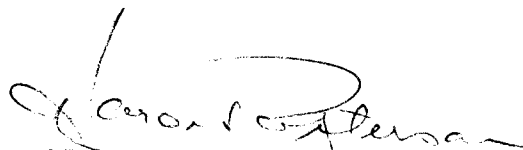


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A COMPARISON OF SPEED AND ACCURACY OF WORD RETRIEVAL
IN GERIATRIC AND YOUNGER ADULT SPEAKERS

A Thesis
Presented for the
Master of Arts
Degree
The University of Tennessee, Knoxville

Marita Christine Manakkil
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ABSTRACT

The purpose of this study was to investigate differences between geriatric and younger adult speakers in accuracy and speed of word retrieval on two tests of word retrieval, which differed by commonality of words. The subjects, grouped by age, demonstrated adequate functional hearing and vision and had no history of neuropathology or diagnosis of dementia by self report. The older subjects were also identified as mobile and socially active.

The results did not indicate any significant age differences in accuracy or speed of word retrieval, but significant differences between tests were found. A moderate correlation between speed of retrieval and receptive vocabulary size was also indicated.

The findings of this study suggested that although the difference in mean scores was not significant, the individual subject data indicated more variation in both speed and accuracy for the older subjects in comparison with the younger subjects. The comparison of test differences implied that common words were retrieved more efficiently than less frequently occurring words. The relationship between receptive vocabulary and speed of word retrieval was also discussed.

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CHAPTER I

INTRODUCTION

The growing number of people sixty-five and older has generated an interest as well as a need for identifying and describing the geriatric population (Jacobs-Condit, 1984; Warner-Schaie, 1980). Current research has specifically emphasized defining characteristics of the "normal" elderly. This involves documenting the normal life span changes of individuals as a means of differentiating between normal and pathological changes (Ulatowska, Cannito, Hayashi, and Fleming, 1985). Such documentation involves "identifying functions that develop, remain stable, and decline throughout the life span" (Davis, 1984, p. 81).

Much of the literature has reported a general slowing of cognitive processes with age. Davis (1984), for example, discussed changes in sensory function, physiological function, and memory as probable contributing factors to this slowing. Possible changes in language function have also been attributed to this slowing of cognitive processes, and there is an interest in determining the areas of linguistic performance in which this process has an impact, particularly in relation to

linguistic accuracy and efficiency (Davis, 1984; Ulatowska, Cannito, Hayashi, and Fleming, 1985).

Language function as it relates to general communication skill can be viewed in terms of efficiency of communication. Analysis of connected speech samples of young adult and geriatric speakers has indicated that geriatric speakers are less efficient communicators with respect to the amount of information they convey per content unit of speech, as well as the rate at which they convey the information (Yorkston and Beukelman, 1980). Such findings indicate a possible decline in language facility. This decrease in information conveyed suggests a loss in the amount of language available to a geriatric individual. Verbal fluency tests utilizing word association tasks have reported that older adults give fewer responses than younger adults implying less available language (Burke and Light, 1981). Vocabulary has also been used to quantitatively measure changes in the language abilities of the aged (Obler, 1985).

The decrease in the rate at which information is conveyed by elderly speakers suggests that a loss in language facility could be related to the ability to access the language that is available to the speaker, specifically in terms of the speed and accuracy of word retrieval. Studies have reported increased response time in older

adults on both linguistic and nonlinguistic tasks (Rastatter and Lawson-Brill, 1987; Riegel and Birren, 1965; 1966; 1967).

One way to investigate the differences in language facility of geriatric and younger adult speakers is through receptive vocabulary level and the speed and accuracy of word retrieval.

Review of Literature

The literature relevant to this study is reported under the headings of vocabulary and word retrieval.

Vocabulary

The question of whether vocabulary ability is maintained throughout the life span is unresolved. Sorenson (1933) and Christian and Paterson (1936) reported no loss in vocabulary in the over-sixty age range. In contrast, Shakow and Goldman (1938) utilized fifty words from the Stanford-Binet list to assess the vocabulary level of subjects aged eighteen to ninety years. They reported a slow decline in vocabulary ability beyond the age of sixty.

A study by Fox (1947) compared the performance of subjects between the ages of forty and forty-nine years with that of subjects between the ages of seventy and

seventy-nine years on a multiple choice vocabulary recognition task and definition test. They estimated that the average size of total vocabulary was essentially the same for both groups. No differences in the relative quality of definition responses were found between the two age groups and no decline with increasing age was noted.

Botwinick and Storandt (1974) administered the Wechsler Adult Intelligence Scale to a group of young adults, aged seventeen to twenty years, and a group of older adults, aged sixty-two to eighty-three years. A quantitative scoring system did not indicate any age related differences. However, a qualitative analysis that differentiated among levels of good performance, levels of poor performance, and types of errors did show an age pattern in relation to types of responses. The younger subjects responded more frequently with superior synonyms and less frequently with poor explanations than their older counterparts. These results failed to support the generalization that vocabulary ability is maintained through adult life.

A follow-up study conducted by Botwinick, West, and Storandt (1975) that utilized similar procedures, replicated these results in terms of qualitative vocabulary differences. However, no interaction between age and qualitative scoring procedures was found. This

failed to support the idea of a decrement in qualitative responses with regard to age.

Word Retrieval

Word retrieval abilities have been investigated using a variety of procedures. Thomas, Fozard, and Waugh (1977) assessed the effects of age on the speed of word retrieval for pictured common objects with adult males ranging in age from twenty-five to seventy-four years. The older subjects demonstrated a significantly longer naming latency than the younger subjects. This difference was minimized with practice and cueing of the objects' names but the subjects' performances did not interact with effects of word frequency.

A study by Bowles and Poon (1981) investigated the effect of aging on the speed of lexical access, which was defined as the locating of words in the internal lexicon. Subjects were asked to identify a series of letter strings as real or nonsense words utilizing a button response box. Statistical analysis indicated significant effects of both aging and word frequency on response latency, but no age related differences in the accuracy of performance were observed. The older subjects required a longer response time and as expected, high-frequency words were identified faster than low-frequency words. No significant interaction was found between the age and word frequency

variables suggesting that the age differences in response time were due to differences in sensorimotor processing time rather than the speed of lexical access.

The speed and accuracy of lexical access in younger and older adults of high and low educational levels were assessed with word pair tasks in which subjects were asked to decide whether two words were the same, independent of the style of printing (Petros, Zehr, Chabot, 1983). The test data indicated that the younger adults responded faster than the older adults, that positive responses to the test stimuli occurred faster than negative responses, and that highly typical word pairs were responded to more quickly than less typical word pairs. However, no differences between the two age groups in the accuracy of responses were reported and effects related to the subjects' educational levels were not found to be significant.

A related study by Bowles and Poon (1985) utilized a similar lexical decision task involving identification of stimuli as words or non-words. No significant differences between younger and older subject groups in either accuracy or response latency were observed for this task. In a secondary study, word retrieval was assessed with these same subjects using a naming-by-semantic-description task. Older adults had significantly fewer successful retrievals

and demonstrated higher response latencies despite achieving higher vocabulary levels than the younger adults. This age-related deficit was related to differences in the ability to access the lexical network in word retrieval.

Several studies have utilized the experimental edition of The Boston Naming Test (Kaplan, Goodglass, and Weintraub, 1978) to investigate the accuracy of word retrieval of various subject groups. Normative data collected on the test on 147 neurologically unimpaired adult males showed that age and educational differences between the subjects produced significant differences in performance that favored the younger aged groups and the more highly educated groups (Borod, Goodglass, and Kaplan, 1980).

Goodglass (1980) reported on additional studies using this test instrument. The results indicated that by the age of ten-and-one-half years, children were within the adult naming range but that past the age of sixty, some subjects' naming scores fell to levels below those of the young children included in the study. Elderly women living in nursing homes were compared to those living in the community on the same test. The community dwelling group achieved the same mean score as that obtained by the male subjects in the original normative data reported above. The institutionalized group scored lower. Both groups were superior to aphasic subjects in object naming,

but achieved similar scores to the aphasics in retrieval of proper names. It was suggested that this result was indicative of a selective deficit for people's names in the elderly.

LaBarge, Edwards, and Knesevich (1986) examined the performance of male and female noninstitutionalized subjects aged sixty to eighty-five years on the same experimental edition of The Boston Naming Test. The results from the testing as presented in five-year age groupings showed a decrease in scores as age increased. Correlations between the test scores and the sex and educational level of the subjects were judged to be not significant.

Several additional factors influencing the accuracy and speed of word retrieval have been investigated. The response latency of younger and older adults in a printed word association task was examined by Riegel and Birren (1965). The older subjects had significantly higher response latencies and a greater variability of responses with continuation of the task than the younger subjects. In addition, an inverse relationship between word frequency and response latencies was found but no differential age effects were observed. Analysis of the results by grammatical classification showed the smallest age differences in latency were for adjectives, with increasing

differences for concrete nouns, verbs, and abstract nouns.

Poon and Fozard (1978) examined naming latency in three adult age groups to determine if speed of word retrieval was influenced by the datedness and familiarity of the objects to be named. Utilizing a picture naming design, the authors found that the familiarity of the pictured objects was the major determinant of the required retrieval time for all of the subjects. The older subjects named dated unique objects with less time than the younger subjects while the younger subjects showed the same tendency for the unique contemporary objects. A middle aged group performed at a level between the other two groups for common contemporary objects. It was concluded that differences in naming latency were dependent on inter-age group familiarity with the test stimuli, frequency of use, and the uniqueness and datedness of the stimuli.

Obler (1985) reported on a study conducted by Obler, Nicholas, Albert, and Goodglass (forthcoming) that looked at strategies of lexical access in younger and older adults. It was noted that in both groups there was no difference among different word classes in that the same patterns of lexical access were found for verbs, common nouns, and proper nouns. Obler (1985) concluded that the structure of the inner lexicon did not appear to change with advanced age such that access for comprehension was maintained but that access for production may change.

Summary

The studies cited have reported inconsistent results concerning changes in language facility with advanced age. In relation to vocabulary, Sorenson (1933), Christian and Paterson (1936), and Fox (1947) failed to find an age related decline in vocabulary. Shakow and Goldman (1938), however, reported a decrease in vocabulary beyond the age of sixty. Botwinick and Storandt (1974) found no quantitative differences in vocabulary between younger and older adults, but their results indicated qualitative differences in definition responses.

The results from studies regarding word retrieval have also been inconsistent. Borod, Goodglass, and Kaplan (1980), Goodglass (1980), Bowles and Poon (1985) and LaBarge, Edwards, and Knesevich (1986) reported age differences in accuracy of word retrieval on The Boston Naming Test (Kaplan, Goodglass, and Weintraub, 1978). In contrast, Bowles and Poon (1981;1985) and Petros, Zehr, and Chabot (1983) did not find any age related differences.

Response time for word retrieval was reported to be significantly longer for geriatric subjects in studies by Riegel and Birren (1965) Thomas, Fozard, and Waugh (1977), Bowles and Poon (1981; 1985), and Petros, Zehr, and Chabot (1983). A study conducted by Bowles and Poon (1985)

utilizing a lexical decision task did not, however, support these findings.

The effect of word frequency on the speed of word retrieval has been investigated. Several studies (Riegel and Birren, 1965; Poon and Fozard, 1978; Bowles and Poon, 1981; Petros, Zehr, and Chabot, 1981) reported significant effects of word frequency. A study conducted by Thomas, Fozard, and Waugh (1977) did not find any such interaction.

Statement of the Problem

Communicative efficiency of the elderly as it relates to language facility involves both the availability of language and the ability to access that language. Vocabulary size (receptive recognition) and word retrieval (the ability to access expressive vocabulary) have both been studied in an effort to identify changes in language facility with age.

A review of the literature has not conclusively supported the generalization of an age related decline in vocabulary ability, but has generally indicated a decrease in both the speed and accuracy of word retrieval for the geriatric population. Research, however, is limited in terms of investigating a possible relationship between receptive vocabulary level and efficiency of word retrieval.

Efficiency of word retrieval, in terms of both accuracy and speed, has been shown to be influenced by the frequency of occurrence or commonness of the specific vocabulary word. One test of word retrieval, the Test of Word Finding (TWF) (German, 1986), assesses both speed and accuracy of word retrieval in children. It consists of common, frequently occurring vocabulary words expected to be acquired by the sixth grade.

The Boston Naming Test (BNT) (Kaplan, Goodglass, and Weintraub, 1983), designed to detect word retrieval problems, has been utilized in previous studies to investigate changes in the geriatric population's ability to access language. Consisting primarily of less frequently occurring words, it was not designed to differentiate between the efficiency of word retrieval for vocabulary of different levels of difficulty. It has previously been used only for measuring accuracy of word retrieval.

As performance on these word retrieval tasks has been assumed to be age related, and possibly related to overall receptive vocabulary, the following experimental questions were proposed:

- 1) Is there a significant difference between geriatric and younger adult speakers in accuracy of word retrieval on two tests of word retrieval, the BNT and the TWF?

- 2) Is there a significant difference between the BNT and the TWF in accuracy of word retrieval for geriatric and younger adult speakers?
- 3) Is there a significant difference between geriatric and younger adult speakers in speed of word retrieval on two tests of word retrieval, the BNT and the TWF?
- 4) Is there a significant difference between the BNT and TWF in speed of word retrieval for geriatric and younger adult speakers?
- 5) Are there significant correlations between receptive vocabulary scores on the Peabody Picture Vocabulary Test-Revised (PPVT-R) (Dunn and Dunn, 1981) and the speed of word retrieval on the TWF for geriatric and younger adult speakers?
- 6) Are there significant correlations between receptive vocabulary scores on the PPVT-R and the speed of word retrieval on the BNT for geriatric and younger adult speakers?

CHAPTER II

PROCEDURES

Subjects

Two groups of subjects, each composed of twelve adult males, were employed in this study. The subjects in one group ranged in age from sixty-four to seventy-four years and the other group ranged in age from thirty-five to fifty years. All of the subjects were volunteers from the community from either a local senior citizens center or church, or from a local firehall. They met the following criteria: 1) demonstrated adequate functional hearing for the tasks required in this study as determined by their performance on the Peabody Picture Vocabulary Test-Revised (Form L) (Dunn and Dunn, 1981), administered in normal conversational voice; 2) demonstrated adequate functional vision as judged by the subject's ability to read a pre-test questionnaire; 3) were native English speakers; 4) achieved a standard score equivalent of at least eighty-one (third stanine) on the Peabody Picture Vocabulary Test-Revised (Form L) based on the normative data for ages 35:0 to 40:11 (Dunn and Dunn, 1981); 5) had no history of neuropathology, such as stroke, by self report; and 6) had no medical diagnosis of senile dementia

or organic brain syndrome by self report. Additionally, the older subjects were noninstitutionalized and mobile and socially active to the extent that they participated in at least one community or social function every month.

Prior to subject selection, all potential subjects were asked to answer a general background questionnaire adapted from the criteria of Butler and Lewis (1973) (see Appendix) which identified them as mobile and socially active with no history of neuropathology or diagnosis of dementia. The subjects' responses on the questionnaire were used to determine subject candidacy in accordance with the above stated criteria.

Materials

In addition to the initial questionnaire, the following tests were administered to each subject:

1) the Peabody Picture Vocabulary Test-Revised (PPVT-R), Form L (Dunn and Dunn, 1981); 2) the noun and verb picture naming sections of the Test of Word Finding (TWF) (German, 1986); and 3) the Boston Naming Test (BNT) (Kaplan, Goodglass, and Weintraub, 1983).

The PPVT-R was designed primarily as a measure of receptive vocabulary for Standard American English (Dunn and Dunn, 1981). The test was selected because it:

1) is untimed so as to test power rather than speed of receptive vocabulary; 2) provides normative data for adults; and 3) allows quick administration and objective scoring. It served as both a subject selection criterion and as an overall measure of receptive vocabulary.

The noun and verb picture naming sections of the TWF consisted of sixty stimuli including the starter items. The overall test was designed to assess speed and accuracy of word retrieval difficulties in children. It provides normative data for children ages 6:6 to 12:11. The stimulus words occur with equal frequency and are equated for seven basic semantic characteristics: concreteness, imagery, categorizability, meaningfulness, number of selected attributes, familiarity, and pleasantness. The words were selected from first through sixth grade vocabulary lists and are expected to be acquired by the sixth grade (Wiegel-Crump and Dennis, 1986). German (1986) reported that ninety-five percent of the words included in the test were receptively identified by ninety-five percent of the first and second graders and by ninety-nine percent of the third through sixth graders in the standardization sample.

The BNT was designed to detect mild word retrieval problems. Its sixty line drawn objects are graded for increasing difficulty on the basis of the frequency at which each word was missed when they were presented to a

large sample of subjects. Normative data for normal children and adults and for aphasics is available (Kaplan, Goodglass, and Weintraub, 1983).

Equipment

Each subject's responses on the TWF and the BNT were recorded on an audio cassette tape recorder (Sony, Model M1120). Retrieval times for these responses were measured from the tape recording with a stopwatch (Fisher Scientific, Model 14-649-5) in units of centiseconds.

Experimental Procedures

Each subject was tested individually. The PPVT-R (Form L) was administered initially and served as both a subject selection criterion and as an overall measure of receptive vocabulary. The test stimuli were presented and scored according to the prescribed instructions.

The stimuli for the noun and verb picture naming sections of the TWF were administered next, followed by the BNT, with the order of the two tests alternated for every other subject. In accordance with prescribed TWF instructions, the picture stimuli were sequentially presented to each subject, who was then asked to name the

picture. The examiner verbalized "NOW" as each item was presented which indicated stimulus exposure on the audiotape. If the subject failed to respond or said "I don't know" after fifteen seconds, the next item was presented. As suggested by the TWF manual, the examiner completed five practice administrations prior to any actual testing to establish fluency of presentation.

According to TWF procedures, receptive comprehension was assessed for any stimuli not correctly named. The subject was asked to identify, by pointing, the intended word from a choice of eight of the pictured stimuli.

The BNT was given according to its instructions except that responses were timed and a receptive procedure similar to that for the TWF was added for items not correctly identified expressively. The receptive testing was included to insure that failure to correctly name a picture was not due to the specific word not being in the subject's vocabulary.

The accuracy and speed of the subjects' responses were assessed for both word retrieval tests according to TWF procedures. Accuracy was scored in terms of the number of accurate word retrievals. The subjects' responses were scored as either accurate or inaccurate. An accurate response was defined as a correct first attempt to name the pictured stimuli. If a subject failed to respond, said "I don't know," or incorrectly identified the picture, the

item was scored as inaccurate. Incomplete words were not considered to be responses and self-corrections of first responses were scored as incorrect.

A cumulative retrieval time, defined as the sum of the times immediately following the verbalized "NOW" up until the instant of the subject's first response, was measured post-test for each sixty item test, utilizing the audio-recording and a stopwatch. The examiner alternately activated the stopwatch upon hearing "NOW" and deactivated it upon initiation of the subject's first response. As prescribed by the TWF procedures, if a subject failed to respond or said "I don't know" a maximum retrieval time of fifteen seconds was assigned. A response produced beyond the fifteen second limit was not included in the scoring procedures for either accuracy or speed of retrieval, but was noted for later discussion.

CHAPTER III

RESULTS

Subjects were grouped according to age and three tests were administered to each of the subjects, yielding five different scores: a receptive vocabulary score from the PPVT-R, and a speed and an accuracy score for word retrieval from both the TWF and the BNT. The PPVT-R score was reported in standard score equivalents. For the retrieval tests, the accuracy scores represented the number of test stimuli out of sixty items accurately identified on the first response. The speed of retrieval scores represented the cumulative response time for each sixty item test as measured to the nearest centisecond. The individual subjects' ages and the raw data for the younger adult group along with their respective means, ranges, and standard deviations are reported in Table 1. The mean accuracy scores for the younger subjects were 57.25 (SD = 1.82) for the TWF and 52.83 (SD = 1.58) for the BNT. The mean response times were 70.36 (SD = 12.21) for the TWF and 99.21 (SD = 27.37) for the BNT. Table 2 presents the same data for the geriatric group. The mean accuracy scores for the older subjects were 55.17 (SD = 2.52) for the TWF and 51.92 (SD = 5.82) for the BNT. The mean response times were 84.44 (SD = 16.14) for the TWF and 113.59 (SD = 43.19) for the BNT.

Table 1. Summary of individual and group data for younger adult subjects for age(years:months), Peabody Picture Vocabulary Test-Revised(PPVT-R) score, and accuracy(ac) and response time(rt) scores for the Test of Word Finding(TWF) and the Boston Naming Test(BNT).

Subject	Age	PPVT-R	TWFac	TWFr _t	BNTac	BNT _r t
1	49:04	106	56	92.01	50	96.12
2	40:01	96	59	55.46	54	45.10
3	35:02	97	59	57.47	52	111.21
4	36:05	92	58	56.27	53	125.26
5	39:01	102	60	71.20	54	118.46
6	42:10	99	57	64.40	54	78.01
7	47:00	117	58	68.29	55	79.09
8	38:06	106	59	60.06	53	76.92
9	47:11	89	55	77.04	50	145.86
10	49:06	100	56	86.08	52	122.85
11	46:02	97	55	74.17	53	96.61
12	39:10	96	55	81.83	54	95.08
Mean	42:08	99.75	57.25	70.36	52.83	99.21
Range	35:02 to 49:06	89.00 to 117.00	55.00 to 60.00	55.46 to 92.01	50.00 to 55.00	45.10 to 145.86
Standard Deviation	5:02	7.39	1.82	12.21	1.58	27.37

Table 2. Summary of individual and group data for geriatric subjects for age(year:month), Peabody Picture Vocabulary Test-Revised(PPVT-R) score, and accuracy(ac) and response time(rt) scores for the Test of Word Finding(TWF) and the Boston Naming Test(BNT).

Subject	Age	PPVT-R	TWFac	TWFr _t	BNTac	BNT _r t
13	73:03	104	55	113.13	50	185.71
14	66:04	100	57	65.99	57	62.18
15	67:01	92	50	95.51	50	132.42
16	69:03	133	59	78.77	56	86.41
17	69:06	100	56	100.91	44	112.54
18	72:01	113	55	65.83	58	76.93
19	73:10	128	54	79.36	57	79.07
20	67:03	159	58	87.40	57	85.42
21	71:01	96	54	75.80	50	137.48
22	70:10	159	57	72.75	57	70.92
23	72:01	107	55	70.94	44	158.22
24	66:07	94	52	106.85	43	175.78
Mean	69:11	115.42	55.17	84.44	51.92	113.59
Range	66:04 to 73:10	92.00 to 159.00	50.00 to 59.00	65.83 to 113.13	43.00 to 58.00	62.18 to 185.71
Standard Deviation	2:08	23.99	2.52	16.14	5.82	43.19

Reliability

The intra-examiner and inter-examiner reliability measures are reported in Tables 3 and 4.

Intra-Examiner Reliability

Intra-examiner reliability was determined by retiming the responses of four randomly selected subjects, two from each group. The examiner's initial timing measurements, subsequent retiming measurements for reliability purposes, and the differences between measurements are listed in Table 3. The differences in total time values ranged from 0.16 seconds to 1.71 seconds with the reliability values varying from 0.20 percent (percentage equals the difference between the two timings divided by initial timing and multiplied by 100) to a maximum of 2.26 percent from the initial measurements.

Inter-Examiner Reliability

Inter-examiner reliability was assessed by having an independent examiner time the four randomly selected subjects. This examiner's initial measured values and the independent examiner's measures are listed in Table 4 for comparison. The independent examiner's timing of the eight sets of responses differed by a range of 0.03 seconds to 2.58 seconds (0.04 percent to 3.4 percent; percentages

Table 3. Summary of intra-examiner measurements for word retrieval response time (initial timing and retiming) on the Test of Word Finding(TWF) and the Boston Naming Test(BNT).

Subject	Test	Initial Timing	Retiming	Difference	Difference Percentage
4	TWF	56.27	57.44	+1.17	2.08%
4	BNT	125.26	126.97	+1.71	1.36%
7	TWF	68.29	68.08	-0.21	0.31%
7	BNT	79.09	78.54	-0.55	0.70%
16	TWF	78.77	78.93	+0.16	0.20%
16	BNT	86.41	84.46	-1.95	2.26%
19	TWF	79.36	78.45	-0.91	1.45%
19	BNT	79.07	78.58	-0.49	0.62%

Note: The difference percentage equals the difference between the two timings divided by initial timing and multiplied by 100.

Table 4. Summary of inter-examiner measurements for word retrieval response time (first and second examiner) on the Test of Word Finding(TWF) and the Boston Naming Test(BNT).

Subject	Test	First Examiner	Second Examiner	Difference	Difference Percentage
4	TWF	56.27	58.16	+1.89	3.36%
4	BNT	125.26	127.84	+2.58	2.06%
7	TWF	68.29	67.97	-0.32	0.47%
7	BNT	79.09	81.35	+2.26	2.86%
16	TWF	78.77	77.79	-0.98	1.24%
16	BNT	86.41	86.70	+0.29	0.34%
19	TWF	79.36	77.02	-2.34	2.95%
19	BNT	79.07	79.10	+0.03	0.04%

Note: The difference percentage equals the difference between the two timings divided by first examiner's timing and multiplied by 100.

equal the difference between the two timings divided by initial examiner's timing and multiplied by 100) from the author's initial values.

These ranges of variability for intra-examiner and inter-examiner reliability were considered acceptable for the purpose of this study.

Statistical Analysis

An analysis of variance for repeated measures (Bruning and Kintz, 1977) was calculated for both speed and accuracy of word retrieval to determine whether any significant differences existed between subject groups and/or between the two word retrieval tests.

The analysis of variance for accuracy of word retrieval examined the main effects of age and test. The data from this analysis is reported in Table 5. Results indicated that the age variable was not significant ($F = 1.73$, $df = 1$, $p < 0.20$). The test variable was found to be significant ($F = 23.86$, $df = 1$, $p < 0.0001$). The interaction effects of age and test were not significant ($F = 0.55$, $p < 0.46$).

A statistical analysis for the speed of word retrieval also assessed the main effects of age and test. These results are summarized in Table 6. The analysis of variance showed no significant age effects on test

Table 5. Summary of analysis of variance for repeated measures for accuracy of word retrieval scores on the Test of Word Finding and the Boston Naming Test for subject groups.

Source	df	Sum of Squares	Mean Square	F	P
Group	1	27.00	27.00	1.73	0.20
Error group	22	343.92	15.63		
Test	1	176.33	176.33	23.86	0.0001
Error test	22	162.58	7.39		
Group x Test	1	4.08	4.08	0.55	0.46
Error group x test	22	162.58	7.39		

Table 6. Summary of analysis of variance for repeated measures for word retrieval response time on the Test of Word Finding and the Boston Naming Test for subject groups.

Source	df	Sum of Squares	Mean Square	F	P
Group	1	2429.20	2429.20	2.31	0.14
Error group	22	23110.69	1050.48		
Test	1	10095.77	10095.77	21.87	0.0001
Error test	22	10154.61	461.57		
Group x Test	1	0.26	0.26	0.00	0.98
Error group x test	22	10154.61	461.57		

performance ($F = 2.31$, $df = 1$, $p < 0.14$). The test effect, however, was again significant across age groups ($F = 21.87$, $df = 1$, $p < 0.0001$). The interaction between groups and tests was not significant ($F = 0.00$, $p < 0.98$).

Four Pearson product-moment correlations were calculated to determine if any significant relationships existed between receptive vocabulary scores on the PPVT-R and the speed of word retrieval scores on the TWF and the BNT for both subject groups. A summary of this data is provided in Table 7. The results did not show any significant relationships between PPVT-R scores and the TWF speed scores for the younger subjects ($r = 0.12$, $p < 0.71$) or for the geriatric subjects ($r = -0.29$, $p < 0.35$). For the BNT speed of retrieval scores, there was no significant correlation with the PPVT-R for the younger group ($r = -0.43$, $p < 0.16$), but a significant negative correlation ($r = -0.57$, $p < 0.05$) was found for the geriatric group.

Differences in Accuracy

As indicated earlier in Table 5, an analysis of variance for repeated measures did not find a significant difference in accuracy of word retrieval between the age groups, but did find a significant difference between the two tests. The group and test means and their respective

Table 7. Summary of Pearson product-moment correlations for Peabody Picture Vocabulary Test-Revised scores and response time on the Test of Word Finding(TWF) and the Boston Naming Test(BNT) for subject groups.

Test	Group	r	P
TWF	younger adults	+0.12	0.71
TWF	geriatrics	-0.29	0.35
BNT	younger adults	-0.43	0.16
BNT	geriatrics	-0.57	0.05

ranges reported in Tables 1 and 2 (pages 21 and 22) are graphically presented in Figure 1. Inspection of the data revealed an apparent separation in means between the age groups for both tests. The fact that this apparent difference is not significant is probably due in part to the large variability in the scores of the geriatric group and the considerable overlap of the scores for both groups.

Results from the analysis of variance (Table 5) showed a significant difference between the two tests. Figure 1 displays this difference. Inspection of the test means indicated that for both subject groups, the mean number of correct responses was consistently higher on the TWF. This appeared to indicate that the subjects retrieved the common, more frequently occurring words on the TWF more accurately than the less frequently occurring words that comprise the BNT. The data also showed a greater variability of scores on the BNT for the geriatric group.

Differences in Speed

The statistical analysis for speed of word retrieval as reported in Table 6 did not reveal a significant difference between the two subject groups, but again found a significant difference in scores between the two tests. A graphic representation of the group and test means and their ranges from Tables 1 and 2 (pages 21 and 22) is shown in Figure 2.

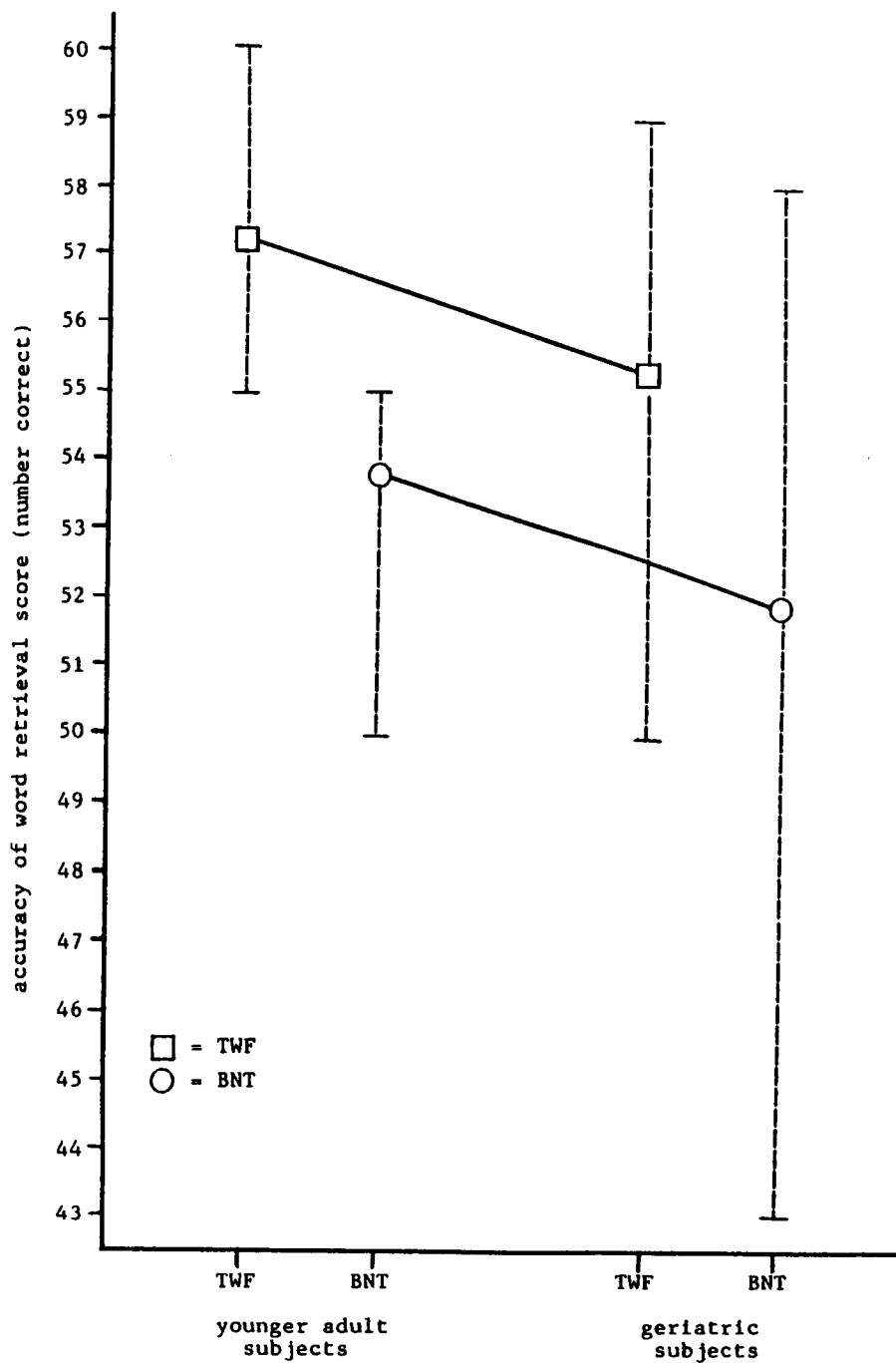


Figure 1. Mean accuracy of word retrieval scores with their respective ranges, for geriatric and younger adult subjects on the Test of Word Finding(TWF) and the Boston Naming Test(BNT).

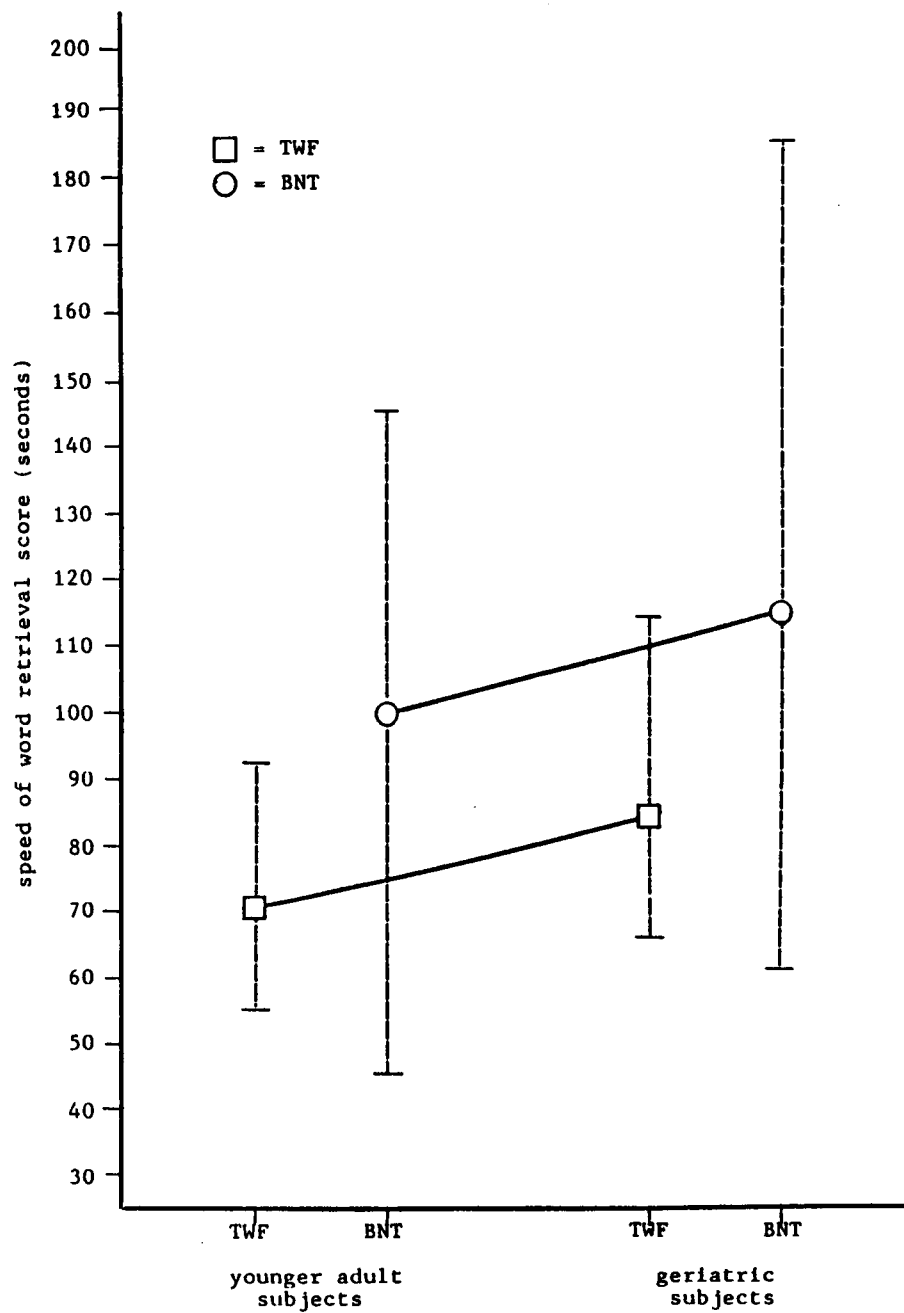


Figure 2. Mean speed of word retrieval scores with their respective ranges, for geriatric and younger adult subjects on the Test of Word Finding(TWF) and the Boston Naming Test(BNT).

The data indicated that although not significant, the mean response time was longer for the geriatric group. The magnitude of this difference in means appeared to be consistent across both tests. From inspection of the test means, both subject groups had significantly longer retrieval times for the items on the BNT than for the items on the TWF. This indicated that the subjects expressively identified the common, more frequently occurring words on the TWF in less time than the less frequently occurring words that make up the BNT. In addition, the range of scores was larger on the BNT than on the TWF for both groups.

Correlations

Vocabulary and TWF

As summarized in Table 7 (page 28), the Pearson product-moment correlations between the standard scores on the PPVT-R and the retrieval time on the TWF were not significant for either subject group. A description of the coefficient values using Guilford's classification (1956) as reported by Williams (1986), indicated that for the younger group the correlation between PPVT-R and the retrieval time scores was slight to almost negligible. A low negative correlation was found between the vocabulary scores and the retrieval times for the geriatric group.

This suggested a small inverse relationship between the two variables for the older subjects.

Vocabulary and BNT

The results presented in Table 7 (page 28) indicated that the correlation between the PPVT-R receptive vocabulary scores and the speed of word retrieval on the BNT was moderate but not significant for the younger adult group. For the geriatric subjects, a moderate significant correlation was found. This negative relationship implied that as receptive vocabulary level increased, response time for expressive word retrieval decreased slightly. This significant correlation could partially be related to the large range in PPVT-R and BNT speed scores for the geriatric group.

Summary

In summary, the major findings of this study were as follows:

- 1) The difference in accuracy of word retrieval between geriatric and younger adult speakers was not found to be significant.
- 2) The difference in accuracy of word retrieval between the TWF and the BNT was found to be significant.

- 3) The difference in speed of word retrieval between geriatric and younger adult speakers was not found to be significant.
- 4) The difference in speed of word retrieval between the TWF and the BNT was found to be significant.
- 5) The correlations between PPVT-R receptive vocabulary scores and speed of word retrieval on the TWF for geriatric and younger adult speakers were not found to be significant.
- 6) The correlation between PPVT-R scores and speed of retrieval on the BNT for younger adult speakers was not found to be significant, but a significant correlation was found for the geriatric speakers.

CHAPTER IV

DISCUSSION

This study compared the speed and accuracy of word retrieval of geriatric and younger adult speakers on two tests of word retrieval, the TWF and the BNT. In accuracy of word retrieval, although there was not a significant difference between age groups, there was a significant difference between the two tests. Similar results were found for speed of word retrieval scores. There was no significant age difference, but a significant test difference was indicated. Correlations between PPVT-R receptive vocabulary scores and speed of word retrieval scores were not significant for either subject group on the TWF or for the younger adult group on the BNT. A significant negative correlation was found for the geriatric group on the BNT.

Accuracy of Word Retrieval

The lack of a significant difference in age groups does not support a majority of the literature concerning this type of task (Borod, Goodglass, and Kaplan, 1980; Goodglass, 1980; LaBarge, Edwards, and Knesevich, 1986). The results of this study would seem to indicate that the

geriatric subjects are not necessarily different from the younger adult speakers with regard to access of expressive vocabulary. In fact, the much larger range of scores for the geriatric subjects would seem to imply that although geriatric subjects are not significantly less accurate as a group, they do instead demonstrate a higher degree of variability in responses. A study by Riegel and Birren (1965) found a similar increase in variability utilizing a word association task. Thus the results suggest that changes in accuracy of word retrieval is more a function of the individual than a function of age.

Previous literature has primarily dealt with the effects of word frequency on the speed of word retrieval. The test differences for accuracy of word retrieval suggest that word frequency also affects the accuracy with which words are retrieved. The differences found between the TWF and BNT indicate that more common words (as in the TWF) are easier to access expressively than words that are less common or less frequently used (as in the BNT). A possible implication of such a finding would involve the idea that lexical or word access may have a linguistic component based on commonality of words, such that efficiency of word retrieval is not exclusively related to reaction time.

Speed of Word Retrieval

The results of this study regarding age differences in speed of word retrieval do not support a majority of the literature concerning response time changes with age (Riegel and Birren, 1965; Thomas, Fozard, and Waugh, 1977; Bowles and Poon, 1981; 1985; Petros, Zehr, and Chabot, 1983). The lack of a significant difference suggests that there is not necessarily a general increase in response time for older adults on this type of task. Given the absence of a significant difference and the large variability among the subjects, there is an implication that the changes in response time are more dependent on the specific individual rather than determined by age. In other words, changes in speed of word retrieval are more subject specific than group or age specific. Such a premise can not be substantiated from the data obtained from this study as the performance of the geriatric subjects at a younger age can not be determined.

The interaction of word frequency with speed of word retrieval was reconfirmed by the results of this study. The less frequently occurring words that comprise the BNT required a longer retrieval time than the more common words on the TWF. There is also less variability in responses for the TWF for both age groups. The greater retrieval time and greater variability on the BNT again suggests that

efficiency of word retrieval may have a language component.

Receptive Vocabulary and Speed of Word Retrieval

As there was no significant correlation between the PPVT-R receptive vocabulary scores and the speed of retrieval scores on the TWF, it does not appear that speed of word retrieval for common, frequently occurring words is a function of overall vocabulary level. This is supported by the small variability of speed scores for the TWF for both age groups.

In contrast, the larger range of scores on the BNT indicates the possibility of a stronger relationship with the PPVT-R scores. The significant negative correlation for the geriatric subjects suggests that response time may be a function of vocabulary such that for less frequently occurring words, the higher the subject's receptive vocabulary level, the shorter the response time for expressively retrieving a word. The younger group showed this same trend although the relationship was not significant. It is interesting to note however, that the two geriatric speakers who achieved the highest receptive vocabulary level, according to the PPVT-R, did not have the shortest response times for retrieval. Also, the older subjects who achieved the lowest PPVT-R scores did not have

the longest retrieval times. This would seem to indicate that while there is a relationship between receptive vocabulary and response time of expressive vocabulary, particularly for the geriatric group, it is not clearly defined. In fact looking at the "r" coefficient, only thirty percent of the variance in the scores is explained by the relationship.

Accuracy and Speed Profile

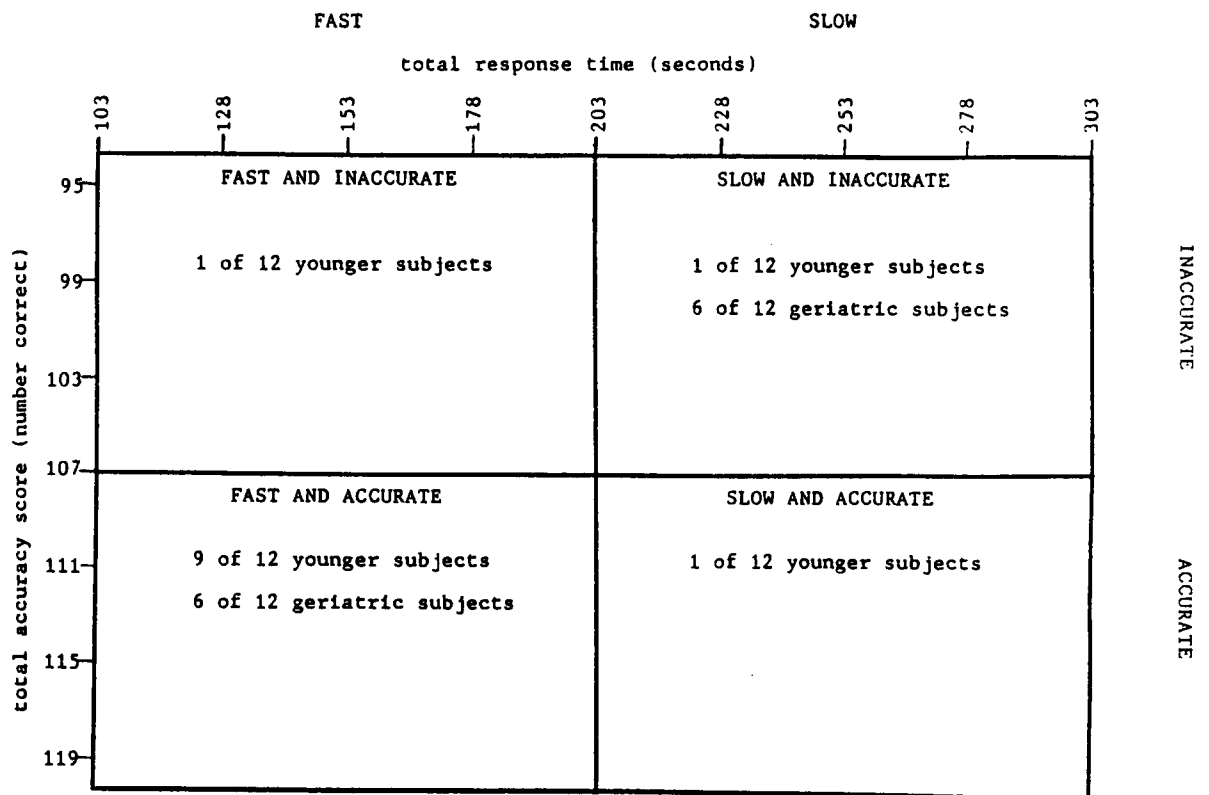
An accuracy and speed "word finding" profile utilized by the TWF was applied to each of the subject's raw data. The profile, based on the variables of speed and accuracy, classifies subjects on the basis of their score's deviation from the mean accuracy and mean speed score of the normative data. According to the profile, a subject is inaccurate if his score is one standard deviation below the mean accuracy score. A subject is considered slow if his response time was one standard deviation above the mean response time. This established four accuracy and speed categories: fast and inaccurate, slow and inaccurate, fast and accurate, and slow and accurate. For this study the younger adult group was considered to be the "normative group" and the same criteria were used to establish the profiles. This allowed for a description of the

performance of the geriatric speakers as a variation from the younger speakers.

Inspection of the group profile (see Figure 3) revealed that seventy-five percent (nine of twelve) of the younger group were classified as fast and accurate. In comparison, only fifty percent (six of twelve) of the geriatric speakers were considered fast and accurate. The other fifty percent were categorized as slow and inaccurate. The profile appears to demonstrate a difference between the two age groups, but more importantly it illustrates the greater variability of performance of the geriatric subjects in comparison to the younger group.

Scoring

The TWF scoring criteria were used for scoring the accuracy and speed of word retrieval for all the subjects. These procedures may have influenced the raw data to some extent. The receptive comprehension task was administered after testing for those items not accurately identified expressively. The testing revealed that a total of eighteen of the missed items on the BNT were not receptively identified across both groups. Thus eighteen responses (of the 1440) on the BNT were counted as inaccurate and the subjects did not have the particular



Note: The cutoff separation of "fast" and "slow" is one standard deviation above the mean total response time of the younger adult subjects.

The cutoff separation of "accurate" and "inaccurate" is one standard deviation below the mean accuracy score of the younger adult subjects.

These cutoff criteria were taken from the Test of Word Finding.

Figure 3. Accuracy and speed "word finding" profile of geriatric and younger adult subjects based on total accuracy score and total response time for Test of Word Finding and Boston Naming Test combined.

word in his vocabulary. This may appear to have biased the overall comparison between tests. However, the eighteen responses comprise only a small percentage (six-tenths of one percent) of the total number of responses and did not likely affect the outcome of the results.

The same conclusion can be drawn when considering the scoring for possible visual misperceptions. In examining the individual responses, twenty-four incorrect responses could have been categorized as resulting from a visual misperception of the picture. For example, one subject identified a "jack" as a "snowflake." Possible visual misperceptions could have accounted for inaccurate word retrievals. Again, the same rationale can be applied in examining its effects on the overall results. The possible misperceptions were almost evenly distributed between the two tests (ten on the TWF and fourteen on the BNT). The relative balance of the possible visual misperceptions would not appear to have affected the significant difference found between the two tests. Eighteen of the misperceptions were accounted for by the geriatric group while six were tallied for the younger adults. Taking these responses into consideration would have only decreased the probability of finding a significant difference between the age groups.

The maximum fifteen second time limit utilized during

the timing for speed of word retrieval was prescribed by the TWF. In administering the tests, responses produced beyond the fifteen second allowance were not counted but were noted to examine possible biasing of the results by this criteria. Inspection of the individual data revealed that only seven responses were produced beyond the fifteen second limit, one on the TWF and six on the BNT. These responses occurred from 17.23 seconds to 31.50 seconds after the stimulus exposure. Inclusion of this additional response time would only have increased the difference between tests for speed of word retrieval (speed of word retrieval was significantly different at the 0.05 level between tests). In addition, this extra response time was relatively balanced between the groups (three for the younger group and four for the geriatric group) and again would not appear to have affected the absence of a significant difference between the age groups.

CHAPTER V

CONCLUSION

The purpose of this study was to investigate the differences between geriatric and younger adult speakers in accuracy and speed of word retrieval on two tests of word retrieval. The subjects included twelve geriatric speakers aged sixty-four to seventy-four years and twelve younger adults aged thirty-five to fifty years. Each subject, a native English speaker with no history of neuropathology or diagnosis of dementia by self report, demonstrated adequate functional hearing and vision, and achieved at least the third stanine level on a receptive vocabulary test, the PPVT-R. In addition, the older subjects were identified as mobile and socially active.

Two tests of word retrieval, the TWF and the BNT, were administered to each subject. The TWF consisted of common, frequently occurring vocabulary words that are expected to be acquired by the sixth grade. The BNT was comprised of more difficult (less frequently occurring) words. An accuracy score and cumulative response time was determined for each test for each subject.

Analyses of variance for repeated measures (Bruning and Kintz, 1977) were performed to determine age and test differences for both accuracy and speed of word retrieval.

In addition, Pearson product-moment correlations were calculated to assess any significant relationships between receptive vocabulary levels (PPVT-R scores) and the speed of word retrieval scores for both tests.

The results of the analyses of variance indicated that there were no significant differences between the geriatric and younger adult speakers in either accuracy or speed of word retrieval. Significant differences were found between the two tests for both accuracy and speed of word retrieval. The Pearson product-moment correlations revealed no significant relationships between the PPVT-R receptive vocabulary scores and the response time on the TWF for either group or for the younger group on the BNT. A moderate significant negative correlation was found for the geriatric subjects on the BNT.

The findings of this investigation suggest that geriatric speakers as a group, do not differ from younger adults in accuracy and speed of word retrieval. They do not support the idea of an age related decline in language facility and indicate that the observed evidence of changes in language facility may be more individually based than age specific (see Figure 3, page 40).

The results regarding test differences indicate that the retrieval for common words is more efficient in terms of both accuracy and speed of word retrieval. They support the premise that efficiency of word retrieval may have a

language component that is related to the level of commonality of the word being retrieved.

The findings from the correlations suggest that receptive vocabulary size does not have an effect on speed of word retrieval for common words. A stronger relationship is indicated for more difficult words particularly for the geriatric population, but there are other unidentified factors accounting for the variation of these scores.

Limitations of the Study

The following limitations should be considered when interpreting the results of this study:

- 1) Due to the nature of the tasks, the reliability of the subjects' responses could not be assessed, as their performance would have been influenced by their familiarity with the test stimuli.
- 2) The sample size for each group, although acceptable, is small and caution should be exercised in making widespread implications.

Suggestions for Further Research

The results and implications from this study give rise

to some suggestions for further research. These are as follows:

- 1) conduct a longitudinal study to measure possible changes in speed and accuracy of word retrieval to distinguish group from individual differences.
- 2) measure differences in speed and accuracy of word retrieval between male and female speakers of different ages.
- 3) measure speed and accuracy of word retrieval of a larger sample size utilizing the same procedures.

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APPENDIX

QUESTIONNAIRE

DATE:

NAME:

AGE:

BIRTHDATE:

TELEPHONE NUMBER WHERE YOU CAN BE REACHED:

PLEASE ANSWER THE FOLLOWING QUESTIONS:

1. IS ENGLISH YOUR NATIVE LANGUAGE?

2. HOW MANY YEARS OF SCHOOLING HAVE YOU HAD?

NUMBER OF YEARS:

GRAMMAR:

HIGH SCHOOL:

COLLEGE:

GRADUATE OR PROFESSIONAL SCHOOL:

LATER COURSES/OTHER EDUCATION:

3. WHAT IS/WAS YOUR OCCUPATION/PROFESSION?

4. WHERE DO YOU CURRENTLY LIVE? (CHOOSE ONE)

HOUSE/APARTMENT:

NURSING HOME:

OTHER:

5. DO YOU LIVE BY YOURSELF?

IF NO, WHOM DO YOU LIVE WITH?

6. HOW DO YOU USUALLY GET AROUND?

CAR:

PUBLIC TRANSPORTATION:

OTHER:

7. WHAT ARE YOUR INTERESTS? (DESCRIBE)
- HOBBIES
- SPORTS/EXERCISE:
- COMMERCIAL RECREATION (MOVIES, CLUBS, ETC.):
- OTHER:
8. ARE YOU INVOLVED IN COMMUNITY ACTIVITIES? (DESCRIBE)
- MEMBERSHIPS-ORGANIZATIONS, CLUBS, ETC.:
- VETERANS ORGANIZATION:
- VOLUNTEER WORK:
- POLITICAL WORK:
- CHURCH WORK:
9. HOW OFTEN DO YOU PARTICIPATE IN THESE ACTIVITIES:
- EVERY WEEK:
- ONCE A MONTH:
- OTHER:
10. HAVE YOU EVER HAD ANY OF THE FOLLOWING? (DESCRIBE)
- STROKE:
- HEAD TRAUMA:
- DIAGNOSIS OF DEMENTIA OR ORGANIC BRAIN SYNDROME:
- MEMORY LOSS:
- COMMUNICATION DISORDER:
11. ARE YOU CURRENTLY TAKING ANY MEDICATION? (PLEASE DESCRIBE)

VITA

Marita Christine Manakkil was born in Las Cruces, New Mexico on April 2, 1965. She graduated with honors from Saint Joseph Central High School in Huntington, West Virginia in June 1982. The following September she entered Marshall University and in May 1986 graduated summa cum laude with a Bachelor of Arts degree in Speech Pathology and Audiology. In the fall of 1986 she accepted a graduate fellowship at The University of Tennessee, Knoxville and enrolled in the Master's program in Speech Pathology. She received a Master of Arts degree in Speech Pathology in December 1987.