & Word Type	42	1.72	

*p < .05.

Table III. Descriptive Statistics for Word Types

Word Type	Mean
1. High Frequency - High Imagery	6.067
2. High Frequency - Low Imagery	4.733
3. Low Frequency - High Imagery	4.800
4. Low Frequency - Low Imagery	5.33

Table IV. Duncan's New Multiple Range Test

Comparisons	Mean	F
1 x 3		6.99*
1 = High imagery/high frequency	6.0667	
3 = Low imagery/high frequency	4.8000	
1 x 2		7.75*
1 = High imagery/high frequency	6.0667	
2 = High imagery/low frequency	4.7333	
3 x 4		
3 = Low imagery/high frequency	4.8000	
4 = Low imagery/low frequency	5.3333	
2 x 4		
2 = High imagery/low frequency	4.7333	
4 = Low imagery/low frequency	5.3333	
1 x 4		
1 = High imagery/high frequency	6.0667	
4 = Low imagery/low frequency	5.3333	
2 x 3		
2 = High imagery/low frequency	4.7333	
3 = Low imagery/high frequency	4.8000	

*p < .05.

The means were significantly different ($F = 7.75, p < .05$) which demonstrates that the hypothesis was rejected.

H_6 : There is no significant difference between words with low imagery and high frequency and words with low imagery and low frequency (3 x 4).

The means in this comparison were not significantly different ($F = 1.24, p > .05$) hence the hypothesis was not rejected.

H_7 : There is no significant difference between words with low frequency and high imagery and words with low frequency and low imagery (2 vs 4).

The means in this comparison were not significantly different ($F = 1.57, p > .05$) hence the hypothesis was not rejected.

H_8 : There is no significant difference between words with high imagery and high frequency and low imagery and low frequency (1 x 4).

The means in this comparison were not significantly different ($F = 2.34, p > .05$) hence the hypothesis was not rejected.

H_9 : There is no significant difference between words with high imagery and low frequency and low imagery and low frequency (2 x 3).

The means in this comparison were not significantly different ($F = .02, p > .05$).

Descriptive Statistics

Frequency distributions. The pattern of scores as shown by the frequency distribution supports the results of the previous analysis. The frequency distribution for high imagery and high frequency words showed 66% of the subjects recalling 6 or 7 of the 8 high imagery and high frequency words within the word lists. This distribution supports the significant interaction found earlier. In contrast, of the high imagery and low frequency words, the frequency distribution indicates that 60% of the subjects recalled only 4 or 5 of the words within that category type. This also supports the suggestion of the previous analysis of variance that imagery alone does not have significant effect. However, high imagery combined with high frequency does make a significant difference in the number of words recalled.

In the pattern of scores as shown in the frequency distribution for high imagery words alone, those scores were not significantly different than the low imagery scores. The scores suggest a tendency for high imagery words to be more readily recalled because 79% of the subjects recalled between 10 and 14 words. However, only 51% of the subjects recalled between 10 and 14 words of the low imagery type. Uneven distribution of scores within the high imagery and low imagery frequency distributions prevents a significant effect for imagery characteristics alone. High frequency and high imagery scores distribution was more normal than the other distributions

of high imagery and low frequency or low imagery and low frequency. This supports the interaction hypothesis stated previously that high frequency characteristics combine with high imagery characteristics in a significant way.

Correlation Coefficients. There is a significant correlation of .78 ($p < .05$) between high imagery and high frequency words. The other significant correlation is a correlation of .69 between high frequency and low imagery words that is suggestive of the strong effects of frequency on word recall.

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Summary

This study was designed to compare the effects of imagery and frequency on the recall of words. Word lists were developed by the researcher (4 lists of 8 words controlled for imagery and frequency and matched for number of letters in words within each list) and students at the Tennessee School for the Deaf participated in the recall activity. Analysis of the scores on the recall test suggest certain characteristics may be more helpful than other characteristics in teaching vocabulary.

The subjects who participated in the study were 15 hearing-impaired students ranging from 13 to 14 years of age. The subjects were in grades 5 or 6. The students were screened by several teachers at the Tennessee School for the Deaf and the language and reading skills of the subjects were judged to be adequate for the recall activity by the language teacher.

The completed data were analyzed by a computer statistical program (SAS, citation) and a one-way repeated measures ANOVA was computed. Duncan's new multiple range test was used to determine the location of significance of difference among the various levels of frequency and imagery.

Conclusions

A significant interaction of the main effects was further analyzed by the use of Duncan's new multiple range test. A significant difference between words of high imagery and high frequency and words of low imagery and high frequency was found (1 x 3). For example, if a teacher had a list of words from a curriculum area, these data would suggest that the teacher should select those words of high imagery and high frequency first, over the words that are of low imagery yet high frequency. This significance may indicate imagery as a factor to consider in vocabulary selection.

The significant difference of high frequency and high imagery words and low frequency and high imagery words (1 x 2) suggests that frequency may also be a consideration in vocabulary instruction. The more frequently occurring words may be more easily taught than those at a lower frequency level. This significance of high frequency and high imagery suggests that imagery in combination with frequency may offer teachers another method of vocabulary selection.

Implications

These data findings may suggest the importance of imagery consideration in vocabulary instruction. However, the slightly higher recall of words of low imagery and low frequency characteristics may imply that the "low frequency" selection of the words for the recall task may not have been low enough. It is possible that the low frequency level should have been the 2,000th word frequency level.

However, the fact that the students knew these low frequency words in this study strengthens the findings of this study. If too many of the words in the low imagery lists were unknown the results would have been falsely more suggestive of the imagery and frequency effects. If the low imagery and low frequency words were unknown to the subjects they would have omitted the words from the test not because of the effects of imagery and/or frequency but instead, because the words were simply not within the subjects' vocabulary and reading level. Thus, the results of the effects of imagery and frequency have not been confounded by the effect of the subjects simply not knowing the test words.

This may suggest that words beyond the 2,000 frequency level be carefully considered by teachers of the hearing-impaired. The final selection of low imagery and low frequency words for this study was made from a smaller number of possibilities because many of the low imagery and low frequency words were marked by the teachers as possibly being unknown to the students. Perhaps the low imagery-low frequency words chosen for the study were in fact too familiar to the subjects. The results suggest that low imagery and low frequency words may be particularly difficult for hearing-impaired students. However, these results might have been more strongly suggestive of the effects of low imagery and low frequency on the recall of word if those particular type words were not so carefully selected as being within the students' lexical abilities.

Also, some of the easier high imagery and high frequency words that this researcher felt should not have been missed were in fact missed by almost all of the subjects. (For example, numbers was a high imagery and high frequency test word that was missed by most of the students.) While some of the most difficult words in the low imagery and low frequency list (for example, height) was recalled by almost all the students. Other low imagery and low frequency words recalled by most subjects were peace, leader, and chapter. These results for low imagery and low frequency words may also have occurred because of many years of specialized vocabulary instruction by teachers of the hearing-impaired. Since vocabulary instruction is specifically taught and planned for hearing-impaired students, from a young age, they did well on the low imagery words because of the specific vocabulary instruction they receive in school. Yet, some of the more easy words of high frequency were missed by many of the students indicating a gap in word knowledge.

Limitations. Several noticeable limitations should be considered in interpreting the results:

1. The small number of students/subjects limit the ability to generalize about the results.
2. Imagery and/or association tendencies in hearing-impaired students was indicated by the over-rating of many nouns that hearing raters clearly rated as low in imagery. The hearing-impaired raters were highly consistent and accurate in ratings of high imagery words

but very few rated low imagery words with a 1 or 2 (on a scale of 7) as the hearing raters did. This suggests a greater effect of imagery for hearing-impaired raters.

3. The subjects did not have to demonstrate knowledge of the test words in any other way than recall. This study does not attempt to make inferences about the subject's ability to use the test words in conversation or in any other form, such as in the ability to define the words, read or comprehend them. Recalling them does not suggest expressive use of these words.

Suggestions for Further Research

1. Similar studies might be directed to determine the way words are rated for imagery value by hearing-impaired students. Low imagery words in particular might be studied.

2. Research efforts may be directed towards establishing low frequency levels for hearing-impaired students at older ages.

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APPENDIX

APPENDIX A*

Instructions

Nouns differ in their capacity to arouse mental images of things or events. Some words arouse a sensory experience such as a mental picture or sound, very quickly and easily, whereas others may do so only with difficulty (i.e., after a long delay) or not at all.

The purpose of this study is to rate a list of words as to the ease or difficulty with which they arouse mental images. Any word which, in your estimation, arouses a mental image (i.e., a mental picture, or sound, or other sensory experience) very quickly and easily should be given a high imagery rating; any word that arouses a mental image with difficulty or not at all should be given a low imagery rating. "Apple" would elicit an image relatively easily and would be rated as high imagery; "fact" would probably do so with difficulty and would be rated as low imagery. Since words tend to make you think of other words as associates, e.g., knife-fork, it is important that you note only the ease of getting a mental image of an object or an event to the word.

Your ratings will be made on a seven-point scale, where one is the low imagery end of the scale and seven is the high imagery

*Imagery rating scales as developed by Paivio, Yuille and Madigan (1968). Instructions and scale design from Paivio, et al., 1968.

end of the scale. Make your rating by putting a circle around the number from 1 to 7 that best indicates your judgement of the ease or difficulty with which the word arouses imagery. The words that arouse mental images most readily for you should be given a rating of 7; words that arouse images with the greatest difficulty or not at all should be rated 1; words that are intermediate in ease or difficulty of imagery, of course, should be rated appropriately between the two extremes.

Feel free to use the entire range of numbers, from 1 to 7;
at the same time, don't be concerned about how often you use a particular number as long as it is your true judgement.

Work fairly quickly but do not be careless in your rating. Below are four examples. Indicate the ease of getting an image by circling the appropriate number.

CITY	Low imagery	1	2	3	4	5	6	7	High imagery
SOUL	Low imagery	1	2	3	4	5	6	7	High imagery
EGO	Low imagery	1	2	3	4	5	6	7	High imagery
MEADOW	Low imagery	1	2	3	4	5	6	7	High imagery

If necessary, refer back to these instructions when rating the words on the following pages. If there are any questions, ask them now. Otherwise, turn the page and begin.

SPACE	Low imagery	1	2	3	4	5	6	7	High imagery
IDEA	Low imagery	1	2	3	4	5	6	7	High imagery
HANDS	Low imagery	1	2	3	4	5	6	7	High imagery
PLACES	Low imagery	1	2	3	4	5	6	7	High imagery
LETTERS	Low imagery	1	2	3	4	5	6	7	High imagery
DOG	Low imagery	1	2	3	4	5	6	7	High imagery
FIRE	Low imagery	1	2	3	4	5	6	7	High imagery
TOWN	Low imagery	1	2	3	4	5	6	7	High imagery
PERSON	Low imagery	1	2	3	4	5	6	7	High imagery
STATE	Low imagery	1	2	3	4	5	6	7	High imagery
LIST	Low imagery	1	2	3	4	5	6	7	High imagery
VOICE	Low imagery	1	2	3	4	5	6	7	High imagery
BIRDS	Low imagery	1	2	3	4	5	6	7	High imagery
AREA	Low imagery	1	2	3	4	5	6	7	High imagery
SUMMER	Low imagery	1	2	3	4	5	6	7	High imagery
MOON	Low imagery	1	2	3	4	5	6	7	High imagery
ANIMAL	Low imagery	1	2	3	4	5	6	7	High imagery
MIND	Low imagery	1	2	3	4	5	6	7	High imagery
POWER	Low imagery	1	2	3	4	5	6	7	High imagery
PROBLEM	Low imagery	1	2	3	4	5	6	7	High imagery
WINTER	Low imagery	1	2	3	4	5	6	7	High imagery
MOUNTAINS	Low imagery	1	2	3	4	5	6	7	High imagery
GAME	Low imagery	1	2	3	4	5	6	7	High imagery
SYSTEM	Low imagery	1	2	3	4	5	6	7	High imagery

WATCH	Low imagery	1	2	3	4	5	6	7	High imagery
PERSONS	Low imagery	1	2	3	4	5	6	7	High imagery
HANDLE	Low imagery	1	2	3	4	5	6	7	High imagery
ANGLE	Low imagery	1	2	3	4	5	6	7	High imagery
LEADER	Low imagery	1	2	3	4	5	6	7	High imagery
PEACE	Low imagery	1	2	3	4	5	6	7	High imagery
CHAPTER	Low imagery	1	2	3	4	5	6	7	High imagery
PLATE	Low imagery	1	2	3	4	5	6	7	High imagery
SCORE	Low imagery	1	2	3	4	5	6	7	High imagery
BEACH	Low imagery	1	2	3	4	5	6	7	High imagery
BOWL	Low imagery	1	2	3	4	5	6	7	High imagery
NEWSPAPER	Low imagery	1	2	3	4	5	6	7	High imagery
VIEW	Low imagery	1	2	3	4	5	6	7	High imagery
SOURCE	Low imagery	1	2	3	4	5	6	7	High imagery
DETAILS	Low imagery	1	2	3	4	5	6	7	High imagery
MUSCLES	Low imagery	1	2	3	4	5	6	7	High imagery
MODEL	Low imagery	1	2	3	4	5	6	7	High imagery
CLIMATE	Low imagery	1	2	3	4	5	6	7	High imagery
HORSE	Low imagery	1	2	3	4	5	6	7	High imagery
INDIANS	Low imagery	1	2	3	4	5	6	7	High imagery
SOUNDS	Low imagery	1	2	3	4	5	6	7	High imagery
BOX	Low imagery	1	2	3	4	5	6	7	High imagery
CLASS	Low imagery	1	2	3	4	5	6	7	High imagery
SURFACE	Low imagery	1	2	3	4	5	6	7	High imagery
RIVER	Low imagery	1	2	3	4	5	6	7	High imagery

NUMBERS	Low imagery	1	2	3	4	5	6	7	High imagery
GIRLS	Low imagery	1	2	3	4	5	6	7	High imagery
PAST	Low imagery	1	2	3	4	5	6	7	High imagery
BALL	Low imagery	1	2	3	4	5	6	7	High imagery
ROAD	Low imagery	1	2	3	4	5	6	7	High imagery
MEANING	Low imagery	1	2	3	4	5	6	7	High imagery
FRIENDS	Low imagery	1	2	3	4	5	6	7	High imagery
DESK	Low imagery	1	2	3	4	5	6	7	High imagery
STORM	Low imagery	1	2	3	4	5	6	7	High imagery
EARTH	Low imagery	1	2	3	4	5	6	7	High imagery
SMOKE	Low imagery	1	2	3	4	5	6	7	High imagery
TRACK	Low imagery	1	2	3	4	5	6	7	High imagery
LAWS	Low imagery	1	2	3	4	5	6	7	High imagery
STRUCTURE	Low imagery	1	2	3	4	5	6	7	High imagery
HEIGHT	Low imagery	1	2	3	4	5	6	7	High imagery
CLOCK	Low imagery	1	2	3	4	5	6	7	High imagery
PLANES	Low imagery	1	2	3	4	5	6	7	High imagery
PLANS	Low imagery	1	2	3	4	5	6	7	High imagery
BARN	Low imagery	1	2	3	4	5	6	7	High imagery
TONE	Low imagery	1	2	3	4	5	6	7	High imagery
TOOLS	Low imagery	1	2	3	4	5	6	7	High imagery
ROOT	Low imagery	1	2	3	4	5	6	7	High imagery
WAGON	Low imagery	1	2	3	4	5	6	7	High imagery
BASEBALL	Low imagery	1	2	3	4	5	6	7	High imagery
SYMBOL	Low imagery	1	2	3	4	5	6	7	High imagery

WINDOWS	Low imagery	1	2	3	4	5	6	7	High imagery
MILE	Low imagery	1	2	3	4	5	6	7	High imagery
FORESTS	Low imagery	1	2	3	4	5	6	7	High imagery
FENCE	Low imagery	1	2	3	4	5	6	7	High imagery
MAPS	Low imagery	1	2	3	4	5	6	7	High imagery
ISLANDS	Low imagery	1	2	3	4	5	6	7	High imagery
CHART	Low imagery	1	2	3	4	5	6	7	High imagery
SHEET	Low imagery	1	2	3	4	5	6	7	High imagery
ART	Low imagery	1	2	3	4	5	6	7	High imagery
BOTTLE	Low imagery	1	2	3	4	5	6	7	High imagery
MONEY	Low imagery	1	2	3	4	5	6	7	High imagery
CAR	Low imagery	1	2	3	4	5	6	7	High imagery
BODY	Low imagery	1	2	3	4	5	6	7	High imagery
FACE	Low imagery	1	2	3	4	5	6	7	High imagery
DOOR	Low imagery	1	2	3	4	5	6	7	High imagery
GROUP	Low imagery	1	2	3	4	5	6	7	High imagery
FISH	Low imagery	1	2	3	4	5	6	7	High imagery
PLANTS	Low imagery	1	2	3	4	5	6	7	High imagery
BOOK	Low imagery	1	2	3	4	5	6	7	High imagery
GROUND	Low imagery	1	2	3	4	5	6	7	High imagery
LINES	Low imagery	1	2	3	4	5	6	7	High imagery
TABLE	Low imagery	1	2	3	4	5	6	7	High imagery
TREE	Low imagery	1	2	3	4	5	6	7	High imagery
COURSE	Low imagery	1	2	3	4	5	6	7	High imagery
AIRPLANE	Low imagery	1	2	3	4	5	6	7	High imagery
METHODS	Low imagery	1	2	3	4	5	6	7	High imagery

Word ListsHigh frequency - High imagery

book
fire
table
hands
plants
winter
indians
numbers

High frequency - Low imagery

idea
past
space
power
system
places
meaning
problem

Low frequency - High imagery

barn
desk
wagon
fence
smoke
planes
forests
windows

Low frequency - Low imagery

mile
laws
peace
plans
score
leader
height
chapter

VITA

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