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Effects of category-relevance, retention measure, and category-affiliation upon retention of the aging

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EFFECTS OF CATEGORY-RELEVANCE, RETENTION MEASURE, AND CATEGORY-AFFILIATION UPON RETENTION OF THE AGING

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To the Dream

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Chapter I

INTRODUCTION

According to folklore, the years subsequent to maturity are marked by a gradual decline in cognitive abilities, most outstanding of which are learning and memory. Indeed, numerous investigators (Hulicka, 1967a; Canestrari, 1967; Riegal & Riegal, 1962; Kay, 1959; Jerome, 1959; Ruch, 1934; Wechsler, 1958) report marked performance deficits with advancing age. While the evidence cited may be construed as supporting the stereotype of the aged individual as slow to learn and quick to forget, to do so would be scientifically premature.

Hulicka (1967a), in an excellent review of memory functioning in the aged, reminds the research psychologist of some basic, but often overlooked, considerations. She asserts that, "...in spite of the well-established 'fact' that efficiency of memory functioning declines with age, very little may actually be known about relationships between memory as a process and age as an independent variable (p. 46)." Further, Hulicka suggests:

> Groups which differ in chronological age might also differ in terms of a number of other variables which might have some effect on efficiency of memory functioning and/or score on tests of retention. Moreover, "memory" is an intervening variable or a hypothetical construct which does not necessarily bear a one-to-one relationship to the score earned on tests of retention (p. 46).

By and large, there has been a tendency to attribute apparent memory losses to various physiological changes that usually occur with aging. It should be apparent, however, that behavior is seldom, if ever, determined solely by one variable. It would seem more likely that some combination of physiological, psychological, and environmental factors interact to produce the observed deficits.

It is the author's contention that a need exists to explore more fully psychological and environmental concomitants of aging as they relate to apparent memory losses. While several investigators (e.g., Isotti, 1966; Hulicka, 1967b) have concerned themselves with this area, the need for meaningful data ar exceeds its supply.

The Problem Stated. The present investigation represents an attempt to further explore several parameters of short-term memory as a function of the relevance or appropriateness of the verbal materials utilized. It is the author's contention that due to changing patterns of interests and experiences accompanying chronological aging, certain types of verbal material vary with respect to their relevance for use with aging populations. In regard to parameters of short-term memory, the present study contains provisions for exploring efficiency of retention as a function of: the retention measure; and category-affiliated as opposed to randomly-selected words. A more complete and integrated formulation is presented in the following chapter.

Chapter II

BACKGROUND AND THEORY

The present experimental formulation developed as an outgrowth of several lines of research. This chapter is concerned with the theoretical and empirical backgrounds leading to the present formulation. More specifically, the chapter deals with the following areas: the theoretical and empirical background of the disuse hypothesis, relevant aspects of the spew hypothesis, and brief surveys of the literature concerning changing patterns of interests with aging, the measurement of retention, and encoding mediation. Finally, the hypotheses generated therefrom are presented.

The Disuse Hypothesis

It has frequently been noted that elderly subjects, when presented with typical laboratory tasks and materials, often remark, "It's been years since I've done this sort of thing." It is likely such remarks that began psychologists wondering about the *effect of* disuse upon performance.

Theoretically, the disuse hypothesis is somewhat related to the construct of the habit-family hierarchy. According to this notion, an organism's behavioral repertoire is arranged in the form of a series of habit-family hierarchies. The relative position in the hierarchy of a particular response determines the probability of that response being

elicited or emitted in the presence of a particular stimulus configuration. Repetition is among the most important variables in determining a response's position in the hierarchy.

The concept of response availability occupies a central position in the disuse hypothesis. In essence, the disuse hypothesis asserts that due to distinctive patterns of experiences and interests, a hierarchy of available responses is established. Experiences, in the form of intake and/or output, which occur frequently assume positions high in the hierarchy, while those which occur infrequently assume lower positions. Disuse, therefore, may be defined in terms of the frequency with which an experience occurs. Over extended periods of disuse, various responses become less available and as a result performance, when tested, suffers.

Evidence in support of the disuse hypothesis has been neither conclusive nor systematic. This is due, in part, to the difficulties involved in assessing disuse. Cross-sectional studies, the most commonly employed means of assessing age differences, are largely inappropriate for exploring the notion of disuse. Cross-sectional studies succeed in pointing out that there are indeed performance differences between age-groups, but fail to illuminate the underlying dynamics which might account for the differences. Nevertheless, several factor analytic studies sampling across age groups were chosen for inclusion.

Green and Berkowitz (1964) factor analyzed scores on the Wechsler-Bellevue scale. Their results strongly supported the contention that

there is a change in the factorial structure of the responses as a function of age. The authors concluded that sub-test scores may be spanned by a three-dimensional space for groups aged 55 and up, whereas for groups in their twenties, at least six factors are required. A general-to-specific-to- general hypothesis, under which disuse is easily subsumed, was advanced to account for the findings.

In an investigation of the effect of normal aging on intellectual performance on the WAIS, Berger, Bernstein, Klein, Cohen, & Lucas (1964) also reported finding factorial variability. For the Verbal and Memory factors, some degree of age-related change appeared. The authors stated:

> For normal adults in their prime (ages 25-54) Verbal and Memory skills exist as relatively separate factors. For those 18-19 and 60 and over, no separate Memory factor appeared. Instead, Memory here coalesces with Verbal skills together forming a joint Factor 1 (p. 205).

The studies cited above constitute a rather weak form of evidence. Taken together, the studies are descriptive of factorial changes which occur when progressive age groups are sampled. Unfortunately, they lack much explanatory value. With advancing age, high loadings are found on fewer factors, suggesting increased or maintained reliance on several abilities and decreased reliance on others. It is not clear whether the change represents a positive or negative process. For instance, it is possible that the observed variability represents the integration of knowledge into more pervasive factors. More likely, some

loss in intellectual functioning occurs. Again, however, it is unclear as to whether the loss is due to age-related changes in the CNS, to disuse, or to some combination of the two.

Isotti (1966), in his doctoral dissertation, investigated the relation of ego-constriction and interests to recall in the aged. Essentially, he found that recall varied directly as a function of diversity of interests and inversely as a function of ego-constriction.

What is perhaps the strongest evidence in support of the disuse hypothesis comes from an investigation by Berkowitz and Green (1965). The authors investigated the changes in performance on the WAIS and Wechsler-Bellevue scales that occur in elderly people when retesting occurs shortly after the initial examination as compared with changes after a longer test-retest interval. The WAIS (short-interval) sample had a mean age of 61.2 years when initially tested. The retest occurred an average of 194 days later. For the W-B (long-interval) sample the mean chronological ages at the times of the initial testing and at the time of retesting were 56.38 years and 64.98 years respectively. Thus, retesting occurred an average of 8.60 years later. Their results indicated that Ss, on the average, obtained lower scores on the retest following the long test-retest interval. The short-interval group, on the other hand, showed essentially the same improvement from an administration of the test as do young subjects. Examination of the data suggested that the improvement lasts a substantial period of time but

is finally negated by very long intervals. The relationship obtained between test performance and length of the test-retest interval led the authors to conclude that the long-term decline was probably due to disuse of skills involved rather than to deterioration in any irreversible sense.

The Spew Hypothesis

It may be observed that the disuse hypothesis has, in some respects, a corollary in the spew hypothesis. The spew hypothesis, according to Underwood and Schulz (1960), asserts that "...when the subject is faced with a relatively unstructured situation, the order of output is directly related to frequency of input (p. 90)." They continue, "It seems inevitable that individual differences in spew order could or should be related to differences in nature of intake (p. 90)."

There are a number of reported investigations of the spew hypothesis whose findings are pertinent to the problem being investigated. For example, a number of investigators (Hall, 1954; Jacobs, 1955; Bousfield & Cohen, 1955) using Thorndike-Lorge (1959) counts as an index of frequency of experience, have reported positive relationships between frequency and performance on learning and retention tasks.

Of more relevance are those studies relating to the notion that individual differences in spew order may be related to differences in nature of intake. Foley & MacMillan (1943) review a number of such studies. In their own study these investigators studied verbal associates given in response to ambiguous homophones by groups which differed

in type and amount of professional training. First- and second-year law and medical students plus students in non-professional areas made up the experimental groups. There were clear relationships between the nature of responses and professional backgrounds of the Ss. The different frequencies of experience with particular verbal material were held to account for the findings.

Bousfield and Cohen (1956) investigated sex differences in the recall of category-organized word lists. A list of forty words was exposed item by item for one presentation. The list contained 20 words representing male interests and 20 words representing female interests. Subjects showed significantly greater recall of words representing interests of their own sex than of words representing interests of the opposite sex. Frequency of experience was offered as a possible explanation.

What these studies suggest is that between-group differences on certain tasks may be more a function of differences in experiences than of differences in 'native ability'. With regard to age differences, the suggestion has obvious implications.

Changing Interest Patterns

There are indications that interest patterns are not stable across an entire life span. Research suggests that there are shifts in areas of interests as well as a narrowing down of the range of interests with advancing age. In view of the restrictions imposed by physiological

aging as well as changing life-situations, this should not be surprising.

The trend appears to be one of moving away from more active situations to more quiet, sedentary types of activities. Strong (1939) has pointed out the decrease in interest in activities involving physical skill, daring, and strenuous activity. He also noted that interest in the passive activity of reading, as well as a greater preference for solitary activities such as walking, visiting friends, clubs, and church emerge as interests in later years. On the basis of a literature review, Anderson (1959) noted a tendency towards increasing interest in religion and philosophy and decreasing interest in social endeavors. In a factor analytic study of the attitudes of aging VA patients, Guertin (1961) reported that three of the resulting five factors suggested preoccupation with matters of health.

The Measurement of Retention

"Memory" can be inferred from savings scores for relearning, recognition scores, and recall scores. Of the three measures of retention, recall is the most commonly employed in investigations of "memory." This is so despite the fact that recall is thought to be the least sensitive of the three as an index of retention.

It was decided to include in the design a Measures factor whereby performance under recall and recognition conditions could be compared. The decision was based upon two considerations. First, while a relatively consistent relationship between recall and recognition has been reported (McGeoch & Irion, 1952) with younger subjects, the data has

not been extended to the higher age ranges. Results of comparing recall with recognition might have further illuminated the nature and extent of observed "memory" deficits with aging. The second reason was based on empirical data (Canestrari, 1963) which suggests that retrieval of information is more difficult and time-consuming for aging subjects. If recognition is indeed more sensitive a measure than recall, it is undoubtedly because retrieval is less difficult in the recognition mode. Thus, the issue warranted investigation.

Encoding Mediation

Miller (1956) advanced the hypothesis that retention-capacity can be expanded beyond the limits of the immediate memory span if the input information is recoded into chunks. In this sense, a "chunk" is a "new name" for a group of items, or a group of words which "go together."

Subsequent investigations (Bousfield, 1953; Cohen, 1963; Mathews, 1954) have shown that words falling into categories (i. e., chunks), presented in a randomized list for free recall, are recalled in clusters according to category membership. These studies also indicate that recall of such a category-organized list is superior to recall of a randomly selected set of words.

Formulation of Hypothesis

From discussions in the preceding sections, the following generalizations are made. First, evidence concerning the disuse hypothesis suggests that lower scores earned by elderly individuals on tasks involving higher mental abilities are not an inevitable or irreversible function of chronological aging per se. Second, there is evidence to

suggest that observed performance deficits may be related to disuse and the resultant lowering of response availability. Research relating to the spew hypothesis suggests a third generalization; i. e., the frequency with which verbal units occur in experience is an important variable in determining output. It would seem further, that frequency of experience is functionally related to response availability.

Thus, the crucial question explored is stated, "Do the institutionalized aged represent a population sub-group with experiential characteristics which systematically affect the parameters of retention?" The author's general purpose here was to predict the efficacy of a seemingly significant characteristic and the nature of its effect on selected parameters of retention.

It is the author's contention that frequency of experience constitutes a critical variable in retention. Further, the author asserts that interests have predictive value as an index of verbal experience. In connection with this, it is pointed out that interests may be defined as positive predispositions to react in a manner that is consonant with needs and desires.

With the above in mind, the following experimental hypotheses are advanced:

1. Significantly more correct responses are produced under recognition conditions than are produced under recall conditions.

2. Significantly more category-affiliated (CA) items than randomly-selected (RS) items are recalled and recognized from word lists composed of equal numbers of CA and RS items equated on frequency of usage.

3. The differences expected on the basis of Hypothesis 2 are smaller on lists containing non-relevant (NR) categories than on lists containing relevant (R) categories.

4. Most importantly, significantly more items are retained from relevant (R) categories than from non-relevant (NR) categories.

Chapter III

METHOD OF INVESTIGATION

Methodologically, the present investigation may be thought of as consisting of two components. Since the central issue involved the nature of materials employed in assessing retention of the aging, a particularly large burden of responsibility rested on the adequacy of the experimental materials. Because of this responsibility and because of the relatively discrete rationale and methodology involved, verbal materials are treated as a separate section.

Verbal Materials

This section is concerned with the construction of six category-affiliated list-segments and the randomly-selected list-segment. The categories were chosen on the basis of research on interests and attitudes of aging populations previously cited. Of the six categories appearing in Table 1, the first three were thought to be relevant to the interest patterns of elderly individuals in a VA setting. The remaining three were thought to be non-relevant.

The construction of the six category-affiliated list-segments involved several steps. First, it was necessary to collect a pool of items for each of the selected categories. A procedure developed by Bousfield, Cohen, and Whitmarsh (1957) enabled the meeting of this end. In essence, their procedure involves the gathering of verbal norms

Table 1

Selected Verbal Categories

Relevant	Non-relevant
Sedentary Activities	Physical Activities
Religion-Philosophy	Sociality
Health	Education

on associates of various category names. The process yields both item pools and category-membership norms (taxonomic frequency measures).

For two major reasons, it was decided to utilize a college sample for securing the norms. First, investigators in the area of verbal learning typically utilize college students for the procurement of norms of this type. Tradition, however, was not as much an issue as the second reason. Since the present investigation involved the disuse phenomenon, it seemed essential to avoid confounding the verbal norms with the disuse effect. It was assumed that the college students, because of the quantity and diversity of their input/output, would produce a broader variety of output in this situation.

Subjects. A total of 88 Frederick College students from three undergraduate psychology classes participated in the collection of norms. Of these, 50 were males with a mean age of 20.28 years and 38 were females with a mean age of 20.26 years.

Materials. Mimeographed data sheets containing the instructions and eight preliminary category designations were utilized (See Appendix A). Of the eight categories, only six were employed in the retention study.

Procedure. As the data sheets were distributed, the nature of the research was explained and illustrations of the task were provided. They were to write their first five associates which met the following specifications: (a) responses were to be single words, (b) responses

were to be nouns, and (c) the length of the responses should not have been less than three letters nor more than twelve.

The data were analyzed in the following manner. For each class of items a tabulation was made of the frequency of occurrence of each discrete response. The data of the male and female subjects were tabulated separately. Responses which were misspelled but left no doubt as to what the subject meant were tabulated under the correct spelling of the responses. In those cases in which responses were grossly misspelled, illegible, or not in keeping with required specifications, the responses were omitted. The norms thus collected appear in Appendix B.

The second step in the construction of the CA list-segments involved the selection of items composing each list-segment. Category-membership norms (taxonomic frequencies) and frequencies of usage from the Thorndike-Lorge (1959) "L" count were computed for many of the responses judged most appropriate. From these, the six 20-word list-segments were constructed so as to be equated as nearly as possible for (a) mean taxonomic frequency per word, and (b) mean frequency of usage.

A word pool for the single RS list-segment was obtained by selecting the tenth word from the bottom of the left hand columns on the even pages in Part I of Thorndike & Lorge's (1959) Teacher's Word Book of 30,000 Words. If the tenth word did not meet the specifications listed previously, the closest word to it that met the specifications was taken.

From this pool, 20 words were selected in such a manner as to be equated as nearly as possible with the CA segments on frequency of usage. Appendix C presents the final RS and CA list-segments along with appropriate frequency measures. It should be noted that while the taxonomic values of the RS list are not thought to be nil, the values should be quite small.

The Retention Study

The present investigation may be viewed as a 2 × 6 × 2 factorial design, the first factor being Retention Measure, the second Lists, and the third Affiliation. Free recall and recognition, respectively, served as levels of the Measure factor. The six 40-word CA-RS composites made up the levels of Lists. The CA and RS segments, respectively, made up the levels of Affiliation.

Subjects. A total of 120 male Ss participated in the investigation. Subjects were drawn from domiciliary facilities at the Kecoughtan Veterans Administration Center, Hampton, Virginia. Selection of participants was subject to the following restrictions. First, Ss were required to be 55 years of age or older. Second, Ss were required to have attended school and to have completed at least the fifth year. Third, Ss were not to have severe sensory or cognitive disabilities.

The age of the sample used in the study ranged from 55 to 80 years with a mean chronological age of 67.12 years and a standard deviation of 2.67 years. However, since the distribution of Ss by age (See Appendix

D) did not resemble the normal curve, the mean is not a particularly accurate description of the sample's central tendencies. Years of formal education ranged from 5 to 16 with a mean of 8.68 and a standard deviation of 2.76 years.

Subjects were assigned randomly to the 12 experimental groups, yielding equal cell n's of 10 Ss each. Analysis of variance indicated that the resulting groups did not significantly differ with respect to chronological age or years in school.

Materials and Apparatus. The verbal materials were those six 40-word lists described in the preceding section. The words were printed in large, legible letters on 3 x 5 in. index cards, one word per card.

A modified Wisconsin General Test Apparatus was used to present the lists. This apparatus consisted of a plywood screen separating the examiner from the S with a small opening at the base through which a tray containing the stimulus cards could be pushed.

A stopwatch was also employed for aspects of the investigation which required timing.

Procedure. In the present study, Ss were tested individually. Ss were instructed that they were to be presented with a list of 40 words and that their task was to remember, in any order and by any method they chose, as many words as they could. When the experimenter was certain that the S understood the task, presentation was begun.

The lists were alternately prearranged in one of four random sequences and presented at a rate of 3 sec. per word with a 3 sec. inter-item interval. Immediately following the presentation of the respective lists, Ss were tested for retention.

Under the free recall conditions, Ss were given pencils and blank sheets of paper and instructed to write as many words as they could recall. They were told that spelling did not count as long as the E could understand the word intended. Five minutes was allowed for recall.

Under recognition conditions, the Ss were supplied with pencils and mimeographed sheets (see Appendix E) containing 120 words. Ss were told that 40 of these words were identical to those previously presented. The remaining words were drawn randomly or taken from category pools so as to be of approximately equal difficulty as the words in the lists. Ss were instructed to indicate the words they remembered from the list by placing "X's" in the blanks to the left of these words. They were informed that the number of responses was not to exceed 40. Again, five minutes were allowed for this task.

Chapter IV

RESULTS AND STATISTICAL ANALYSES

Ss were scored in terms of the number of correct responses produced. Under free recall conditions, misspelled responses that left no doubt that correct responses were intended were scored as correct. Grossly misspelled and/or illegible responses that did not meet the above specification were scored as incorrect, thereby being omitted from analysis. Under the recognition conditions, records upon which more than 40 responses appeared were adjusted in such a manner that only 40 responses were scored. The adjustment was accomplished by the omission of excess responses from the middle segment of the S's response record. Since the responses omitted varied as a function of both the distribution of responses and the total number of responses, the adjustment procedure did not appear to constitute a source of bias. Only three records were thus involved for a total loss of 20 responses.

The raw data were tabulated and cast into appropriate experimental cells. Table 2 presents the means and standard deviations thus obtained.

A series of statistical analyses was employed to provide critical tests of the hypotheses stated in Chapter II. Table 3 presents the summary table from an overall 2 × 6 × 2 Analysis of Variance. The design of the present experiment contained providions for repeated measures on the last factor and thus corresponded to Winer's (1962)

Table 2

Cell performance: Means and Standard Deviation

		list 1		list 2		list 3		list 4		list 5		list 6	
		CA[a]	RS	CA[b]	RS	CA[c]	RS	CA[d]	RS	CA[e]	RS	CA[f]	RS
recall	M	4.80	2.60	5.90	2.60	6.10	1.60	5.00	2.30	3.90	2.60	4.90	2.70
	SD	2.35	1.65	2.28	1.58	2.02	1.07	1.88	1.95	2.18	0.84	2.18	1.89
recognition	M	12.40	11.10	13.00	11.20	12.20	9.50	11.10	10.50	10.40	10.50	12.70	10.70
	SD	4.74	4.38	2.21	3.74	4.37	4.03	4.41	3.69	3.37	2.95	2.36	2.54

[a] Sedentary Activities
[b] Religion-Philosophy
[c] Health
[d] Physical Activities
[e] Sociality
[f] Education

Table 3

Overall ANOV Summary Table

Source of Variation	df	MS	F
Between Subjects	119		
Measure (M)	1	3,397.54	256.25**
Lists (L)	5	8.71	0.66
M X L	5	2.09	0.16
Subj. w. gps.	108	13.26	
Within Subjects	120		
Affiliation (A)	1	250.10	67.76**
M X A	1	26.00	7.05**
L X A	5	10.01	2.71*
M X L X A	5	1.15	0.31
A X subj. w. gps.	108	3.69	

* $F_{.95}(5, 108) = 2.30$
** $F_{.99}(1, 108) = 6.90$

Case II. Since the results of this ANOV had relevance for several of the hypotheses, frequent references to Table 3 appear in subsequent sections.

The following sections describe results and analyses as they bear upon the respective hypotheses.

Hypothesis 1. The first hypothesis was concerned with the efficacy of recognition as opposed to free recall. A decision with regard to this hypothesis was contingent upon the *F* ratio for main effects due to the Measure factor (*M*) and upon *F* ratios for main effects due to the interaction of Measure with other factors.

The ANOV, represented by Table 3, yielded an *F* of 256.25 for Measure. This value was significant well beyond the .01 level. However, since Measure X Affiliation was also significant ($F=7.05$, $p<.01$), an analysis of simple main effects was required.

Figure 1 presents the plotted means for Measure at levels of Affiliation. As shown in Table 4, the analysis of simple main effects yielded significant *F* values for Measure at both levels of Affiliation ($F=151.52$ and $F=106.69$ respectively; $p<.01$). Thus, a hypothesis of no difference is held untenable. The results, as predicted by Hypothesis 1, indicated that significantly more correct responses were produced under recognition conditions than under free recall conditions regardless of whether words were category-affiliated or randomly-selected.

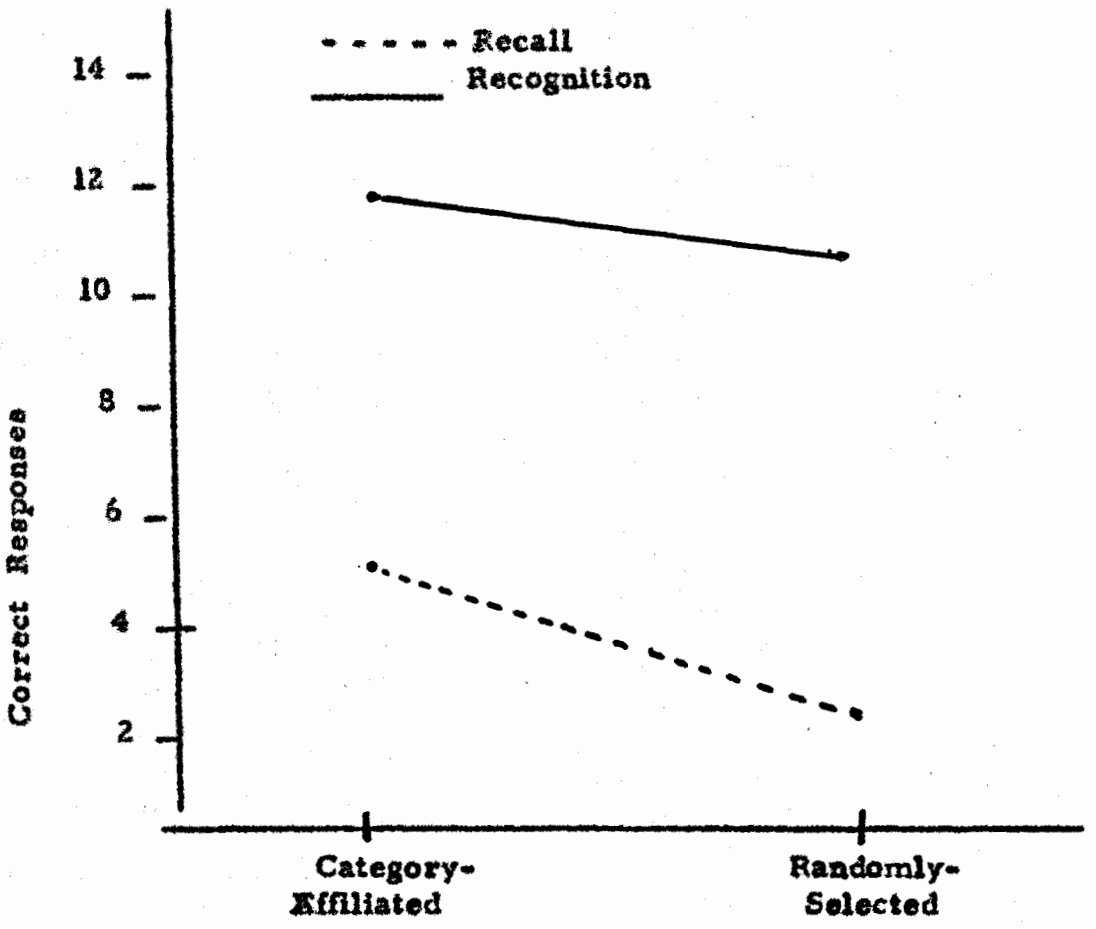

Figure 1. Mean Measure performances at levels of Affiliation.

Table 4

Analysis of Simple Main Effects of Measure

at levels of Affiliation

Source of Variation	df	MS	F
Measure			
at a_1 (CA)	1	2,009.01	151.52 **
at a_2 (RS)	1	1,414.53	106.69 **
prror (a)	108	13.26	

** $F_{.99}$ (1, 108) = 6.90

Hypothesis 2. The second hypothesis dealt with the effect of category-affiliated vs. randomly-selected list-segments on retention. Operationally, a decision with regard to the hypothesis was contingent upon analysis of the Affiliation factor and its interactions with other factors. As shown in Table 3, the overall ANOV yielded a significant value for main effects due to A. ($F = 67.78$; $p < .01$). However, since both Measure X Affiliation ($F = 7.05$; $p < .01$) and Lists X Affiliation ($F = 2.71$; $p < .05$) were also significant, analyses of these interactions were required prior to a decision with regard to Hypothesis 2.

As a means of probing M X A interaction, Affiliation was examined at levels of Measure. Figure 2 presents these data in terms of plotted means. The appropriate analysis of simple main effects, as represented by Table 5, indicated significant variance at both levels of M ($F = 59.26$ and $F = 15.56$ respectively; $p < .01$). In both instances, the numerical value of a_1 (category-affiliated responses) exceeded that of a_2 (randomly-selected responses), thus accounting for the significant variance.

In a similar manner, L X A was examined in terms of Affiliation at levels of Lists. Figure 3 presents the plotted means of CA and RS responses across the six word lists. As shown in Table 6, the analysis of simple main effects resulted in significant F values ($p < .01$) for all lists with the exception of list 5. In every case, however, CA responses were more numerous than RS responses.

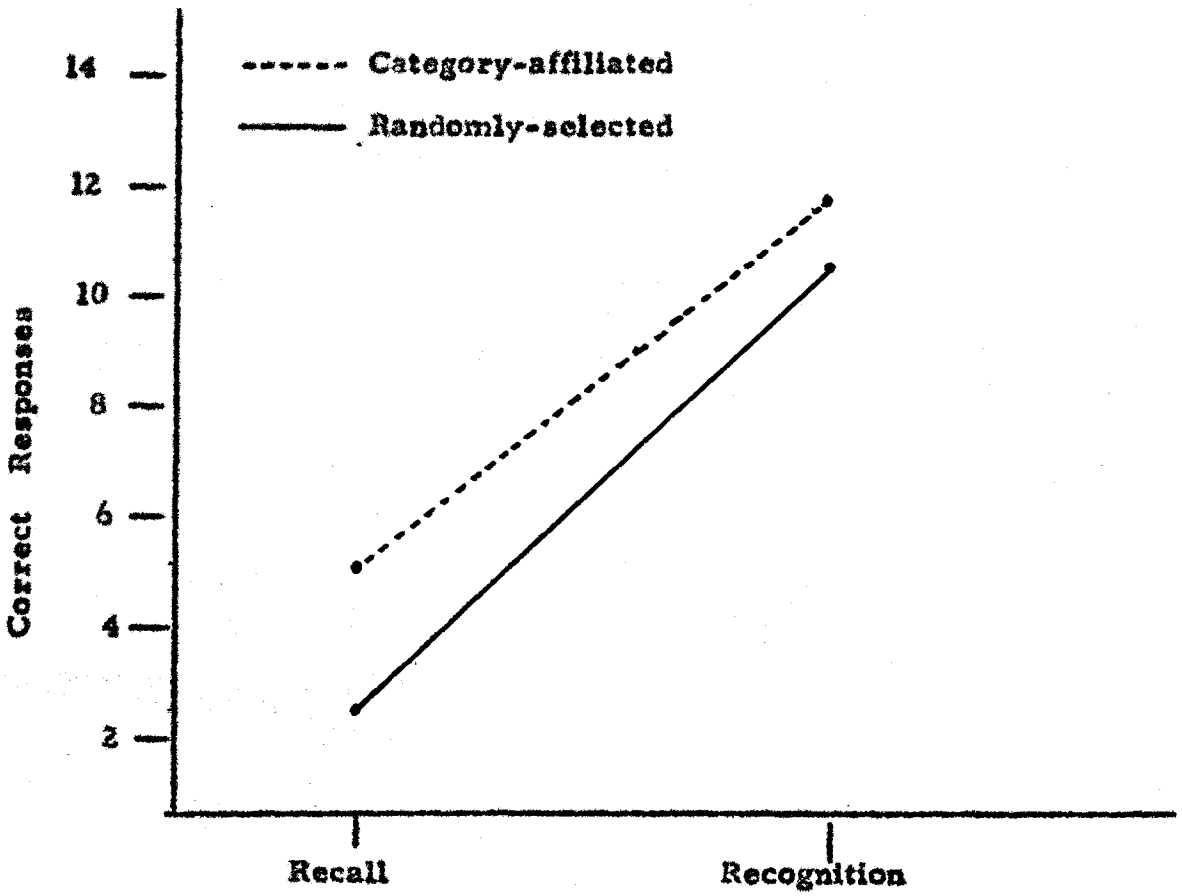

Figure 2. Mean Affiliation Performances at levels of Measure.

Table 5

Analysis of Simple Main Effects of Affiliation

at Levels of Measure

Source of Variation	df	MS	F
Affiliation			
at level m_1 (recall)	1	218.70	59.26**
at level m_2 (recogn.)	1	57.41	15.56**
error (b)	108	3.69	

** $F_{.99}$ (1, 108) = 6.90

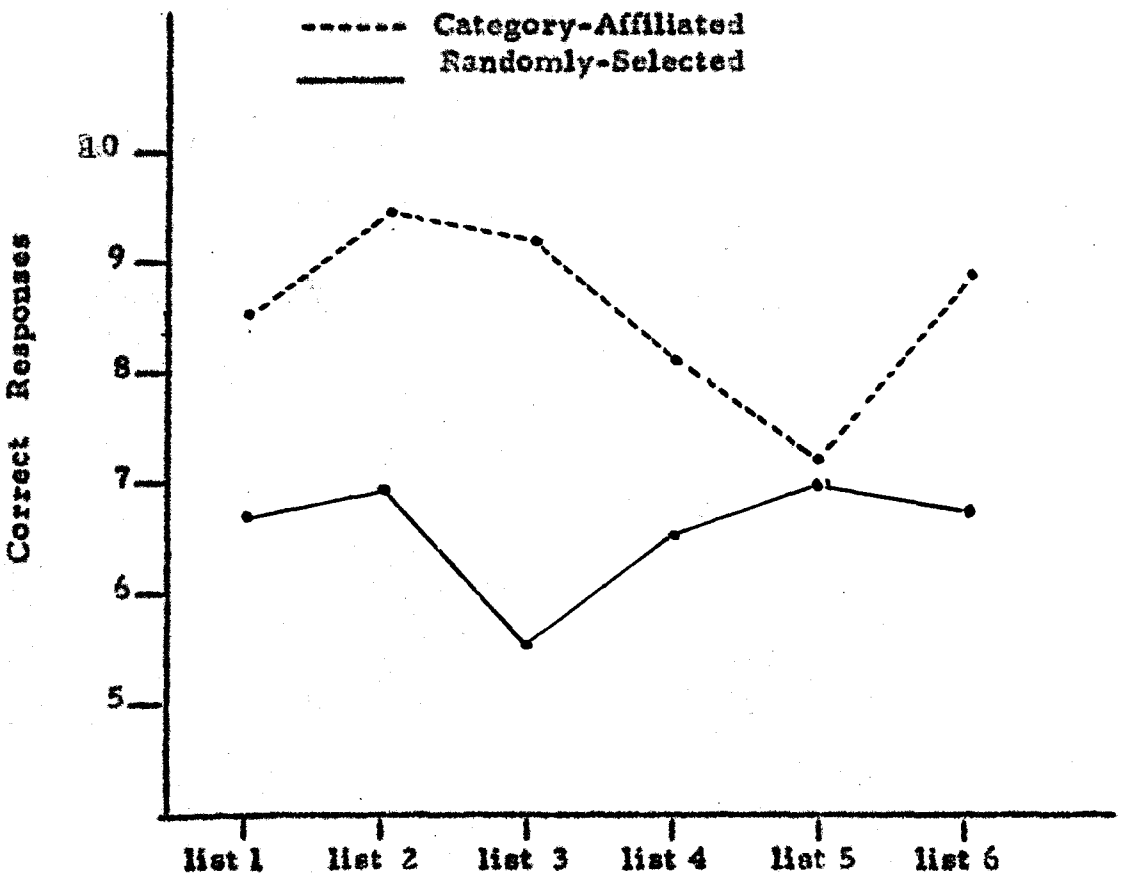

Figure 3. Mean Affiliation performance at levels of Lists.

Table 6

Analysis of Simple Main Effects of Affiliation

at Levels of Lists

Source of Variation	df	MS	F
Affiliation			
at list 1	1	30.62	8.30**
at list 2	1	65.02	17.62**
at list 3	1	129.60	35.12**
at list 4	1	27.22	7.38**
at list 5	1	3.60	0.98
at list 6	1	44.10	11.95**
error (b)	108	3.69	

* $F_{.95}$ (1, 108) = 3.94

** $F_{.99}$ (1, 108) = 6.90

In view of the preceding analyses, a hypothesis of no difference between CA and RS responses is held untenable. As predicted by the second hypothesis, significantly more category-affiliated than randomly-selected items were recalled and recognized.

Hypothesis 3. Operationally, the third hypothesis was concerned with the extent to which CA-RS differences varied as a function of category-relevance.

While category-relevance per se was not among the primary variables in the factorial design, it was nonetheless expected to influence the results of the overall ANOV. More specifically, the operation of the category-relevance variable was expected to exert its influence in the form of L X A interaction. As shown in Table 2 and reported in the preceding section, Affiliation was significant at all levels of Lists with the exception of list 5. List 5 contained the CA segment affiliated with the category "sociality", considered to be non-relevant to the sample population.

In order to deal more specifically with the third hypothesis, Affiliation data were transformed into a set of difference scores. Difference scores were obtained for each subject by subtracting the number of randomly-selected responses from the number of category-affiliated responses. Table 7 presents the means and standard deviations of these difference scores under the various M and L treatment combinations. These data were subjected to a 2 X 6 ANOV, the results of which appear in Table 8. The F of 6.74 ($p < .01$) for main effects due to M indicated

Table 7

Difference Scores: Means and Standard Deviations

lists		1	2	3	4	5	6
Recall	M	2.20	3.30	4.50	2.70	1.30	2.20
	SD	2.82	2.58	2.07	2.06	2.54	2.82
Recogn.	M	1.50	1.80	2.70	0.60	-.10	2.00
	SD	2.88	2.62	3.37	3.27	3.07	1.94

Table 8

ANOV Summary Table for Difference Scores

Source of Variation	df	MS	F
Measure (M)	1	49.41	6.74**
List (L)	5	19.83	2.71*
M X L	5	2.51	0.34
error	108	7.33	

*$F_{.95}$ (5, 108) = 2.31

**$F_{.95}$ (1, 108) = 3.94

significantly larger difference scores in recall as opposed to recognition. Main effects of L ($F = 2.70$; $p < .05$) were also significant. With regard to the latter finding, a Newman-Keuls Test was performed on treatment means and resulted in only one difference significant beyond the .05 level. The difference occurred between list 3 (R category; "health") and list 5 (NR category; "sociality").

In order to provide the most direct and sensitive test on the third hypothesis, a priori provisions were made for the inclusion of orthogonal comparisons of difference scores among levels of Lists. The advantage of this statistical analysis lies in the fact that it permits not only direct comparisons between individual treatments but also comparisons among all possible combinations of treatments. The statistic used in making the comparisons, according to Winer (1962), has the general form

$$F = \frac{(\Sigma c_j T_j)^2}{(n \Sigma c_j^2)(MS_{error})}$$

Here, the c's represent a linear combination of weights which sum to zero, and T_j's the various treatment totals. The F ratio has one degree of freedom for the numerator and kn-k degrees of freedom for the denominator.

The single most direct test on Hypothesis 3 resulted from a component of a sum of squares contrasting the weighted sum of differences from the relevant category lists (list 1, 2, and 3) with the weighted sum of differences from the non-relevant category lists (lists 4, 5, and 6).

The comparison yielded an F of 6.06 which exceeds the critical value at the chosen level of significance ($F_{.95}[1, 114] = 3.93$). Thus, when considered as a whole, a_1-a_2 differences from lists containing R categories were significantly larger than a_1-a_2 differences from lists containing NR categories. Here again, a hypothesis of no difference is held untenable. Taken as a whole, the results provided support for the third directional hypothesis as stated in Chapter II.

As a means of further exploring the relationship between category-relevance and Affiliation differences, orthogonal comparisons were made utilizing identical components under recall and recognition conditions considered separately. The results, while in the expected direction, did not attain significance. By combining treatment totals in other ways, several additional comparisons were made. The entire series of comparisons and their resulting F ratios appear in Table 9. It should be noted that several of the post hoc comparisons produced F's that exceeded chance probability.

Hypothesis 4. The fourth hypothesis pertained to retention differences between R and NR categories. Since judgments with regard to the hypothesis were contingent upon performance under a_1 conditions only, little information was to be gained from the overall ANOV.

Table 10 presents the means and standard deviations of the a_1 data under the various combinations of Measure and Lists. A 2 X 6 ANOV,

Table 9

Orthogonal Comparisons on Difference Scores

Test	Component of Sum of Squares		F
	Overall (M collapsed)		
1	+1 X Lists 1 + 2 + 3	-1 X Lists 4 + 5 + 6	6.06*
	Recall (m_1)		
1	+1 X Lists 1 + 2 + 3	-1 X Lists 4 + 5 + 6	3.84
2	+3 X Lists 2 + 3	-2 X Lists 4 + 5 + 6	6.44**
3	+2 X Lists 1 + 2 + 3	-3 X Lists 5 + 6	4.81**
	Recognition (m_2)		
1	+1 X Lists 1 + 2 + 3	-1 X Lists 4 + 5 + 6	2.43
2	+3 X Lists 2 + 3	-2 X Lists 4 + 5 + 6	2.87
3	+2 X Lists 1 + 2 + 3	-3 X Lists 4 + 5	4.38**

*$F_{.95}$ (1, 114) = 3.95
**$F_{.95}$ (1, 54) = 4.02

represented by Table 11, was performed on these data. Only factor M was found to be significant ($p < .01$) again reflecting the greater production of responses under recognition conditions.

For the reasons explained in the previous section, a priori provisions were made for the inclusion of orthogonal comparisons among category-affiliated conditions. With levels of M collapsed to yield six sets of scores, a statistic was constructed in order to compare combined R categories (from lists 1, 2, and 3) with combined NR categories (from lists 4, 5, and 6). As noted in Table 12, the resulting F ratio, while approaching the critical value, was not significant. Two additional comparisons were performed on the collapsed data. As shown in Table 12, these comparisons yielded significant values when the categories from lists 1 and 6 respectively were omitted.

Also appearing in Table 12 is a series of orthogonal comparisons performed on recall and recognition data considered separately. As in the primary comparison over both levels of M, the analysis failed to reveal significant values when all three R categories were compared with all three NR categories. Analysis of recall data, however, yielded a pair of significant values when one or another of the categories was omitted from the components.

Therefore, while a number of comparisons lent credence to the directional hypothesis as stated in Chapter II, the primary overall comparison failed to provide the evidence required to reject the null hypothesis.

Table 11

Summary Table of ANOV on Relevance Data

Source of Variation	df	MS	F
Measure (M)	1	1,414.53	153.29*
Lists (L)	5	13.77	1.49
M X L	5	2.77	0.30
error	108	9.23	

Table 12

Orthogonal Comparisons on Relevance Data

Test	Component of Sum of Squares		F
	Overall (M collapsed)		
1	+1 X Lists 1 + 2 + 3	-1 X Lists 4 + 5 + 6	3.70
2	+3 X Lists 2 + 3	-2 X Lists 4 + 5 + 6	4.40*
3	+2 X Lists 1 + 2 + 3	-3 X Lists 4 + 5	5.59*
	Recall (m_1)		
1	+1 X Lists 1 + 2 + 3	-1 X Lists 4 + 5 + 6	3.22
2	+3 X Lists 2 + 3	-2 X Lists 4 + 5 + 6	5.06**
	Recognition (m_2)		
1	+1 X Lists 1 + 2 + 3	-1 X Lists 4 + 5 + 6	1.82
2	+2 X Lists 1 + 2 + 3	-3 X Lists 4 + 5	3.61

* $F'_{.95}(1, 114) = 3.93$
** $F'_{.95}(1, 54) = 4.02$

Chapter V

DISCUSSION

In light of the results, the following discussion is offered as a possible interpretation of the data.

The finding of a significant effect due to the Measure factor was not particularly surprising in view of the long-standing concensus that recognition constitutes a more sensitive measure of retention than does recall. Thus, the present findings are consistent with those studies reviewed by McGeoch & Irion (1952) employing younger Ss.

Of particular interest is the extent to which performance under recognition conditions exceeded performance under recall conditions. In terms of mean performances, recognition (with 22.55 items per S) was approximately three times as efficacious as free recall (with 7.50 items per S). If the assumptions are made that the two groups differed in no systematic manner other than retention measure and that the present design allowed for an adequate test of measure differences, then it might logically be concluded that performance varied as a function of the nature and/or extent of information-retrieval demanded by the two levels of the Measure factor. Thus, it would appear that retention measures differ with respect to thresholds required for the elicitation of responses.

The two sources of significant double-order interaction notwith-

standing, the findings of the present investigation lent considerable support to the second directional hypothesis. The number of category-affiliated responses significantly exceeded the number of randomly-selected responses across both levels of Measure and, with the exception of list 5, across all levels of Lists. These findings, taken as a whole, are consistent with the findings of previous investigations (Bousfield, 1953; Cohen, 1963)

It seems evident that at some point between the presentation of the stimuli and the production of responses a form of mediation is brought to bear. The most plausible candidate for the form of mediation would appear to be some variant of the explanation provided by Miller's "chunk" hypothesis (Miller, 1956). According to this hypothesis, "words that go together (p. 95)" are recoded into chunks thereby allowing for storage beyond the span of immediate memory. In the present study there seems little doubt that the inter-relationship among words afforded by category-affiliation as opposed to random-selection largely accounted for the significant difference between the levels of factor A.

An interesting finding relating to the present discussion resulted from the analysis of a_1-a_2 difference scores. More specifically, the ANOV on difference scores resulted in a significant value for main effects due to the Measure factor. In spite of the fact that approximately three times more items were recognized than were recalled, a_1-a_2 differences produced under recall conditions were significantly

larger than those produced under recognition conditions. Thus, it would appear that whatever the advantage incurred in the recall of related (CA) as opposed to unrelated (RS) items, it is partially negated when recognition serves as the retention measure. The following is advanced as a possible explanation. In the learning process, more CA items are processed and stored than RS items due to the built-in mediation afforded by virtue of the CA items "going together." In free recall, this advantage is augmented by the greater inter-item associative strength of the CA items. It is most likely the latter advantage which is largely negated when recognition serves as the retention measure.

Since randomly-selected words were repeated across lists and the CA list-segments were equated with respect to frequency of usage and taxonomic frequency, an interaction effect between Lists and a_1-a_2 differences would indicate the extent to which the content or subject matter of the various category-affiliated segments affects the proportions. Significant values for L X A from the overall ANOV and significant main effects due to L from the analysis of a_1-a_2 difference scores suggested this interaction effect.

Apparently, in list 5 there is something about the content or subject matter of the category "sociality" which virtually negated the advantage of built-in mediation. For all other lists the number of CA responses was significantly greater than the number of RS responses.

It is perhaps no coincidence that "sociality" was considered, intuitively, the least relevant of the categories.

When the means of a_1-a_2 difference scores were ordered for purposes of a Newman-Keuls Test, it was noted that the lists producing the largest differences were lists 2 and 3, and the lists producing the smallest differences were lists 5 and 4. Lists 5 and 4 contained the categories "sociality" and "physical" activities, and were considered non-relevant. Lists 2 and 3, on the other hand, contained the categories "religion-philosophy" and "health" and were considered relevant. The only significant difference, however, resulted between the list containing "health" and that containing "sociality." The result implies differential probabilities of retaining CA items as opposed to RS items again as a function of the category subject matter.

Since the third hypothesis was stated as a more or less dichotomous comparison of relevant and non-relevant categories in terms of difference scores, the most direct test resulted from the primary orthogonal comparison. As reflected in the significant F value, the designation of word categories as "relevant" or "non-relevant" took on some meaning.

The critical test on Hypothesis 4 was somewhat disappointing. The primary orthogonal comparison contrasting relevant and non-relevant categories in terms of performance on CA items approached, but did not exceed, the critical value at the chosen level of significance.

However, it should be noted that convention alone dictated the level at which statistical tests were to be made. Although it is admittedly a post hoc observation, one is justified in noting that the chances are less than one in ten that the observed differences resulted from chance variation. However, the only differences significant at the .05 level occurred when either "sedentary activities" or "education" was omitted from the comparison.

Thus, the preceding analyses provided at least limited support for the contention that verbal materials vary with respect to their relevance for this particular sample population. To the extent to which this is true, it would appear that research findings concerning modal interest patterns of the aging constitute a fairly adequate predictor of relevance.

Two studies in particular related to the present findings. In the first, Bousfield and Cohen (1956) investigated recall as a function of male-female interest patterns. For two major reasons, the design and procedure employed by these researchers could be expected to yield more significant differences than the present study. Since the 40-word list was composed of 20 words relating to male interests and 20 words relating to female interests, the procedure allowed for the simultaneous presentation of both "relevant" and "non-relevant" items in the same list. Bearing in mind the limited span of immediate memory, the two components of the list may be viewed as competing

for limited storage space. Thus, any advantage afforded to one component would be at the expense of the other. In the second place, interests patterns distinctions made on the basis of sex probably represent more of a dichotomy than those based on chronological age.

Isotti (1966) employed a correlational design to investigate recall in the aging. Although his design and procedure differed a good deal from the present study, his findings also provided some support for the contention that recall is differentially related to interest. His main focus, however, was on the narrowing range of interests concomitant with ego-constriction. Of particular interest was his finding that of the four predictor variables employed, chronological age was the least efficacious. Further, Isotti reported that while chronological age intercorrelated with his measure of interest, the magnitude of this intercorrelation was negligible. These findings have implications for the entire field of aging as well as the present investigation. When speaking of the aging phenomenon, in terms of either its physiological or psychological aspects, one must bear in mind that the phenomenon does not bear a one-to-one relationship with chronological age. The range of individual differences is quite substantial and often is a confounding variable in such investigations.

With particular reference to the present study, it should be noted that a modal description of the interest patterns of a particular normative group probably does not constitute an accurate portrayal of its individual

members. In the present study, there is some reason to believe that categories judged "non-relevant" to the group were, in actuality, of interest to many of the Ss. Similarly, categories judged "relevant" to the group probably held little or no interest for an undetermined number of Ss. Thus, if this were the case, a much larger number of Ss would have had to be sampled before the results indicated a high level of significance.

However tentative, the results of the present study suggest several generalizations. If the assumption is made that the assignment of Ss to treatments was adequately randomized, then there is reason to believe that the categories "health" and "religion-philosophy" are quite relevant to the interests and/or linguistic patterns of the sample population. In light of the fact that the vast majority of Ss has medical or quasi-medical disabilities which qualify the members for residence in the domicile, findings with respect to the former category are not surprising. That "religion-philosophy" was relevant is consistent with research reported by Anderson (1959) on the interests of the aging.

On the basis of the relevance measures used, it seems fairly safe to conclude that the "sociality" category was the least relevant. This finding is consistent not only with interest literature but also with "disengagement" theory (Cumming & Henry, 1961). According to these authors, disengagement in the aging process refers to an inevitable mutual withdrawal resulting in decreased interaction between the individ-

ual and the social structure to which he belongs, often accompanied by an increased preoccupation with self.

The three remaining categories yielded ambiguous results. As Ss were often observed to initiate discussions relating to education and schooling during the experimental sessions, it would be questionable to conclude that education is non-relevant. With regard to "physical activities," it should be noted that many of the items related to sports in which Ss may have been interested as spectators. Finally, judging from the results, the "sedentary activities" category was not as relevant as was supposed.

Considerations and Implications

The acceptance of the present findings is contingent upon a number of considerations. First, the nature of the results was somewhat dependent upon the adequate selection and classification of categories employed in the design. As suggested in the preceding paragraphs, there is some doubt as to the accuracy of these preliminary judgements.

The question also arises as to the adequacy of the associative norms gathered for the categories. In particular, it might be argued that employing verbal norms gathered from college students for use with aging Ss introduces an age-related bias. This criticism is not thought to be particularly valid in view of Canestrari's (unpublished) findings that associative norms do not differ significantly across this age span.

Another possible criticism might arise as to the final selection of items composing the category-affiliated segments of the various lists. While selection of items was partially judgmental, it should be noted that rather substantial restrictions were imposed upon the selection procedure by considerations of Thorndike-Lorge (1959) "L" counts and taxonomic frequency counts. Thus, the degrees of judgmental freedom were quite limited.

The final consideration to be discussed concerns the representativeness of the sample. Actually, two separate issues are involved. First, in order to generalize to the entire sample populations, it must be assumed that the groups tested were representative of the total subject pool. This is a questionable assumption in view of the restrictions imposed by selection criteria. Since groups were relatively equal with respect to obvious variables such as education and age, there is probably a justifiable basis for assuming that the Ss were representative of that portion of the total subject pool which would have met the selection criteria.

The second issue involves the extent to which these findings may be generalized to the aging population as a whole. Obviously, there are restrictions imposed by the points discussed above. In addition, two other points merit mention. In the first place, since the sample was composed entirely of males, a generalization to the overall population falling within the tested age range is not justifiable. Indeed, it seems quite likely that sex differences which would influence the results occur

in the process of aging. In the second place, an assumption that the sample tested is representative of the overall population of males falling in this age range is also rather questionable. Indeed, there is evidence to suggest that VA domiciliary members differ, at least with respect to selected personality dimensions, from males of the same age who do not reside in an institutional setting, (Bortner, 1962; 1963). Thus, considerable caution must be exercised in generalizing beyond this type of setting.

The above considerations notwithstanding, several interesting implications resulted from the present study. The bulk of the implications not already dealt with in the discussion are in the form of questions for further research rather than definitive answers.

With regard to performance differences resulting from recognition as opposed to recall, the question arises as to whether the relative difference is stable across age. If the present study were partially replicated with younger Ss and experimental or statistical controls of the variance not directly attributable to age were devised, the results might further illuminate the nature of memory deficits associated with aging. There is some evidence (Canestrari, 1963) to suggest, for example, that information-retrieval requires more time and effort for aging subjects than it does for younger subjects. Absolute performances and relative measure-differences resulting from such a replication might provide meaningful data relating to the locus of observed "memory" deficits.

A second implication arises in connection with the results pertaining to Hypothesis 2. The difference between the retention of category-affiliated and randomly-selected items is taken as a rough index of the advantage afforded the CA segment by virtue of its built-in mediation for encoding and its greater inter-item associative strength. While there is some evidence (Hulicka & Grossman, 1967) indicating an age-related deficit in forming mediators for paired associates, little has been done to investigate the relationship between age and the type of mediation required in the present study. A partial replication with the controls suggested above might result in meaningful information regarding the relationship.

While the present investigation did not provide direct evidence of a relationship between interests and linguistic habits, the results were consistent with what would be expected on the basis of the theoretical formulations. The results did provide at least limited support for the relationship between interests and short-term retention. It is suggested that this area warrants additional investigation. More specifically, the author proposes a cross-sectional investigation of short-term retention in which each word list is composed of a relevant and a non-relevant category. According to this scheme, groups of Ss would be selected on the basis of assessed interest patterns. The relevant category segments of the lists would be determined by the groups' dominant interests. In a similar manner, the non-relevant category segments would be determined by the lowest positions in the groups' interest hierarchies. It is thought that such a design would

largely eliminate confounding variability attributable to individual differences in interests while allowing for a relatively direct comparison of retention between "relevant" and "non-relevant" materials.

The results of such an investigation could be expected to yield information pertaining to two related issues. First, it is expected that the results would constitute confirmatory evidence for the relationship between interest and retention. Second, the results would be expected to reflect age-differences in the extent to which retention is dependent upon the relevance dimension.

Chapter VI

SUMMARY

The present investigation represents an attempt to further explore several parameters of short-term memory of the aging as a function of the relevance or appropriateness of the verbal materials. It was the author's contention that due to changing patterns of interests and experiences accompanying chronological aging, certain types of verbal material vary with respect to their relevance for use with aging populations. It was expected that the relevance dimension would be reflected in retention scores. In regard to parameters of short-term memory, the present study contained provisions for exploring efficiency of retention as a function of: the measure of retention; and category-affiliated as opposed to randomly-selected words.

A 2 X 6 X 2 factorial design was employed in the retention study. From associative norms gathered for six categories which differed in relevance, six 20-word list-segments were constructed. The category-affiliated (CA) list-segments were combined with 20 randomly-selected words to yield six lists. There was one presentation of the list prior to the test of retention.

The major results from the statistical analyses are as follows:

1. Significantly more items were recognized than were recalled.

2. Significantly more category-affiliated items than randomly-

selected items were recalled and recognized from five of the six lists.

3. The numerical differences between category-affiliated and randomly-selected responses were significantly larger on lists which contained relevant categories than on lists which contained non-relevant categories.

4. While there was a definite trend in the predicted direction, the numerical difference between responses from lists containing relevant categories and those from lists containing non-relevant categories did not attain statistical significance.

Thus, at least limited support was found for each of the experimental hypotheses. The results, although somewhat inconsistent, suggested that "relevance" of material does affect the scores made by aging individuals on tests of retention.

APPENDICES

APPENDIX A

Norm Collection Form

Below are listed eight category headings. Beneath each heading you are to write the first five verbal associates occurring to you which meet the following specifications: (a) associates should be single words, not phrases; (b) word-associates should be nouns; and (c) the length of the word-associates should not be less than four letters nor more than 12 letters. Do not be concerned with spelling.

Science	Military	Health

Education	Religion-Philosophy	Sociality

Physical Activities	Sedentary Activities

APPENDIX B

Associative Norms for Chosen Categories

SCIENCE

Item	T	M	F	Item	T	M	F
Biology	63	39	24	Testing	2	1	1
Chemistry	39	25	14	Truth	2	1	1
Geology	23	11	12	Stars	2	0	2
Physics	23	18	5	Unknown	2	2	0
Experiment	17	5	12	Acid	1	0	1
Psychology	9	9	0	Aero-space	1	0	1
Animals	8	3	5	Advancement	1	1	0
Laboratory	8	2	6	Bacteria	1	0	1
Space	8	4	4	Biochemistry	1	1	0
Anatomy	6	2	4	Cancer	1	1	0
Botany	6	5	1	Cause	1	0	1
Math	5	0	5	Cataract	1	0	1
Medicine	5	0	5	Challenge	1	1	0
Microscope	5	3	2	Cheating	1	1	0
Plants	5	2	3	Chemist	1	1	0
Research	5	3	2	Chess	1	1	0
Atom	4	4	0	Chicken	1	0	1
Astronomy	4	4	0	Cold	1	1	0
Ecology	4	4	0	Course	1	1	0
Lab	4	0	4	Creation	1	0	1
Mathematics	4	4	0	Darwinism	1	0	1
Genetics	3	1	2	Descovery	1	0	1
Physiology	3	2	1	Doctor	1	0	1
Scientist	3	0	3	Dog	1	1	0
Teacher	3	1	2	Environment	1	1	0
Theory	3	3	0	Equipment	1	0	1
Zoology	3	2	1	Euglena	1	1	0
Pigs	3	1	2	Evolution	1	0	1
Rockets	3	2	1	Exam	1	0	1
Book	2	2	0	Experimenter	1	0	1
Building	2	1	1	Fact	1	0	1
Cells	2	1	1	Failure	1	0	1
Chemicals	2	2	0	Flask	1	0	1
Disection	2	1	1	Future	1	1	0
Earth	2	1	1	God	1	1	0
Formula	2	1	1	Health	1	0	1
Gravity	2	1	1	Hope	1	1	0
Hypothesis	2	1	1	Ingenuity	1	1	0

APPENDIX B

Item	T	M	F	Item	T	M	F
Knowledge	2	0	2	Porpoise	1	0	1
Ocean	2	2	0	Problem	1	0	1
People	2	2	0	Professor	1	0	1
Physical	2	1	1	Proton	1	1	0
Progress	2	2	0	Project	1	0	1
Intelligence	1	1	0	Reaction	1	1	0
Lens	1	0	1	Religion	1	1	0
Life	1	1	0	Requirement	1	1	0
Machine	1	1	0	Rock	1	0	1
Magnet	1	0	1	Rocketry	1	1	0
Man	1	1	0	School	1	0	1
Metaphysics	1	1	0	Simplicity	1	1	0
Mineralogy	1	0	1	Shells	1	0	1
Missile	1	1	0	Skeleton	1	0	1
Moon	1	0	1	Study	1	0	1
Oceanography	1	1	0	Sociology	1	1	0
Natural	1	0	1	Society	1	0	1
Organism	1	1	0	Taxonomy	1	1	0
Paramecium	1	1	0	Technician	1	0	1
Pathology	1	1	0	Temperature	1	1	0
Philosophy	1	1	0	Thinking	1	0	1
Phylum	1	1	0	Trees	1	1	0
Planet	1	0	1	Water	1	1	0
				World	1	0	1

EDUCATION

Item	T	M	F	Item	T	M	F
College	46	28	18	Intelligence	4	0	4
School	30	14	16	Work	4	2	2
Teacher	27	14	13	Studying	4	2	2
Book	24	13	11	Advancement	3	3	0
Learning	19	12	7	Career	3	0	3
Study	11	8	3	Course	3	2	1
Knowledge	13	7	6	Doctorate	3	2	1
Professor	10	6	4	Future	3	2	1
Student	10	6	4	Masters	3	3	0
Degree	7	5	2	Paper	3	2	1
Reading	7	4	3	Test	3	2	1
Money	6	2	4	Business	2	0	2
Teaching	4	3	k	Class	4	2	2

APPENDIX B

Item	T	M	F	Item	T	M	F
English	2	2	0	Importance	1	0	1
Exam	2	0	2	Information	1	0	1
Graduation	2	2	0	Ingenuity	1	1	0
Institution	2	2	0	Instructor	1	0	1
Job	2	2	0	Lab	1	1	0
Lesson	2	0	2	Lecture	1	1	0
Library	2	2	0	Life	1	1	0
Pencil	2	2	0	Light	1	1	0
Profession	2	0	2	Logic	1	1	0
Psychology	2	0	2	Love	1	1	0
Success	2	2	0	Material	1	1	0
Test	2	1	1	Magazine	1	1	0
Travel	2	1	1	Math	1	1	0
Academics	1	0	1	Major	1	0	1
Accounting	1	1	0	Mind	1	1	0
Administration	1	0	1	Necessity	1	0	1
Blackboard	1	0	1	Music	1	1	0
Boundaries	1	1	0	Opportunity	1	0	1
Children	1	0	1	Philosophy	1	1	0
Church	1	1	0	Physics	1	1	0
Concentration	1	0	1	Post-graduate	1	1	0
Counseling	1	1	0	Power	1	0	1
Criticism	1	0	1	Pre-school	1	0	1
Desire	1	1	0	Program	1	1	0
Desk	1	1	0	Quality	1	1	0
Development	1	1	0	Respect	1	1	0
Diploma	1	1	0	Scholar	1	0	1
Discussion	1	1	0	Segregation	1	0	1
Educators	1	0	1	Standards	1	1	0
Elite	1	1	0	Status	1	1	0
Employment	1	1	0	Studies	1	0	1
Expense	1	1	0	Tension	1	0	1
Fact	1	0	1	Textbook	1	0	1
Friends	1	0	1	System	1	0	1
Future	1	0	1	Training	1	0	1
Goals	1	0	1	University	1	1	0
Discussion	1	1	0	Watching	1	1	0
Graduation	1	0	1	Welfare	1	0	1
Grammar	1	1	0	Worrying	1	0	1
History	1	1	0	Writing	1	1	0
Homework	1	1	0	Years	1	0	1
Home	1	0	1				

APPENDIX B

PHYSICAL ACTIVITIES

Item	T	M	F	Item	T	M	F
Football	47	31	16	Action	1	0	1
Basketball	41	20	21	Animals	1	1	0
Baseball	36	26	10	Bike	1	0	1
Tennis	20	7	13	Billiards	1	1	0
Running	17	10	7	Boats	1	1	0
Exercise	12	6	6	Body	1	1	0
Sports	11	8	3	Boxing	1	1	0
Volleyball	11	8	3	Cars	1	1	0
Golf	10	5	5	Cheerleading	1	0	1
Track	9	6	3	Climbing	1	1	0
Bowling	6	2	4	Combination	1	0	1
Dancing	6	1	5	Competition	1	0	1
Riding	6	1	5	Conditioning	1	1	0
Skiing	5	1	4	Cook	1	0	1
Walking	5	2	3	Dating	1	1	0
Driving	4	3	1	Development	1	1	0
Gymnastics	4	3	1	Drinking	1	1	0
Hunting	4	4	0	Exhaustion	1	1	0
Strength	4	3	1	Fatigue	1	1	0
Weights	4	4	0	Figures	1	0	1
Dance	3	1	2	Fighting	1	1	0
Fitness	3	2	1	Fish	1	1	0
Jumping	3	1	2	Food	1	1	0
Horses	3	1	2	Frenching	1	1	0
Playing	3	2	1	Handball	1	0	1
Sex	3	3	0	Happiness	1	1	0
Ping-pong	3	2	1	Health	1	1	0
Soccer	3	2	1	Hitting	1	1	0
Archery	2	0	2	Hiking	1	1	0
Ball	2	2	0	Injuries	1	1	0
Excitement	2	0	2	Iron	1	0	1
Fishing	2	1	1	Intermurals	1	1	0
Flying	2	1	1	Intercourse	1	1	0
Games	2	1	1	Karate	1	1	0
Gym	2	2	0	Kissing	1	1	0
Hockey	2	0	2	Learning	1	1	0
Lifting	2	2	0	Mountain	1	1	0
Loving	2	1	1	Muscles	1	0	1
Skating	2	1	1	Nails	1	1	0
Softball	2	0	2	Necking	1	0	1

APPENDIX B

Item	T	M	F	Item	T	M	F
Water	2	2	0	Run	1	1	0
Work	2	0	2	Sailing	1	1	0
Outdoors	1	1	0	Score	1	0	1
Party	1	1	0	Sexuality	1	1	0
People	1	1	0	Shooting	1	1	0
Play	1	0	1	Sit-ups	1	1	0
Pool	1	1	0	Snow	1	1	0
Referee	1	1	0	Sorrow	1	1	0
Relaxation	1	0	1	Smoking	1	0	1
Stamina	1	0	1	Spectators	1	0	1
Stupidity	1	1	0	Training	1	1	0
Surfing	1	1	0	Vigor	1	0	1
Swim	1	1	0	Tumbling	1	0	1
Talking	1	0	1	Weakness	1	1	0
Tension-recuc-tion	1	1	0	Working	1	0	1
				Wrestling	1	1	0

SOCIALITY

Item	T	M	F	Item	T	M	F
Party	40	18	22	Appearance	3	1	2
People	20	9	11	Conversation	3	1	2
Dance	15	7	8	Friendship	3	2	1
Friend	13	5	8	Manners	3	3	0
Drink	9	5	4	Meetings	3	1	2
Fraternity	8	6	2	Money	3	2	1
Dates	8	4	4	Movie	3	1	2
Groups	8	3	5	Society	3	2	1
Personality	8	3	5	Sociology	3	0	3
Drinking	6	6	0	Adjustment	2	1	1
Games	5	0	5	Banquet	2	0	2
Clubs	5	1	4	Bowling	2	2	0
Girls	5	5	0	Butterfly	2	0	2
Love	5	4	1	Clicks	2	1	1
Sex	5	5	0	Class	2	1	1
Fun	4	2	2	Clothes	2	1	1
Talk	4	2	2	Enjoyment	2	1	1
Dancing	4	2	2	Friendliness	2	0	2
Dating	4	3	1	Grace	2	1	1
Action	3	2	1	Crowd	2	1	1

APPENDIX B

Item	T	M	F	Item	T	M	F
Inhibition	2	2	0	Female	1	1	0
Laughing	2	2	0	Food	1	1	0
Leaders	2	2	0	Fool	1	0	1
Life	2	0	2	Forgetfulness	1	1	0
Neighbor	2	0	2	Frats	1	1	0
Pleasure	2	1	1	Freedom	1	0	1
Sincerity	2	1	1	Funerals	1	1	0
Sorority	2	0	2	Gatherings	1	0	1
Travel	2	1	1	Gangs	1	1	0
Wealth	2	2	0	Government	1	1	0
World	2	1	1	Happiness	1	0	1
Woman	2	2	0	Hate	1	1	0
Amiability	1	0	1	Help	1	1	0
Apartment	1	0	1	Host	1	1	0
Associate	1	1	0	Hostess	1	1	0
Accident	1	0	1	Humor	1	0	1
Ball	1	1	0	Hypocrisy	1	1	0
Bear	1	1	0	Individual	1	1	0
Bomb	1	1	0	Integration	1	0	1
Booze	1	1	0	Interaction	1	1	0
Boredom	1	1	0	Intercourse	1	1	0
Change	1	1	0	Juvenile	1	0	1
Charm	1	0	1	Language	1	1	0
Coffee	1	0	1	Lectures	1	1	0
Coke	1	1	0	Luncheon	1	0	1
Commitment	1	0	1	Marriage	1	0	1
Care	1	1	0	Mood	1	1	0
Color	1	1	0	Nationality	1	0	1
Competition	1	1	0	Neatness	1	0	1
Competitiveness	1	1	0	Music	1	1	0
Concern	1	0	1	Organization	1	0	1
Conflict	1	1	0	Others	1	1	0
Conformity	1	1	0	Outcast	1	0	1
Cooperation	1	1	0	Partner	1	1	0
Corruption	1	1	0	Politeness	1	1	0
Courtesy	1	1	0	Popularity	1	1	0
Creed	1	1	0	Prejudice	1	1	0
Custom	1	1	0	Project	1	0	1
Democracy	1	0	1	Play	1	0	1
Despair	1	1	0	Recluse	1	0	1
Dinner	1	1	0	Recreation	1	0	1

APPENDIX B

Item	T	M	F	Item	T	M	F
Dress	1	1	0	Status	1	0	1
Etiquette	1	1	0	Ride	1	1	0
Entertainment	1	0	1	Surrounding	1	1	0
Exhibitionism	1	1	0	Taboo	1	1	0
Fear	1	1	0	Teas	1	0	1
Feelings	1	1	0	Talking	1	1	0
Race	1	1	0	Trouble	1	1	0
Roommate	1	1	0	Walking	1	1	0
Rudeness	1	1	0	Wedding	1	1	0
Security	1	0	1	Welfare	1	0	1
Singing	1	1	0	Worry	1	1	0
Sleep	1	1	0	Years	1	0	1
Smoking	1	1	0	Weekend	1	1	0
Socials	1	0	1				

MILITARY

Item	T	M	F	Item	T	M	F
Army	40	23	17	Ship	3	1	2
Navy	34	17	17	Weapon	3	1	2
Draft	19	15	4	Airplane	2	1	1
Marine	19	7	12	Rank	3	1	2
Soldier	18	5	13	Bombs	2	2	0
War	17	9	8	Cadet	2	0	2
Death	10	8	2	Camp	2	1	1
Gun	9	6	3	Combat	2	2	0
Uniform	9	5	4	Deferment	2	1	1
Service	8	4	4	Killing	2	2	0
Tank	7	6	1	Missile	2	1	1
Fight	7	5	2	Obligation	2	1	1
General	6	4	2	Power	2	2	0
Officer	5	3	2	Sergeant	2	2	0
March	4	3	1	Unit	2	1	1
Peace	4	2	2	Violence	2	1	1
Propaganda	5	3	2	Advance	1	1	0
Battle	3	2	1	Ambulance	1	1	0
Bullet	3	2	1	Ammunition	1	0	1
Captain	3	2	1	Anxiety	1	1	0
Command	3	1	2	Arms	1	1	0

APPENDIX B

Item	T	M	F	Item	T	M	F
Defense	3	1	2	Induction	1	1	0
Hate	3	3	0	Infantry	1	1	0
Protection	3	2	1	Installation	1	1	0
Attention	1	0	1	Jeep	1	0	1
Authority	1	1	0	Jungle	1	1	0
Barracks	1	0	1	Leadership	1	1	0
Base	1	1	0	Lieutenant	1	0	1
Blood	1	1	0	Liberty	1	0	1
Candidate	1	1	0	Loneliness	1	1	0
Cannon	1	1	0	Male	1	0	1
Casualties	1	0	1	Maneuver	1	0	1
Children	1	0	1	Mankind	1	1	0
Company	1	1	0	Martinet	1	1	0
Commissary	1	0	1	Metals	1	0	1
Courage	1	1	0	Mortar	1	1	0
Demonstration	1	1	0	Mule	1	1	0
Democracy	1	0	1	Murder	1	1	0
Disease	1	0	1	Mustache	1	1	0
Discharge	1	1	0	Order	1	1	0
Discipline	1	1	0	Patrol	1	0	1
Dominance	1	1	0	Police	1	1	0
Draftee	1	1	0	Private	1	1	0
Drill	1	1	0	Procedure	1	1	0
Earth	1	1	0	Regulation	1	1	0
Exemption	1	1	0	Reserve	1	1	0
Eyes	1	0	1	Retaliation	1	0	1
Father	1	0	1	Reward	1	1	0
Flag	1	1	0	Rice	1	0	1
Flying	1	1	0	Rigor	1		1
Force	1	0	1	Rule	1	0	1
Formation	1	0	1	Sailor	1	0	1
Government	1	0	1	Strength	1	1	0
Guard	1	1	0	Submarine	1	0	1
Gunner	1	0	1	Sword	1	1	0
Hat	1	0	1	Travel	1	1	0
Helicopter	1	1	0	Tent	1	0	1
Hell	1	1	0	Time	1	1	0
Hospital	1	0	1	Training	1	1	0
Hypocrisy	1	1	0	Troops	1	1	0
				Victory	1	0	1

APPENDIX B

SEDENTARY ACTIVITIES

Item	T	M	F	Item	T	M	F
Reading	44	23	21	Laziness	2	0	2
Sleep	22	11	11	Lecture	2	1	1
Television	17	8	9	Love	2	2	0
Talking	15	11	4	Movie	2	1	1
Thinking	13	9	4	Office	2	1	1
Sleeping	12	7	5	Painting	3	0	3
Cards	10	4	6	Smoking	2	1	1
Listening	10	5	5	Acceptance	1	1	0
Writing	10	5	5	Alertness	1	0	1
Rest	8	4	4	Anxiety	1	1	0
Study	7	4	3	Applications	1	1	0
Talk	7	3	4	Archery	1	1	0
Dreaming	6	4	2	Babysitting	1	0	1
Music	6	4	2	Chair	1	1	0
Books	5	3	2	Classroom	1	0	1
Eating	5	3	2	Companion	1	1	0
Radio	5	2	3	Comprehending	1	0	1
Relaxing	7	4	3	Cussing	1	1	0
Thought	5	3	2	Dancing	1	1	0
Chess	4	4	0	Darts	1	1	0
Drawing	4	1	3	Drink	1	1	0
Sewing	4	0	4	Dullness	1	0	1
Sitting	4	2	2	Dying	1	1	0
Studying	4	2	3	Electronics	1	1	0
Watching	4	4	0	Enjoyment	1	1	0
Concentration	3	2	1	Failure	1	0	1
Dream	3	2	1	Family	1	1	0
Records	3	2	1	Fatness	1	0	1
Resting	3	2	1	Feel	1	1	0
Singing	3	3	0	Fighting	1	1	0
Boredom	2	0	2	Future	1	1	0
Bridge	2	1	1	Gambling	1	1	0
Checkers	2	2	0	Gazing	1	1	0
Class	2	1	1	Guitar	1	1	0
Contemplation	2	2	0	Happiness	1	1	0
Conversation	2	1	1	Hypnosis	1	1	0
Daydreaming	2	0	2	Kneeling	1	1	0
Driving	2	1	1	Knowing	1	1	0
Drinking	2	2	0	Knowledge	1	0	1
Bedroom	2	2	0	Learning	1	1	0

APPENDIX B

Item	T	M	F	Item	T	M	F
Looking	1	0	1	Riding	1	0	1
Library	1	0	1	Ring	1	0	1
Lying	1	1	0	School	1	1	0
Marriage	1	1	0	Secretary	1	0	1
Meditation	1	1	0	Smoke	1	0	1
Memory	1	1	0	Stagnation	1	0	1
Mind	1	0	1	Stamps	1	0	1
Monopoly	1	1	0	Stand	1	0	1
Motivation	1	0	1	Standing	1	0	1
Models	1	1	0	Test	1	1	0
Nostalgia	1	0	1	Text	1	1	0
Obsolete	1	0	1	Time	1	1	0
Pain	1	0	1	Vacation	1	0	1
Pencils	1	0	1	Vagrancy	1	1	0
People	1	0	1	Understanding	1	1	0
Photography	1	1	0	Walking[	1	1	0
Ping-pong	1	1	0	Wanting	1	0	1
Planning	1	1	0	Waste	1	1	0
Puzzles	1	1	0	Wondering	1	1	0
Regreting	1	1	0	Worry	1	1	0
Relaxation	1	0	1	Wiskey	1	0	1

HEALTH

Item	T	M	F	Item	T	M	F
Doctor	25	9	16	Education	5	3	2
Hospital	16	7	9	Fitness	5	4	1
Disease	14	7	7	Happiness	5	2	3
Food	12	4	8	Heart	5	4	1
Medicine	9	4	5	Nurse	5	3	2
Body	8	2	6	Vitamin	5	2	3
Exercise	8	3	5	Mind	4	2	2
Diet	7	3	4	Rest	4	1	3
Hygiene	7	4	3	Sanitation	4	1	3
Cleanliness	6	5	1	Sleep	4	2	2
Death	6	5	1	Weight	4	4	0
Illness	6	3	3	Book	3	1	2
Sickness	6	6	0	Condition	3	2	1
Cancer	5	4	1	Eyes	3	2	1

APPENDIX B

Item	T	M	F	Item	T	M	F
Life	3	2	1	Comfort	1	1	0
Pill	3	2	1	Community	1	1	0
Skin	3	1	2	Coordination	1	1	0
Smoking	3	1	2	Digestion	1	0	1
Strength	3	2	1	Drug	1	0	1
Teeth	3	1	2	Drinking	1	0	1
Activity	2	2	0	Environment	1	0	1
Build	2	1	1	Excuse	1	0	1
Color	2	2	0	Feeling	1	1	0
Examination	2	0	2	Greens	1	0	1
Bed	2	1	1	Hands	1	1	0
Cold	2	0	2	Hair	1	1	0
Course	2	1	1	Heighth	1	0	1
Germs	2	0	2	Heredity	1	1	0
Insurance	2	2	0	Infection	1	0	1
Muscle	2	1	1	Innoculation	1	0	1
Research	2	2	0	Infirmary	1	0	1
Shots	2	1	1	Intercourse	1	1	0
Vitality	2	1	1	Learning	1	1	0
Dope	2	2	0	Liquor	1	1	0
Agility	1	1	0	Logic	1	1	0
Posture	2	1	1	Lungs	1	0	1
Sports	2	2	0	Magic	1	1	0
Aged	1	0	1	Marriage	1	1	0
Air	1	0	1	Meat	1	0	1
Anatomy	1	1	0	Medication	1	1	0
Appearance	2	2	0	Milk	1	0	1
Athlete	1	1	0	Mother	1	0	1
Baby	1	0	1	Nutrition	1	1	0
Backbone	1	1	0	Operation	1	0	1
Beans	1	0	1	Penecilin	1	0	1
Bones	1	0	1	People	1	1	0
Brother	1	0	1	Plague	1	1	0
Cafeteria	1	1	0	Poverty	1	1	0
Corrot	1	0	1	Protein	1	0	1
Center	1	1	0	Puke	1	1	0
Cigarette	1	1	0	Reflex	1	1	0
Circulation	1	1	0	Relaxation	1	0	1
Class	1	1	0	Respiration	1	0	1
Clinic	1	1	0	Routine	1	1	0
Running	1	1	0	Thyroid	1	1	0

APPENDIX B

Item	T	M	F	Item	T	M	F
Ward	1	1	0	Study	1	0	1
Well	1	1	0	Sulphur	1	0	1
Senility	1	0	1	Subject	1	0	1
Sex	1	1	0	Suture	1	1	0
Skull	1	1	0	Syphilis	1	1	0
Sound	1	1	0	Tablets	1	0	1
Speed	1	1	0	Teacher	1	0	1
Stamina	1	1	0	Vigor	1	0	1
				Wealth	1	1	0

RELIGION--PHILOSOPHY

Item	T	M	F	Item	T	M	F
Church	30	13	17	History	2	2	0
Bible	23	14	9	People	2	2	0
God	28	14	14	Reasoning	2	1	1
Belief	15	6	9	Requirement	2	2	0
Faith	8	4	4	Salvation	2	1	1
Christ	7	4	3	Superstition	2	2	0
Christianity	7	4	3	Worship	2	1	1
Mind	6	5	1	Admonition	1	0	1
Cross	5	3	2	Afterlife	1	1	0
Heaven	5	4	1	Angel	1	1	0
Love	5	4	1	Animals	1	1	0
Prayer	5	3	2	Athiesism	1	1	0
Death	4	2	2	Augustine	1	0	1
Minister	4	1	3	Baptism	1	0	1
Morals	4	3	1	Bigot	1	1	0
Preacher	4	2	2	Bishop	1	0	1
Thought	4	3	1	Bull	1	1	0
Catholicism	3	1	2	Camp	1	0	1
Hell	3	3	0	Chapel	1	1	0
Life	3	2	1	Communion	1	0	1
Priest	3	1	2	Communism	1	1	0
Truth	3	1	2	Conduct	1	1	0
Altar	2	1	1	Conformity	1	1	0
Books	2	2	0	Controversy	1	1	0
Budism	2	2	0	Convent	1	0	1
Beauty	2	2	0	Hypocrisy	2	2	0
Fanatic	2	0	2	Ideas	2	2	0

APPENDIX B

Item	T	M	F	Item	T	M	F
Course	1	0	1	Morality	1	1	0
Creed	1	1	0	Nun	1	1	0
Crusification	1	1	0	Optomist	1	1	0
Deciple	1	1	0	Pastor	1	1	0
Decision	1	1	0	Professor	1	0	1
Determinism	1	1	0	Pulpit	1	0	1
Devine	1	0	1	Quiet	1	0	1
Dominance	1	0	1	Reformation	1	1	0
Doctrine	1	0	1	Resurrection	1	1	0
Denomination	1	0	1	Rigidity	1	1	0
East	1	1	0	Ritual	1	0	1
Eternity	1	1	0	Saint	1	0	1
Farse	1	1	0	Sermon	1	0	1
Flower	1	0	1	Service	1	0	1
Forgiveness	1	1	0	Sin	1	0	1
Freedom	1	1	0	Sinner	1	1	0
Godliness	1	0	1	Society	1	1	0
Goal	1	1	0	Song	1	0	1
Grace	1	0	1	Soul	1	1	0
Hippie	1	1	0	Sunday	1	1	0
Honesty	1	1	0	Thinkers	1	0	1
Human	1	1	0	Thinking	1	1	0
Individual	1	1	0	Training	1	1	0
Individualism	1	1	0	Utopia	1	1	0
Instability	1	1	0	Virtue	1	1	0
Joke	1	1	0	Understanding	1	1	0
Law	1	0	1	Views	1	1	0
Learning	1	1	0	Well-being	1	1	0
Man	1	1	0	Wisdom	1	0	1
Matter	1	1	0	Works	1	0	1
Missionary	1	0	1	Zen	1	1	0

APPENDIX C

List-Segments and Frequency Counts

SEDENTARY ACTIVITIES

"L" Count	Item	Taxon. Freq.	"L" Count	Item	Taxon. Freq.
684	Books	5	660	Music	6
467	Bridge	2	220	Painting	3
491	Cards	10	4	Photography	1
9	Checkers	2	393	Radio	5
12	Chess	4	278	Puzzles	1
47	Concentration	3	193	Relaxing	7
20	Contemplation	2	503	Sleep	22
68	Darts	1	1000	Talk	7
113	Daydream	2	14	Television	17
21	Meditation	1	92	Drawing	4

RELIGION--PHILOSOPHY

121	Bible	23	58	Altar	2
459	Faith	8	148	Worship	2
1000	Mind	6	183	Sin	1
517	Cross	5	40	Salvation	2
441	Heaven	5	18	Chapel	1
1000	Love	5	57	Doctrine	1
194	Prayer	5	126	Virtue	1
228	Minister	4	16	Morality	1

APPENDIX G

RELIGION--PHILOSOPHY (Continued)

"L" Count	Item	Taxon. Freq.	"L" Count	Item	Taxon. Freq.
212	Belief	15	259	Grace	1
78	Preacher	4	28	Pulpit	1
		HEALTH			
1000	Doctor	25	21	Fitness	5
319	Exercise	8	1000	Heart	5
167	Medicine	9	30	Pill	3
258	Diet	7	37	Germ	3
45	Hygiene	7	58	Circulation	1
815	Death	6	29	Digestion	1
183	Illness	6	54	Infection	1
62	Sickness	6	75	Lungs	1
27	Cancer	5	123	Drug	1
38	Backbone	1	714	Nurse	1
		EDUCATION			
684	Book	24	138	Test	2
356	Teacher	27	69	Graduation	2
206	Reading	7	514	History	1
397	Student	10	144	Lecture	1
272	Professor	10	30	Math	1

APPENDIX C

EDUCATION (Continued)

"L" Count	Item	Taxon. Freq.	"L" Count	Item	Taxon. Freq.
391	Degree	7	47	Scholar	1
179	Grade	6	24	Textbook	1
382	Teaching	5	44	Logic	1
687	Class	4	156	Writing	1
415	Test	3	19	Blackboard	1

PHYSICAL ACTIVITIES

215	Tennis	20	315	Shooting	1
422	Sports	11	87	Tumbling	1
19	Volleyball	11	39	Wrestling	1
278	Golf	10	281	Swim	1
309	Track	9	21	Surfing	1
20	Hunting	4	19	Hockey	2
1000	Dancing	6	357	Weights	4
678	Riding	6	46	Vigor	1
635	Boxing	1	45	Exhaustion	1
57	Hiking	1	105	Fatigue	1

SOCIALITY

1000	Party	40	4	Inhibition	2
658	Drink	9	61	Etiquette	1
447	Society	3	42	Gatherings	1

APPENDIX C

SOCIALITY (Continued)

388	Dates	8	132	Host	1
966	Game	5	79	Popularity	8
999	Club	5	53	Friendliness	2
180	Sex	5	0	Interaction	1
322	Personality	8	26	Roommate	1
54	Banquet	2	60	Status	1
91	Clicks	2	17	Outcast	1

RANDOMLY--SECECTED ITEMS

"L" Count	Item	"L" Count	Item
774	Aunt	227	Presence
24	Bomber	8	Prong
163	Collection	105	Retreat
262	Creature	210	Shame
39	Frenzy	9	Slayer
1000	Glass	726	Sugar
757	Hate	37	Starvation
149	Hero	25	Translation
60	Legislature	70	Version
102	Plaster	266	Wage

APPENDIX D

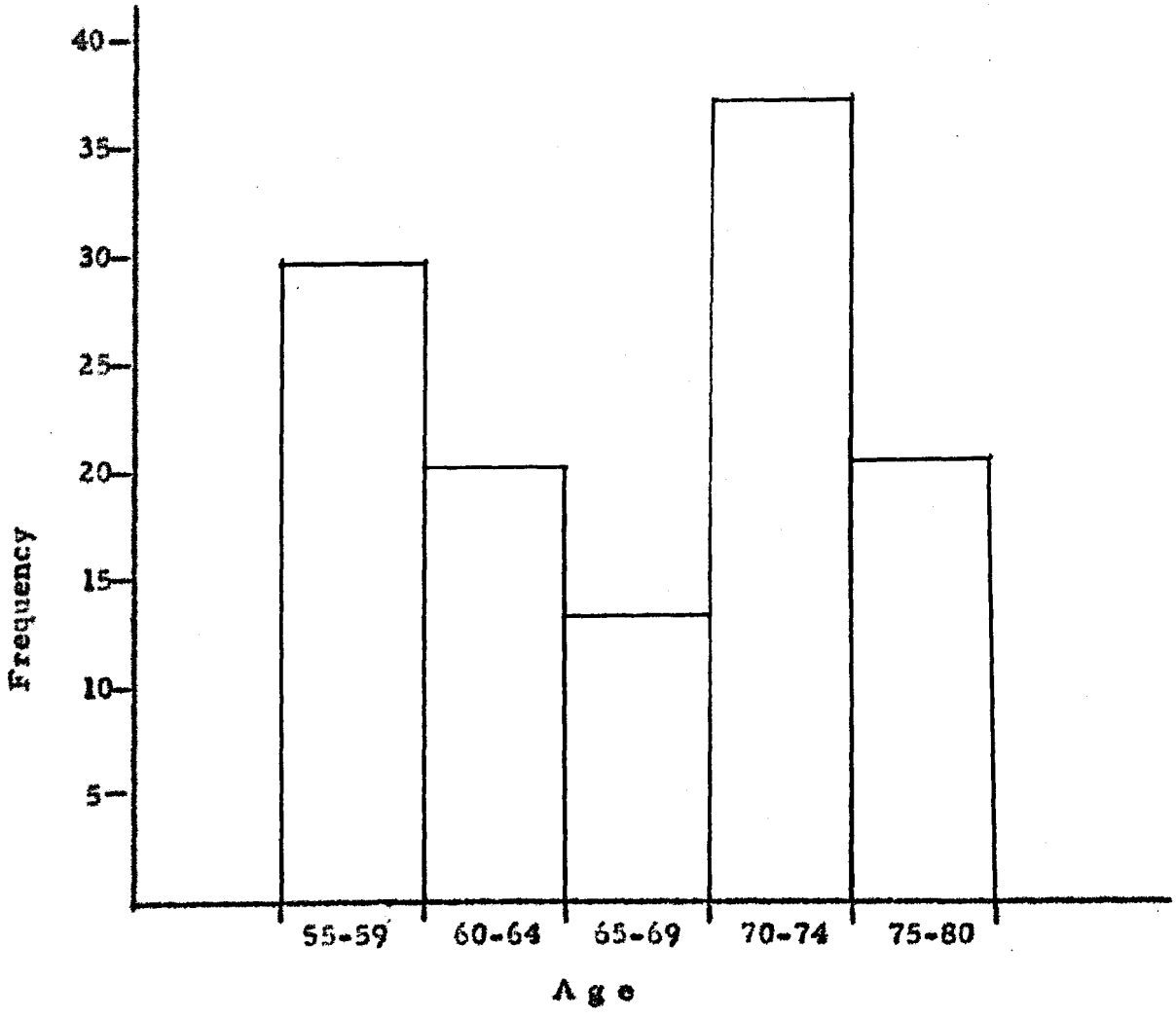

Figure 4. Frequency distribution of Subjects by Chronological age.

APPENDIX E

Recognition Form--Sedentary Activities

Place an "X" in the blank to the left of each word that appeared in the list you were shown. Do not make more than 40 "X's".

___ REGARD	___ BIKE	___ SOUL
___ DAME	___ EXHORTATION	___ SPRING
___ EXAMINATION	___ GLASS	___ GENIUS
___ SHAME	___ COLLECTION	___ NOTATION
___ MUSEUM	___ SKIING	___ WAGE
___ SLEEP	___ BOMBER	___ HATE
___ FRENZY	___ SHOTS	___ CONVERSATION
___ HINGE	___ COURTESY	___ PRONG
___ CHECKERS	___ DUTY	___ FISH
___ JUMPING	___ BOULEVARD	___ POUND
___ WITNESS	___ DARTS	___ PLASTER
___ FLOCK	___ RELAXING	___ PUZZLES
___ CARDS	___ BROTHER	___ YESTERDAY
___ CATHOLICISM	___ INSTRUCTION	___ CONTEMPLATION
___ SHIFT	___ STAGNATION	___ PHILOSOPHY
___ JOCKEY	___ SCRAPBOOK	___ ENEMY
___ LOOKING	___ DINNER	___ FIEND
___ MONOPOLY	___ CONCENTRATION	___ TRANSLATION
___ MOVIE	___ LAUGHTER	___ OFFICE
___ ASSOCIATION	___ TENOR	___ PAIL
___ MIMIC	___ AUNT	___ GRILL
___ STARVATION	___ HOSPITAL	___ CREATURE

(see next page)

APPENDIX E
Recognition Form--Sedentary Activities (page 2)

___ TORCH	___ HELL	___ PICTURE
___ COMPANION	___ MEDITATION	___ IDEA
___ PRESENCE	___ AGILITY	___ DRAWING
___ MEETINGS	___ GRAMMAR	___ BOOKS
___ COLLEGE	___ CHURCH	___ CHAIRMAN
___ INFAMY	___ OPERATION	___ PAINTING
___ VERSION	___ HERO	___ SUGAR
___ SLAYER	___ SCHOOL	___ FRIEND
___ AFFECTION	___ THINKING	___ QUEEN
___ DIPLOMA	___ ACADEMICS	___ RECLUSE
___ VITALITY	___ FOOTBALL	___ TALK
___ LEGISLATION	___ STERN	___ PHOTOGRAPHY
___ SYSTER	___ MUSIC	___ CONFERENCE
___ DAYDREAM	___ CHESS	___ RADIO
___ PLAY	___ UNEMPLOYMENT	___ TELEVISION
___ MADRAS	___ WART	___ NEATNESS
___ RESURRECTION	___ RETREAT	___ BASENESS
___ CLOCK	___ BRIDGE	___ VINDICATION

APPENDIX E
Recognition Form--Religion-Philosophy

Place an "X" in the blank to the left of each word that appeared in the list you were shown. Do not make more than 40 "X's".

___ REGARD	___ BIKE	___ SOUL
___ DAME	___ EXHORTATION	___ SPRING
___ EXAMINATION	___ GLASS	___ GENIUS
___ SHAME	___ COLLECTION	___ NOTATION
___ MUSEUM	___ SKIING	___ WAGE
___ VIRTUE	___ BOMBER	___ HATE
___ FRENZY	___ SHOTS	___ CONVERSATION
___ HINGE	___ COURTESY	___ PRONG
___ CROSS	___ DUTY	___ FISH
___ JUMPING	___ BOULEVARD	___ POUND
___ FITNESS	___ MINISTER	___ PLASTER
___ FLOCK	___ DOCTRINE	___ CHAPEL
___ MIND	___ BROTHER	___ YESTERDAY
___ SALVATION	___ INSTRUCTION	___ PRAYER
___ SHIFT	___ STAGNATION	___ PHILOSOPHY
___ JOCKEY	___ SCRAPBOOK	___ ENEMY
___ LOOKING	___ DINNER	___ FIEND
___ MONOPOLY	___ LOVE	___ TRANSLATION
___ MOVIE	___ LAUGHTER	___ OFFICE
___ ASSOCIATION	___ TENOR	___ PAIL
___ MIMIC	___ AUNT	___ GRILL
___ STARVATION	___ HOSPITAL	___ CREATURE
___ TORCH	___ PREACHER	___ PICTURE

(see next page)

APPENDIX E
Recognition Form--Religion-Philosophy (page 2)

___ COMPANION	___ HELL	___ IDEA
___ PRESENCE	___ AGILITY	___ PULPIT
___ MEETINGS	___ GRAMMAR	___ BIBLE
___ COLLEGE	___ CHURCH	___ CHAIRMAN
___ INFAMY	___ OPERATION	___ WORSHIP
___ VERSION	___ HERO	___ SUGAR
___ SLAYER	___ SCHOOL	___ FRIEND
___ AFFECTION	___ THINKING	___ QUEEN
___ DIPLOMA	___ ACADEMICS	___ RECLUSE
___ VITALITY	___ FOOTBALL	___ MORALITY
___ LEGISLATION	___ STERN	___ SIN
___ SYSTEM	___ ALTAR	___ CONFERENCE
___ BELIEF	___ HEAVEN	___ CATHOLICISM
___ PLAY	___ UNEMPLOYMENT	___ GRACE
___ MADRAS	___ WART	___ NEATNESS
___ RESURRECTION	___ RETREAT	___ BASENESS
___ CLOCK	___ FAITH	___ VINDICATION

APPENDIX E
Recognition Form--Health

Place an "X" in the blank to the left of each word that appeared in the list you were shown. Do not make more than 40 "X's".

___ REGARD	___ BIKE	___ SOUL
___ DAME	___ EXHORTATION	___ SPRING
___ EXAMINATION	___ GLASS	___ GENIUS
___ SHAME	___ COLLECTION	___ NOTATION
___ MUSEUM	___ SKIING	___ WAGE
___ INFECTION	___ BOMBER	___ HATE
___ FRENZY	___ SHOTS	___ CONVERSATION
___ HINGE	___ COURTESY	___ PRONG
___ DIET	___ DUTY	___ FISH
___ JUMPING	___ BOULEVARD	___ POUND
___ WITNESS	___ SICKNESS	___ PLASTER
___ MEDICINE	___ BROTHER	___ YESTERDAY
___ FLOCK	___ DIGESTION	___ CIRCULATION
___ CATHOLICISM	___ INSTRUCTION	___ ILLNESS
___ SHIFT	___ STAGNATION	___ PHILOSOPHY
___ JOCKEY	___ SCRAPBOOK	___ ENEMY
___ LOOKING	___ DINNER	___ FIEND
___ MONOPOLY	___ DEATH	___ TRANSLATION
___ MOVIE	___ LAUGHTER	___ OFFICE
___ ASSOCIATION	___ TENOR	___ PAIL
___ MIMIC	___ AUNT	___ GRILL
___ STARVATION	___ HOSPITAL	___ CREATURE

(see next page)

APPENDIX E
Recognition Form--Health (page 2)

___ TORCH	___ HELL	___ PICTURE
___ COMPANION	___ BACKBONE	___ IDEA
___ PRESENCE	___ AGILITY	___ NURSE
___ MEETINGS	___ GRAMMAR	___ DOCTOR
___ COLLEGE	___ CHURCH	___ CHAIRMAN
___ INFAMY	___ OPERATION	___ HEART
___ VERSION	___ HERO	___ SUGAR
___ SLAYER	___ SCHOOL	___ FRIEND
___ AFFECTION	___ THINKING	___ QUEEN
___ DIPLOMA	___ ACADEMICS	___ RECLUSE
___ VITALITY	___ FOOTBALL	___ LUNGS
___ LEGISLATION	___ STERN	___ PILL
___ SYSTEM	___ FITNESS	___ CONFERENCE
___ CANCER	___ HYGIENE	___ GERM
___ PLAY	___ UNEMPLOYMENT	___ DRUG
___ MADRAS	___ WART	___ NEATNESS
___ RESURRECTION	___ RETREAT	___ BASENESS
___ CLOCK	___ EXERCISE	___ VINDICATION

APPENDIX E

Recognition Form--Physical Activities

Place an "X" in the blank to the left of each word that appeared in the list you were shown. Do not make more than 40 "X's".

___ REGARD	___ BIKE	___ SOUL
___ DAME	___ EXHORTATION	___ SPRING
___ EXAMINATION	___ GLASS	___ GENIUS
___ SHAME	___ COLLECTION	___ NOTATION
___ MUSEUM	___ SKIING	___ WAGE
___ WEIGHTS	___ BOMBER	___ HATE
___ FRENZY	___ SHOTS	___ CONVERSATION
___ HINGE	___ COURTESY	___ PRONG
___ GOLF	___ DUTY	___ FISH
___ JUMPING	___ BOULEVARD	___ POUND
___ WITNESS	___ RIDING	___ PLASTER
___ FLOCK	___ HOCKEY	___ SURFING
___ VOLLEYBALL	___ BROTHER	___ YESTERDAY
___ CATHOLICISM	___ INSTRUCTION	___ DANCING
___ SHIFT	___ STAGNATION	___ PHILOSOPHY
___ JOCKEY	___ SCRAPBOOK	___ ENEMY
___ LOOKING	___ DINNER	___ FIEND
___ MONOPOLY	___ HUNTING	___ TRANSLATION
___ MOVIE	___ LAUGHTER	___ OFFICE
___ ASSOCIATION	___ TENOR	___ PAIL
___ MIMIC	___ AUNT	___ GRILL
___ STARVATION	___ HOSPITAL	___ CREATURE

(see next page)

APPENDIX E
Recognition Form--Physical Activities (page2)

___ TORCH	___ HELL	___ PICTURE
___ COMPANION	___ HIKING	___ IDEA
___ PRESENCE	___ AGILITY	___ FATIGUE
___ MEETINGS	___ GRAMMAR	___ TENNIS
___ COLLEGE	___ CHURCH	___ CHAIRMAN
___ INFAMY	___ OPERATION	___ TUMBLING
___ VERSION	___ HERO	___ SUGAR
___ SLAYER	___ SCHOOL	___ FRIEND
___ AFFECTION	___ THINKING	___ QUEEN
___ DIPLOMA	___ ACALEMICS	___ RECLUSE
___ VITALITY	___ FOOTBALL	___ VIGOR
___ LEGISLATION	___ STERN	___ WRESTLING
___ SYSTEM	___ SHOOTING	___ CONFERENCE
___ BOXING	___ TRACK	___ SWIM
___ PLAY	___ UNEMPLOYMENT	___ EXHAUSTION
___ MADRAS	___ WART	___ NEATNESS
___ RESURRECTION	___ RETREAT	___ BASENESS
___ CLOCK	___ SPORTS	___ VINDICATION

APPENDIX E
Recognition Form--Sociality

Place an "X" in the blank to the left of each word that appeared in the list you were shown. Do not make more than 40 "X's".

___ *REGARD*	___ *BIKE*	___ *SOUL*
___ *DAME*	___ *EXHORTATION*	___ *SPRING*
___ *EXAMINATION*	___ *GLASS*	___ *GENIUS*
___ *SHAME*	___ *COLLECTION*	___ *NOTATION*
___ *MUSEUM*	___ *SKIING*	___ *WAGE*
___ *INTERACTION*	___ *BOMBER*	___ *HATE*
___ *FRENZY*	___ *SHOTS*	___ *CONVERSATION*
___ *HINGE*	___ *COURTESY*	___ *PRONG*
___ *DATES*	___ *DUTY*	___ *FISH*
___ *JUMPING*	___ *BOULEVARD*	___ *POUND*
___ *WITNESS*	___ *PERSONALITY*	___ *PLASTER*
___ *FLOCK*	___ *FRIENDLINESS*	___ *POPULARITY*
___ *SOCIETY*	___ *BROTHER*	___ *YESTERDAY*
___ *CATHOLICISM*	___ *INSTRUCTION*	___ *CLUB*
___ *SHIFT*	___ *STAGNATION*	___ *PHILOSOPHY*
___ *JOCKEY*	___ *SCRAPBOOK*	___ *ENEMY*
___ *LOOKING*	___ *DINNER*	___ *FIEND*
___ *MONOPOLY*	___ *GAME*	___ *TRANSLATION*
___ *MOVIE*	___ *LAUGHTER*	___ *OFFICE*
___ *ASSOCIATION*	___ *TENOR*	___ *PAIL*
___ *MIMIC*	___ *AUNT*	___ *GRILL*
___ *STARVATION*	___ *HOSPITAL*	___ *CREATURE*

(see next page)

APPENDIX E
Recognition Form--Sociality (page 2)

___ TORCH
___ COMPANION
___ PRESENCE
___ MEETINGS
___ COLLEGE
___ INFAMY
___ VERSION
___ SLAYER
___ AFFECTION
___ DIPLOMA
___ VITALITY
___ LEGISLATION
___ SYSTEM
___ BANQUET
___ PLAY
___ MADRAS
___ RESURRECTION
___ CLOCK

___ HELL
___ CLICKS
___ AGILITY
___ GRAMMAR
___ CHURCH
___ OPERATION
___ HERO
___ SCHOOL
___ THINKING
___ ACADEMICS
___ FOOTBALL
___ STERN
___ INHIBITION
___ GAME
___ UNEMPLOYMENT
___ WART
___ RETREAT
___ DRINK

___ PICTURE
___ IDEA
___ OUTCAST
___ PARTY
___ CHAIRMAN
___ ETIQUETTE
___ SUGAR
___ FRIEND
___ QUEEN
___ RECLUSE
___ ROOMMATE
___ GATHERINGS
___ CONFERENCE
___ HOST
___ STATUS
___ NEATNESS
___ BASENESS
___ VINDICATION

APPENDIX E
Recognition Form--Education

Place an "X" in the blank to the left of each word that appeared in the list you were shown. Do not make more than 40 "X's"

___ REGARD	___ BIKE	___ SOUL
___ DAME	___ EXHORTATION	___ SPRING
___ EXAMINATION	___ GLASS	___ GENIUS
___ SHAME	___ COLLECTION	___ NOTATION
___ MUSEUM	___ SKIING	___ WAGE
___ TEXTBOOK	___ BOMBER	___ HATE
___ FRENZY	___ SHOTS	___ CONVERSATION
___ HINGE	___ COURTESY	___ PRONG
___ STUDENT	___ DUTY	___ FISH
___ JUMPING	___ BOULEVARD	___ POUND
___ WITNESS	___ TEACHING	___ PLASTER
___ FLOCK	___ SCHOLAR	___ MATH
___ READING	___ BROTHER	___ YESTERDAY
___ CATHOLICISM	___ INSTRUCTION	___ DEGREE
___ SHIFT	___ STAGNATION	___ PHILOSOPHY
___ JOCKEY	___ SCRAPBOOK	___ ENEMY
___ LOCKING	___ DINNER	___ FIEND
___ MONOPOLY	___ PROFESSOR	___ TRANSLATION
___ MOVIE	___ LAUGHTER	___ OFFICE
___ ASSOCIATION	___ TENOR	___ PAIL
___ MIMIC	___ AUNT	___ GRILL
___ STARVATION	___ HOSPITAL	___ CREATURE

(see next page)

APPENDIX E
Recognition Form--Education (page 2)

___ TORCH	___ HELL	___ PICTURE
___ COMPANION	___ TEST	___ IDEA
___ PRESENCE	___ AGILITY	___ BLACKBOARD
___ MEETINGS	___ GRAMMAR	___ BOOK
___ COLLEGE	___ CHURCH	___ CHAIRMAN
___ INFAMY	___ OPERATION	___ GRADUATION
___ VERSION	___ HERO	___ SUGAR
___ SLAYER	___ SCHOOL	___ FRIEND
___ AFFECTION	___ THINKING	___ QUEEN
___ DIPLOMA	___ ACADEMICS	___ RECLUSE
___ VITALITY	___ FOOTBALL	___ LOGIC
___ LEGISLATION	___ STERN	___ HISTORY
___ SYSTEM	___ EXAM	___ CONFERENCE
___ CLASS	___ GRADE	___ LECTURE
___ PLAY	___ UNEMPLOYMENT	___ WRITING
___ MADRAS	___ WART	___ NEATNESS
___ RESURRECTION	___ RETREAT	___ BASENESS
___ CLOCK	___ READING	___ VINDICATION

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VITA

VITA

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