A COMPARISON OF MEMORY SPAN AND ABSOLUTE JUDGMENT IN THREE ADULT POPULATIONS

A Thesis

Presented to

the Faculty of the Department of Psychology

Appalachian State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts in Psychology

by

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August, 1977

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ACKNOWLEDGEMENTS

I would like to express my appreciation to my thesis committee, Dr. Bruce Bachelder, Dr. Richard Levin, and Dr. Henry Schneider, for their untiring efforts in supervising this thesis.

Words of appreciation are incomplete without thanking the many people who participated in the experiment as subjects. And, too, I would like to thank the staff and residents of Western Carolina Center for providing a pleasant test environment.

Finally, many thanks are given to my family and friends who believed in and supported me throughout it all.

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ABSTRACT

The present study employed 60 adult subjects (thirty-eight White females, three Black females, eighteen White males, and one Black male). The absolute judgment task and the memory span task have important empirical similarities; namely, 7 ± 2, while each is purported as measures of different abilities.

The present study investigated several hypotheses related to performance on both tasks: (1) Memory span and channel capacity in an absolute judgment task are highly correlated; (2) performance on an absolute judgment task is a decreasing function of task complexity regardless of span ability; (3) performance of college students is higher than that of cottage counselors who, in turn, perform higher than retarded subjects; and (4) span ability and task complexity significantly interact.

Results indicated that memory span and span of absolute judgment were highly correlated, $\underline{r} = .89$, ($\underline{p} < .0005$, $\underline{N} = 12$). As expected, performance was a direct function of span ability and a decreasing function of task complexity. A 3 X 14 (Groups X Complexity) analysis of variance with repeated measures on the complexity variable revealed that the two main effects and their interaction were significant. Groups

effect was significant ($\underline{F} = 32.48$, df $= 2/57$, $\underline{p} < .0005$), Complexity effect was significant ($\underline{F} = 132.98$, df $= 13/763$, $\underline{p} < .0005$), and Groups X Complexity was significant ($\underline{F} = 57.50$, df $= 4/763$, $\underline{p} < .0005$).

Since performance on an absolute judgment task and memory span test is highly correlated, it is concluded that the two tasks must have a basic underlying cognitive ability which is called span ability.

CHAPTER I

INTRODUCTION

Memory span tests have a long history of use in clinical assessment. There are span subtests on the Wechsler intelligence scales (Wechsler, 1958), and on the Stanford-Binet Intelligence Scale (Terman and Merrill, 1960). There are span subtests on a test of aphasia (Eisenson, 1954), on a test of brain damage (Hunt, 1943), and on a test of psycholinguistic ability (Kirk and Kirk, 1971).

Memory span tests have generally been considered useful in measuring short term memory (Ellis, 1963; Murdock, 1974). However, they have often been viewed as measures of learning or the ability to form rote associations (Hovland, 1951; Staats, 1961; Jensen, 1970), perceptual skills (Humpstone, 1918; Leaming, 1922), as measures of fluid intelligence as opposed to crystallized intelligence (Horn, 1968), the ability to process information (Miller, 1956); and the ability to cope with complex stimulus control (Bachelder & Denny, 1977a, 1977b). In view of the widespread use and demonstrated clinical utility of memory span tests for the assessment of cognition, intelligence, and mental development and functioning, it would seem imperative that clinicians have a clear understanding of what span tests measure. Findings from research in this area are, at best, unclear.

Bachelder and Denny propose that span ability is basically general intelligence, an idea which is supported by the work of Horn (1968) who expands Cattell's (1941) notion of fluid versus crystallized intelligence. Fluid intelligence is the general abstract intelligence which underlies various cognitive tasks, while crystallized intelligence is the intelligence of learned associations, knowledge, and skills. Horn has found through factor analysis that the memory span test loads on fluid intelligence but not on the factor of crystallized intelligence. This work is yet another reason to suspect that span test is a test of a fundamental cognitive ability which will be important in clinical assessment.

In the memory span experiment, the experimenter presents series of stimuli such as words, digits, color samples, or geometric forms and requires the subject to repeat, recall, or otherwise respond to each of the stimuli (see Brener, 1940 for several examples of span tests). Performance is essentially perfect for small stimulus sequences, but the subject makes errors such as intrusions, omissions, or order errors beyond a certain number of stimuli. When a response sequence is scored as either perfect or wrong, the number of stimuli in a stimulus string which produces 50% perfect responding is called the span of immediate memory (Murdock, 1940).

In the absolute judgment task, the experimenter selects a pool of stimuli such as blue squares differing in size.

The experimenter then defines a set of responses such as the digits 1-10 which are usually arranged on an ordinal scale and are used by subjects in judging stimuli. After familiarizing the subject with the stimulus pool and response terms, the experimenter presents a long series of test trials in random order and the subject attempts to identify each stimulus with the appropriate response. If the pool of stimuli in the absolute judgment task is small, performance on each stimulus is essentially perfect. However, as the number of stimuli is increased (but still with just one stimulus being presented at a time), a point is reached beyond which the subject can no longer judge all the stimuli in the pool correctly. The number of stimuli at the transition point is called the span of absolute judgment.

Recently, spans of absolute judgment have been measured by means of the information metric (Garner and Hake, 1951), and the span of absolute judgment is taken to be the bits of information transmitted at and beyond the point of transition, between perfect and less than perfect judgment. Investigators who use this approach speak of the channel capacity of the subject. Miller (1956) defined channel capacity as the greatest amount of information a subject can give us about the stimulus based on absolute judgment. The channel capacity is the upper limit at which the subject can match his responses to the stimuli presented him. When performance on the absolute judgment task is measured in this manner and plotted against the number of stimuli in the stimulus pool, it is found that, for small numbers of stimuli, information transmitted is equal to the information in the stimulus pool, but transmitted information, at about 7 $\pm$ 2 stimuli for college students, reaches and maintains a plateau although the amount of information in the stimulus pools may increase greatly. Both span of absolute judgment and channel capacity were investigated in this experiment.

Different conceptions of what span tests measure are based upon theoretical considerations and with little supportive empirical evidence. The absolute judgment task and the memory span task have important empirical similarities, while each is purported to measuring different abilities. Thus, a high correlation between the two would provide information useful in acquiring a greater understanding of the utility of memory span tests in making assessment of cognitive abilities. The lack of empirical evidence merits investigation. Hopefully, such an understanding would aid clinicians in making more sophisicated clinical interpretations of memory span scores of individual clients.

Empirical evidence suggests that memory span and span of absolute judgment are correlated; and, thus reflect a common underlying cognitive ability. As Miller (1956) pointed out, the two types of spans have quite similar values in college students, namely, 7 $\pm$ 2 stimuli. Jacobs (1887) and Wechsler (1958) noted that retardates tend to have shorter

memory spans than do normal persons. Spitz (1973) supports this finding by showing that the stimuli value of 5 $\pm$ 2 on both memory span tests and spans of absolute judgment made by retarded population is smaller than that found for a normal population. To date, there is no documentation of a correlation between memory span and span of absolute judgment in a population varying widely in span ability. This correlation should be directly measurable in a population of subjects varying widely in intelligence in that span abilities vary directly with intelligence (Jacobs, 1887; Wechsler, 1958).

There is also theoretical reason to expect that the two types of spans are highly correlated. Bachelder and Denny (1977a, 1977b) have published a therory of intelligence and span ability which defines span ability as the ability to cope with complex stimulus control. Complex stimulus control is defined as a situation in which several stimuli are "conjunctively relevant" for response production. Conjunctively relevant means a situation in which two or more stimuli are both relevant for response production, but neither stimulus alone is sufficient to specify the correct target performance.

By way of illustration of the concept of conjunctive relevance, consider the memory span task. The experimenter presents a series of stimuli, say five words, and the subject produces a verbal sequence of the same five words. Each word in the stimuli string is a relevant stimulus because each informs the subject of the exact word response to produce.

Since, in the memory span experiment, the subject must produce all the words in the stimulus string in order to pass the item, each stimulus is not only a relevant stimulus but all are conjunctively relevant. That is to say, unless the subject attends to and responds to each stimulus, he will err in some way and fail the stimulus problem.

In the absolute judgment task only one stimulus is presented at a time, but as Garner (1962) pointed out, each judgment is made in context of the entire pool of stimuli. Thus, all stimuli in the judgment pool are conjunctively relevant for each response in the absolute judgment task. This theoretical concept thus accounts for the high similarity in spans for the two types of tasks. A subject, in the memory span task who performs perfectly on just five stimuli (a memory span of five) demonstrates his ability to cope with five conjunctively relevant stimuli. The same subject, then, should be able to cope with an absolute judgment task with a pool of five stimuli because they are also conjunctively relevant stimuli according to the concepts of Bachelder and Denny.

The available data clearly indicate that this is the case both in college students and in mildly retarded students. From this point of view, the present experiment tests Bachelder and Denny's notion of complex stimulus control and span ability. And, too, the present study can provide support for their further proposition that the ability measured by span tests (span ability) is a very fundamental cognitive ability underlying performance in diverse cognitive tasks.

This study attempted to experimentally test two other propositions of Bachelder and Denny's theory of intelligence: The first is that performance is inversely related to task complexity. Task complexity is defined as the number of conjunctively relevant cues in a task. In the present experiment each subject attempted several different absolute judgment problems varying in the number of conjunctively relevant stimuli so that the effects of task complexity on performance levels can be studied directly. In addition, Bachelder and Denny state that span ability and task complexity interact such that at low complexity levels there is little or no difference among subjects varying in span, but that at higher levels of task complexity, the higher span subjects will clearly outperform the lower span subjects. Bachelder and Denny's work also predicts that at very high levels of task complexity, high and low span subjects will again be similar in their performance with both performing at a very low level. This prediction was tested in the present experiment.

In summary, the present experiment tested the following hypotheses: (1) Performance on an absolute judgment task is a decreasing function of task complexity for all subjects regardless of span ability; (2) the performance of college students is higher than that of cottage counselors who, in turn, perform higher than retarded subjects; (3) span ability and task complexity interact in the following manner: (a) at low complexities both high and low span subjects perform at similarly high levels, (b) at intermediate levels of task complexity the higher span subjects clearly outperform the lower span subjects, and (c) at higher levels of task complexity the high and low span subjects perform at similar low levels of performance; (4) memory span and channel capacity in an absolute judgment task are highly correlated; and (5) when properly analyzed according to Bachelder and Denny's span theory, the values of memory span and the span of absolute judgment are of comparable size.

CHAPTER II

METHOD

Subjects

The subjects for this experiment were 60 adults recruited from three different populations with no subject being younger than 16 years old. Subjects were recruited from three different populations as to maximize the range of span ability.

These 60 subjects were divided into three groups ; 20 institutionalized retardates ($\overline{IQ}$ = 47.8; $\overline{CA}$ = 21.5; mean staircase word span = 3.42), 20 cottage counselors (mean word span = 5.40), and 20 college students (mean word span = 6.01). Cottage counselors and retardates were located at Western Carolina Center. College students were primarily undergraduates attending universities located in Western North Carolina. The retarded group was composed of ten White females, one Black female, and nine White males. The cottage counselor group was composed of ten White females, two Black females, seven White males, and one Black male. Finally, the college student group was composed of eighteen White females and two White males.

Aside from a minimum age of 16 years old, the subjects were selected on the three following criteria: (1) no major hearing or speech impairment, (2) no history or incidence of seizures, diagnosed psychosis and/or CNS trauma, and (3) no uncorrected visual impairment; minimal visual compliance not less than 20/40. Verification of the above criteria were obtained through medical records for the institutionalized subjects and self-report for the two remaining groups.

Materials

Stimulus materials used in the absolute judgment paradigm consisted of 14 squares of different sizes all of which were cut from blue construction paper. The squares were sufficiently duplicated to control for recognition due to blemishes that may have occurred during testing. The squares were centrally mounted on 9 in. (22.86 cm.) X 10 in. (25.40 cm.) sheets of white cardboard and covered with transparent laminating material. The length of the sides of the squares ranged from one inch (2.54 cm.) to eight inches (20.32 cm.). The length, in inches, of the sides of the squares 1-14 were 1.0 (2.54 cm.), 1.17 (2.97 cm.), 1. 38 (3.50 cm.), 1.62 (4.11 cm.), 1.90 (4.82 cm.), 2.22 (5.64 cm.), 2.61 (6.62 cm.), 3.06 (7.77 cm.), 3.60 (9.14 cm.), 4.22 (10.72 cm.), 4.99 (12.67 cm.), 5.81 (14.76 cm.), 6.82 (17.32 cm.), and 8.0 (20.32 cm.), respectively. The minimum and maximum sizes of the squares were arbitrarily chosen, but the intermediate sizes were determined by using a geometrical progression formula: $X^{13} = 8$. The stimulus squares were secured by a 6.0 in. (15.24 cm.) arch clamp which was attached to a 11 in. (27.94 cm.) X 24 in. (60.96cm.) board covered in white cardboard. This procedure allowed the stimulus material to be flipped over in sequence.

Stimulus materials used in the memory span experiment were ten one-syllable common nouns (boy, book, horse, cat, star, house, tree, arm, plant, and grass) and these words were chosen for their high frequency, imagery, and concreteness. The words were recorded on magnetic cards at a rate of two words per second and played to the subject on a portable Bell & Howell Language Master.

Procedure

The staircase method, first used by Bachelder (1970), was employed for making individual span-like measures in the memory span experiment. The staircase method involves two asending series and ten staircase trials. The two ascending series determine threshold and the ten remaining staircase trials determine a stable mean about the threshold. The experimenter spent several minutes establishing rapport with the subject after he had arrived at the testing area.

After rapport was established, all subjects were individually read the following instructions:

> ...I am interested in the way people remember things. You will be asked to say groups of words, and some of the groups of words are easy to remember while others are more difficult. You are to do your best and not to worry if you should miss a few. However, you are to say the words in the exact order as I play them to you. Please wait until I have finished playing the words before you attempt to say them. Do you understand what I want you to do?

Prior to the commencing of trials, the experimenter asked subjects to repeat each word singly after him. This procedure was used to ascertain possible hearing impairment and to check subject's ability to adequately pronounce and enunciate terms, and to familiarize the subject with the words.

The words were randomly generated and auditorally presented by the language master at a rate of two words per second. The experimenter began with the shortest string, a length of one, on the first ascending staircase trial and presented successively longer strings until the subject made two consecutive failures on any one string size. Then a second ascending series began at the subject's last correct response prior to the two consecutive misses on the first series of ascending trials. The second ascending series terminated after two consecutive misses. Following the trials, a series of nine staircase trials were given beginning at the level of the highest correct response achieved on the second ascending series. In these staircase trials, a correct response led to the presentation of the next longest string; an incorrect response led to the presentation of the next shortest string. The tenth staircase trial was scored but was not given for the subject's performance on the ninth trial determined the size of the string which could be given on the tenth trial. Any omission, intrusion, or transposition of word order was scored as an error. The subject was given verbal feedback as to the correctness of his responses. Throughout the memory span experiment, an intertrial interval of 10-15 seconds was maintained to optimize subject's

performance. Subjects were allowed a 10-15 minute rest period before starting the absolute judgment task. The rest period was instituted to control fatigue or interference of instructions and knowledge of prior experiment.

The absolute judgment task was then initiated. This task consisted of a series of 13 stimulus problems which were arranged on an ordinal scale having two stimuli in the first problem. The number of stimuli in each successive problem consecutively increased by one. The stimulus problems consisted of a test and its alternate form. Each test was composed of two blocks and each block randomly presented all the stimuli within the stimulus problem. Letters of the alphabet were assigned to each stimulus card according to the following criteria: (1) no stimulus card was ever assigned the same letter twice throughout the 13 stimulus problems and (2) no stimulus problems contained letters used in the immediately preceding problem.

Preceding each experimental test, each subject was given a practice session to familiarize him with the task and the stimuli he was to judge. These practice sessions consisted of three presentations of each stimulus problem. The same number of stimuli and letter names were used as were to be used in the experimental session. The experimenter, on the first presentation, presented and identified the stimulus by singly giving its letter name, and the subject was instructed to repeat the letters. On presentations two and three, subjects were asked to identify the stimuli without assistance when a stimulus was presented. Subjects were given feedback after each judgment to inform him of the correctness or incorrectness of his response. Stimuli occurring within the practice session were randomly presented.

A three-second interval was maintained between subject's last response and the presentation of the next stimulus card. Learning effects were also controlled by exposing the stimulus cards for a maximum of 10 seconds. (These two criteria applied to the practice sessions and the experimental trials.) The card was then removed and the subject was encouraged to respond if he had not done so.

The following instructions were read to each subject prior to commencing the practice session:

> ...I am interested in the way people can remember and name squares based on their size and letter names. Some of the squares are easy to remember and name while others are more difficult. However, you are to do your best and not to worry if you should miss a few. Do you have any questions?
>
> ...Now let's practice with two different sized squares. First, I will show and name each square with different letters of the alphabet and you are to look at the square and say that letter after me.
>
> Now I am going to show the squares and you are to name them with the letters and without my help.

Experimental tests followed the completion of the practice session. The experimenter presented each stimulus occurring in a stimulus problem and the subjects were asked to identify each stimulus by its letter name with which he

had already been familiarized. As previously stated, each test consisted of two blocks and each block contained the number of stimuli within the given stimulus problem. The stimuli were randomly assigned to blocks such that there were no duplications of order presentation. Subjects were not informed as to the correctness of their responding on experimental trials.

Failure to reach 90% criterion on the first experimental test resulted in the administering of the alternate test of an identical type as the first experimental test. Three consecutive failures (less than 90% on alternate tests) resulted in termination of the task. Each subject was informed as to the beginning of each new stimulus judgment problem.

There was a rest period of at least 60 seconds between stimulus problems. However, there were no rest intevals between an experimental test and its alternate form. Stimulus card letter names remained the same across a test and its alternate form while like stimulus material on alternate tests was presented randomly.

Following the termination of the memory span experiment and the absolute judgment experiment, the institutionalized residents were paid with either cookies or credit cards, the cottage counselors and assigned students at the institution were thanked for their participation, and Appalachian State University students who were enrolled in an introductory psychology class were given five points toward their grade. It should be noted that incentive had little effect on the subject's performance (Bachelder, Note 1).

CHAPTER III

RESULTS

All subjects performed on at least three absolute judgment problems (2, 3, and 4 stimuli) before being dropped because of low performance as determined by the criterion level. Because all 60 subjects performed on these three problems, the first analyses refer to these first three problems. The mean percent correct responses are plotted in Figure 1.

These date were analyzed according to a 3 X 3 (Groups X Complexity) analysis with repeated measures on the complexity variable. This analysis is presented in Table I. As expected, performance was a direct function of span ability and a decreasing function of task complexity.

In the first analysis (Table I), the interaction between Groups and Complexity did not approach significance. This finding was not surprising in that according to span theory (Bachelder and Denny, 1977a, 1977b) such an interaction should only be expected for wide ranges of task complexity. In order to test the expected interaction effect a different analysis was performed. While many retarded subjects were dropped after stimulus Problem 4 for performing at very low levels, some of the normal subjects continued to perform at fairly high levels up to and including stimulus Problem 8. In order to study all the subjects at all levels of task complexity, a different dependent variable was devised which would be a

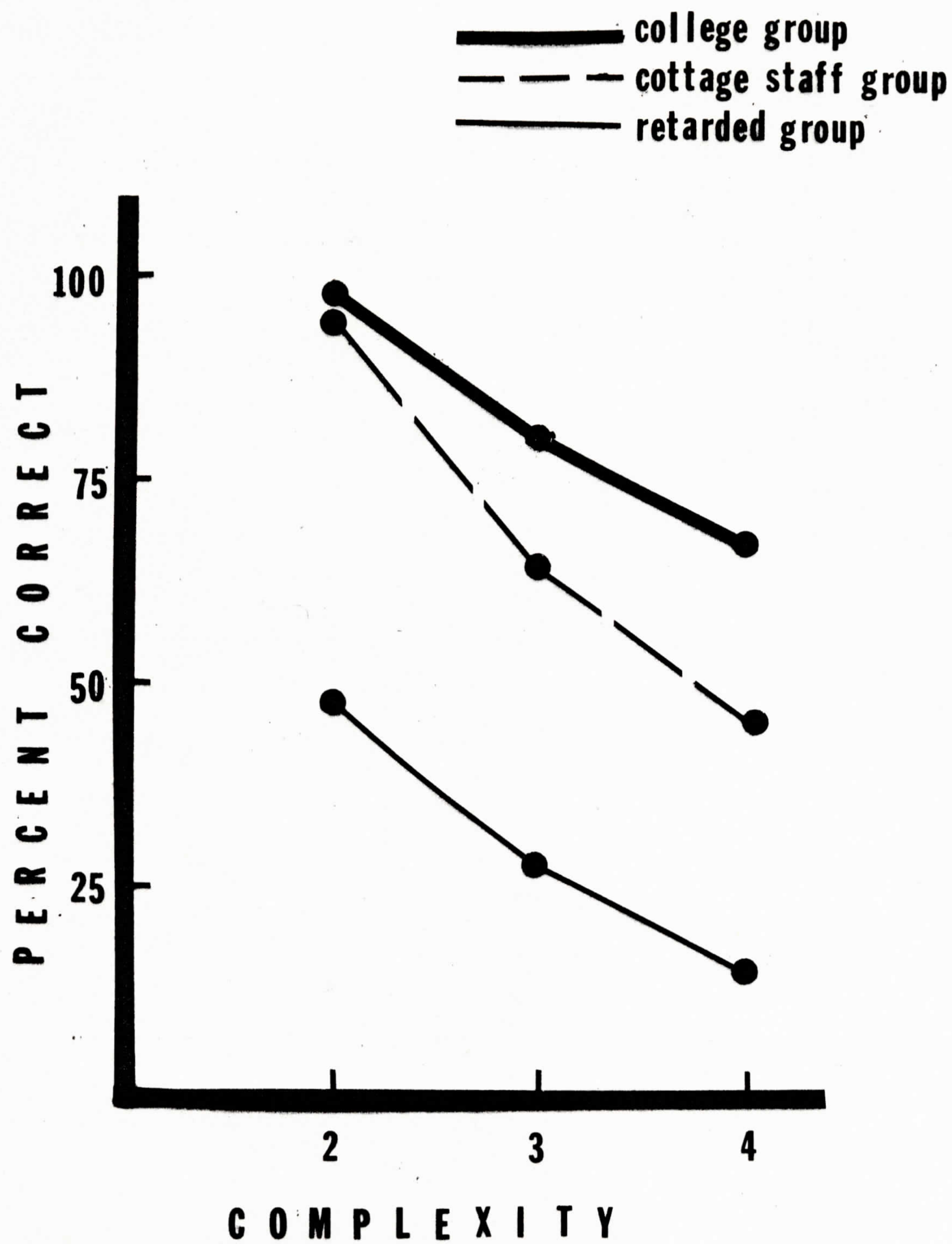

Figure 1. The mean percent correct responses as a function of problem complexity on the absolute judgment task.

TABLE I

ANALYSIS OF VARIANCE

Source	SS	df	MS	*F*
Between Subjects	13.05	59		
Groups	7.99	2	3.99	44.95**
$Error_b$	5.06	57	.089	
Within Subjects	7.89	120		
Complexity	3.70	2	1.85	53.12**
Grp. X Comp.	.22	4	.054	1.55*
$Error_w$	3.97	114	.035	
TOTAL	20.94	179		

**$p. \leq .0005$

*$p. \leq .25$

meaningful estimation of performance even though some of the subjects had been dropped on simpler problems. The dependent variable chosen was a simple pass-fail designation at a criterion of 50% correct responses. This dependent variable allows the assumption than any dropped subjects failed any problem which he had not attempted. And, too, even though stimulus Problem 1 was not administered, it was assumed that all subjects would pass a single stimulus problem at the specified criterion. Figure 2 represents a graph of the number of subjects who passed the 50% criterion ranging in complexities from 1 through 14 stimuli. On Table II data were analyzed according to a 3 X 14 (Groups X Complexity) analysis of variance with one repeated measure (the complexity variable). The analysis revealed that the two main effects and their interaction were significant. Groups effect was significant ($F = 32.48$, df = 4/57, $p. < .0005$, Complexity effect was significant ($F = 132.98$, df = 13/763, $p < .0005$), and Groups X Complexity was significant ($F = 57.50$, df = 4/763, $p < .0005$). The data also showed that the interaction was very much as expected. At low levels of complexity, subjects in all groups had a definite tendency to pass the 50% criterion. At intermediate levels of complexity, span groups were highly separated and at the high complexity, all groups performed quite poorly, and eventually, on the problem of highest complexity, no subject passed the 50% criterion.

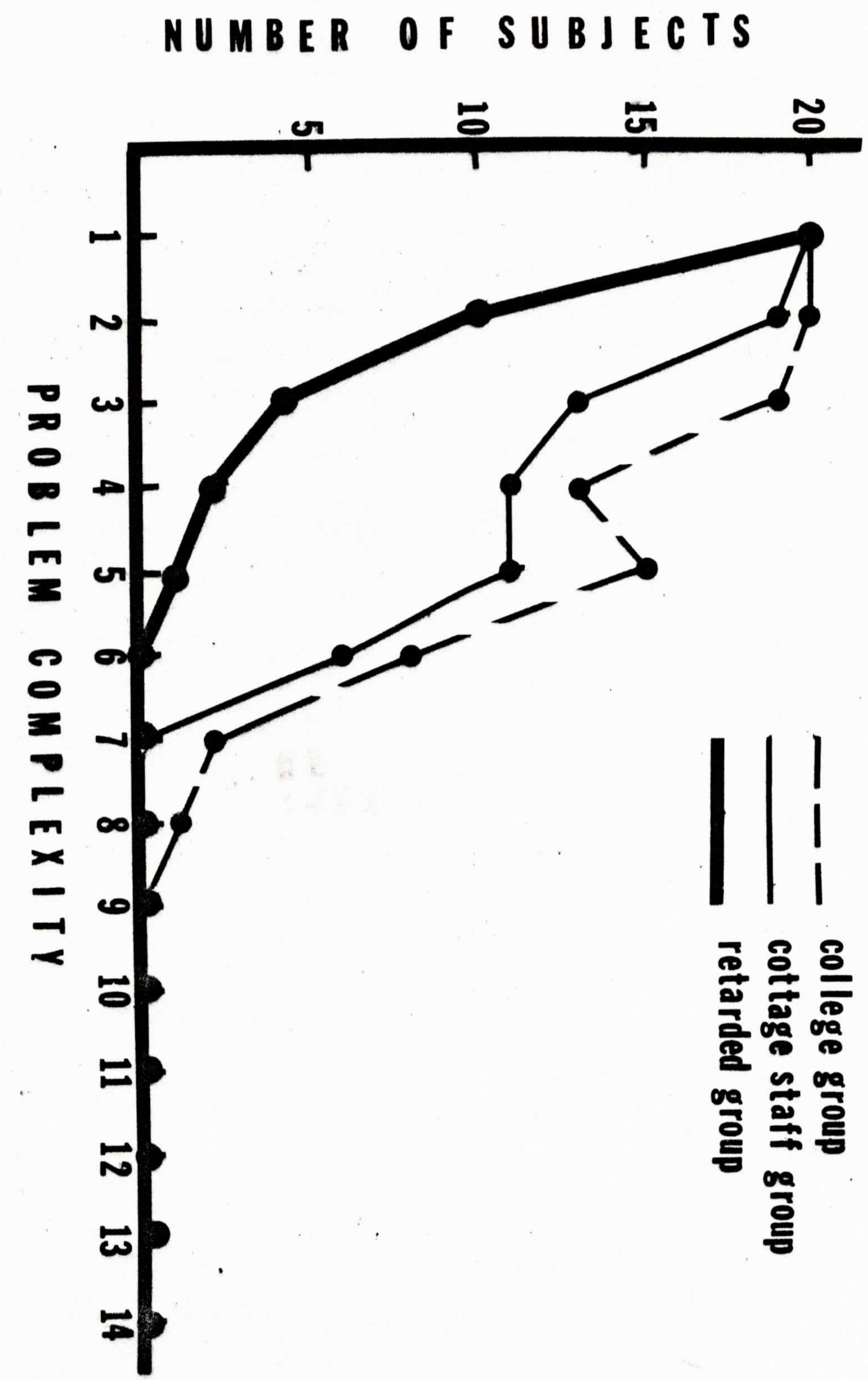

Figure 2. The number of subjects passing the 50% criterion as a function of problem complexity on the absolute judgment task.

TABLE II

ANALYSIS OF VARIANCE

Source	SS	df	MS	F
Between Subjects	13.18	59		
Groups	7.02	2	3.51	32.48*
$Error_b$	6.16	57	.108	
Within Subjects	146.79	780		
Complexity	93.35	13	7.18	132.98*
Grp. X Comp.	12.25	4	3.06	57.50*
$Error_w$	41.19	763	.054	
TOTAL	159.97	839		

*$p < .0005$

Task complexity, to this point in the data analysis, has been defined as the number of stimuli in the stimulus pool for each absolute judgment problem. This definition has sufficed in that task complexity is directly proportional to the number of stimuli in each problem. However, for comparisons of the values of memory span and span of absolute judgment, another measure of task complexity is more appropriate; namely, the theoretical task complexity according to the definition of task complexity proposed by Bachelder and Denny (1977a).

In this definition task complexity is defined as the number of conjunctively relevant cues in a task. In the typical absolute judgment experiment subjects judge stimuli using digits, possibly, 1 through 10. Subjects are able to use these responses without any particular instruction beyond the instructions to so label the stimuli. Each stimulus has a logical relation to each digit and the subject understands this relation. In the present experiment digit responses were not used because it was anticipated that retarded subjects would not understand this relational type of response. Pilot work confirmed this by showing that retarded subjects could not perform when the responses were relational digits but normal subjects did very well.

The procedure which was used involved arbitrary assignment of letters to each square as described above. Each subject, before performing on each judgment problem, was shown each square in the pool and informed of the responses he was to use for each. Theoretically, this procedure doubled the task complexity of each problem because not only were the squares relevant but so were the letter names as provided by the experimenter. In other words, the subjects could not have correctly judged the squares in this experiment unless the responses had not been provided by the experimenter. Thus, the letter names provided by the experimenter were relevant stimuli for correct performance.

In the following analyses the task complexity for each problem was considered to be the number of stimuli plus the number of responses. The span of absolute judgment was defined as the complexity of the problem of greatest complexity at which a subject made at least 90% correct responses. A number of subjects failed the 90% criterion on the two-stimulus problem but it was assumed that they would have performed at a high level on a one-stimulus problem so they were assigned a span of absolute judgment of 2 (one stimulus plus one response). In order to compare the values of the staircase word span and the spans of absolute judgment, the 60 subjects were ranked according to their span abilities then divided into 12 groups of five subjects each which produced 12 groups of increasing span ability. Figure 3 plots the mean spans of absolute judgment as a function of mean span ability. Spans of absolute judgment were a linear function of memory span, $\underline{r} = .89$, $\underline{p} < .0005$, $\underline{N} = 12$. Inspection of Figure 3 reveals that the mean spans are essentially identical to the mean spans of absolute judgment.

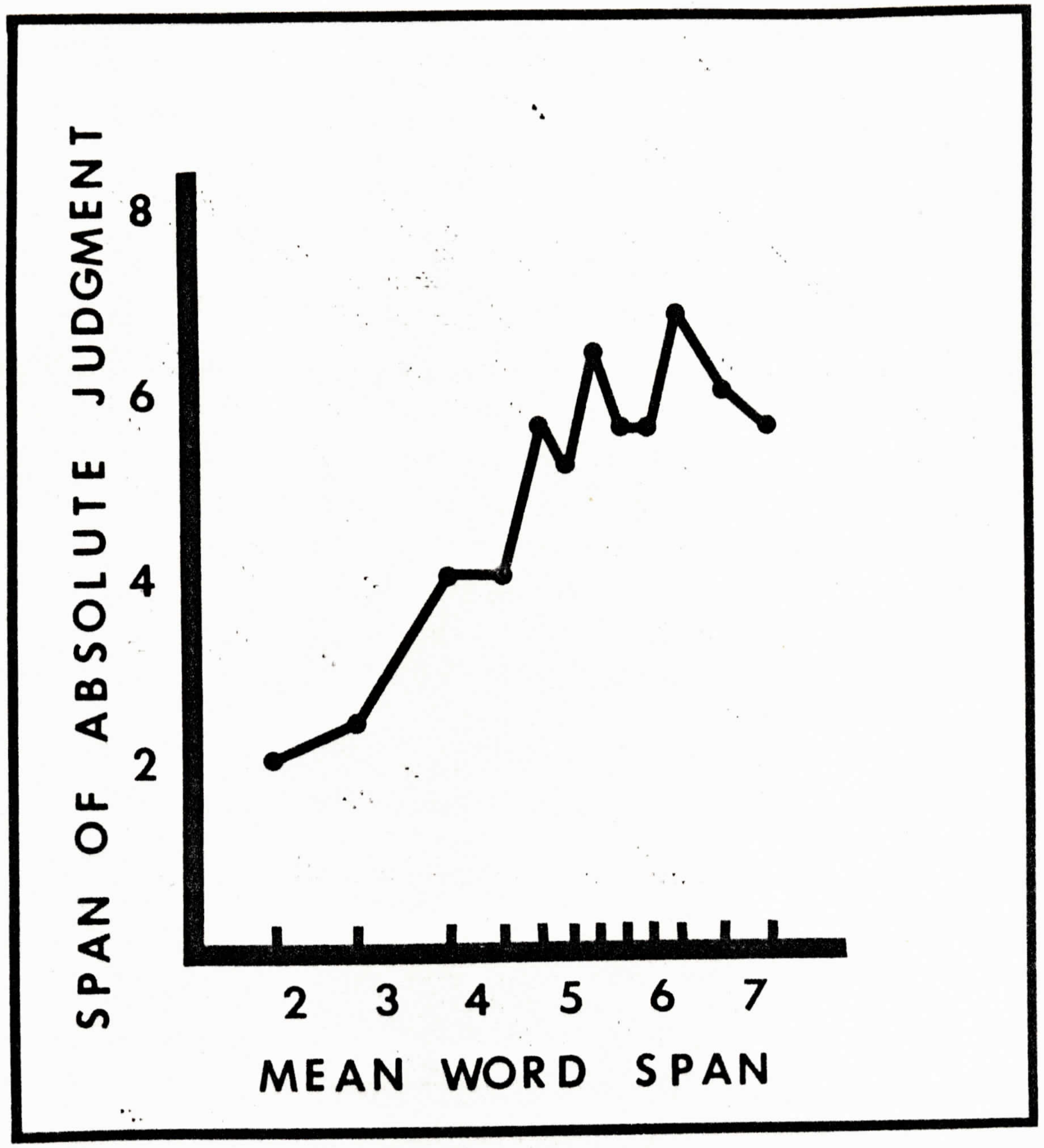

Figure 3. The span of absolute judgment as a function of mean word span. Each point represents five subjects of relatively homogeneous span.

All subjects performed on Problems 2, 3, and 4; thus the correlational analyses were conducted on these problems. The correlations between memory span and the number correct on Problems 2, 3, and 4 were .71, $p < .0005$; .67, $p < .0005$; and .65, $p < .0005$; respectively, $N = 60$ in each case.

It is a general practice to measure absolute judgment in terms of channel capacity (see Garner and Hake for details of this statistic, 1951). Channel capacities tend to be the same although measured on problems of differing complexity (Miller, 1956). Channel capacities were measured for each of the subjects on Problems 2, 3, and 4, and the mean channel capacity was correlated with staircase word span, $r = .78$, $p < .0005$, $N = 60$.

CHAPTER IV

DISCUSSION

The experiment confirmed all the hypotheses. Memory span and absolute judgment are highly correlated whether absolute judgment is measured as the number of correct responses or the more common channel capacity. Absolute judgment performance was a decreasing function of task complexity and was higher in the college students, at intermediate levels in the cottage counselors, and at the lowest levels among retarded subjects. As expected from Bachelder and Denny's span theory, task complexity and span interact such that at low complexity levels the span variable has a relatively small effect and performance is very high, at intermediate levels of complexity the span variable has its largest effect and performance tends to be at intermediate levels, and at high levels of complexity, it has a minimal effect on performance and performance is very low.

Whereas Miller (1956) concluded that the similarity of the two types of span must be coincidental, but the present data make such a conclusion quite difficult to entertain. Miller's arguments as to the coincidental nature of the relation between the two spans were largely theoretical rather than empirical. That is, no data were presented showing direct assessment of the relation between the two spans over a wide range of span abilities. His conclusions were derived from analysis of data by means of information processing concepts and statistics. In view of Miller's lack of empirical data and the findings of the present study, it seems logical to conclude that Miller was in error.

The present data show that performance on the memory span and absolute judgment tasks is highly correlated even though the two tasks are quite different. This must mean that a common ability underlies the two tasks, and this ability is called span ability by Bachelder and Denny.

The confirmation of span theory has implications for the clinical interpretation of span performance on span tests. If, as Bachelder and Denny propose that span ability is the fundamental intellectual ability which functions in diverse cognitive tasks, it is suggested that span tests are indeed a useful instrument for measuring fluid intelligence as conceptualized by Cattell (1941) and Horn (1968) in comparison to the standard IQ tests which measure both fluid and crystallized intelligence.

In this context it is interesting to point out that the span abilities of Black subjects compared with White subjects do not differ--although their IQ's do differ (Jensen, 1970; Clark, 1923; see also Bachelder & Denny, 1977a). If span tests measure fluid intelligence as Horn (1968) and Bachelder and Denny (1977a, 1977b) proposed, then it means that Blacks do not differ from Whites in fluid intelligence but must differ in crystallize intelligence.

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