DOCUMENT RESUME

ED 059 437 AC 012 298

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TITLE A Group and Individual Analysis of the Relationship between Age and Information Channel Capacity of Adults. Final Report.
INSTITUTION North Carolina State Univ., Raleigh. Dept. of Agricultural Information.
SPONS AGENCY National Center for Educational Research and Development (DHEW/OE), Washington, D.C.
BUREAU NO BR-0-C-013
PUB DATE Jul 71
GRANT OEG-3-70-0012(010)
NOTE 35p.

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS *Age Differences; *Data Analysis; *Group Dynamics; *Individual Differences; Information Processing; Learning Plateaus; Learning Theories; Older Adults; Research Methodology; Statistical Data; Stimulus Behavior; *Task Performance; Test Results; Thought Processes

ABSTRACT

This study was designed to measure adult performance as related to age. Using methodology derived from information theory, information processing ability was measured with the individuals performing as a communication system. Fifty-five school teachers, ranging in age from 20 to 66, served as subjects. In four groups, the subjects judged the sizes of dark squares on a light background in five tests. Images were projected onto a screen, under controlled timing conditions. Performance declined as age increased in four of the tests. In two tests this decline was statistically significant ($p<.05$). It was anticipated that the methodology employed would provide asymptotic values of channel capacity, indicating that maximum information processing capacity had been reached. However, the methodology used did not provide such a measurement. A secondary phase of the study explored individual differences. Eleven subjects exhibited considerable variability, particularly a difference in their ability to judge size of squares and the placement of a dot in a grid pattern. The study confirmed earlier studies indicating some decline in performance with aging but pointed up the abilities of older adults to make precise judgments even under severe testing conditions. (Author)

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The research reported herein was performed pursuant to a grant with the Office of Education, U.S. Department of Health, Education, and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

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INTRODUCTION

Problem and Objectives

The aging process of the human organism is of considerable concern to the adult educator since it has been demonstrated that a number of factors associated with age have a bearing on the adult as student and learner. Specifically, the question has revolved around the ability of the middle-age and older adult to learn. Many adults avoid adult education because they believe they are too old to learn. Interest in this area has increased as programs at national, state and local levels have been designed to provide basic literacy training, provide training in vocational skills, and to prepare older persons for new occupations.

Although research has proven beyond doubt that older people can learn, there is a known decline in certain kinds of learning and performing abilities, or in learning under certain circumstances as age progresses through the middle and later years. (12)* Changes include (1) decline in visual acuity; (2) loss of hearing; (3) diminishing motor abilities; (4) decreased speed, strength, and endurance of skeletal neuromuscular reactions; (5) degeneration of the nervous system with impaired attention, memory and mental endurance; and (6) gradual aging of tissue, cells, and other organs of the body. (9) Influences of some of these physiological declines have been measured by performance in such areas as reaction time, card sorting, and learning tasks. (3, 18, 19) There is a need for increased attention to this area, including the development of new approaches to the study of adults to determine their various capacities for learning and performance.

Theoretical Tools

A mathematical model developed by information theorists has provided a tool useful in measuring certain human characteristics. (17) Specifically, it has been used by psychologists to measure the information processing capacity and the information channel capacity of the human organism

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*References are listed by number on pages 25 and 26.

when that organism is acting as a communication system. (2) (Information channel capacity is defined here as the maximum amount of information which can be transmitted through a given channel in a communication system in a given time when the channel itself is the limiting factor. Information processing capacity refers to the amount of information which can be transmitted when the above channel capacity limitation is not the limiting factor or the only limiting factor at work.)

The absolute judgment method of measuring stimulus response has been used to measure information processing abilities in a number of sensory areas, including sight, sound and taste. (1,5,6,7,8,10,11,15) (Absolute judgment may be characterized as a type of judgment in which an observer is required to identify by a name, number, or value each member of a set of individually presented stimuli.)

This work has been built on the assumption that the human organism, acting similar to an electronic transmission system, can serve as a communication or information processing system. Messages (stimuli) are received from outside the organism, assimilated by the system, and combined with relevant information present within the system. The messages then emerge as observable responses. (16)

The amount of information transmitted, often described in terms of the reduction of uncertainty, is measured in bits. In its simplest form, the formula is: $I = \log_2 n$ when the probability of occurrence of all stimuli in the set is equal; n is the number of alternatives or probabilities, and $\log_2$ is the logarithm of n to the base 2. (13, 14)

Recent Research

For the past 4 years the author has used absolute judgments to measure judgmental discrimination accuracy and information processing capacity, with subjects ranging from 23 to 68 years of age, to determine if there is a change in information processing and channel capacity as the human organism grows older. Using visual stimuli, 141 subjects have judged size of dark squares on a light background in three tests, and the location of the place-ent of a dot in a grid pattern in two tests. (4)

These tests were carried out in 1967 at Florida State University and in 1968-70 at N. C. State University. The following three tests utilizing a dark square on a light background were used:

Test 1: Size range of 8; maximum information in test, 3.0 bits.

Test 2: Size range of 13; maximum information in test, 3.70 bits.

Test 3: Size range of 20; maximum information in test, 4.32 bits.

As illustrated in Fig. 1, there has been a decline in information processing abilities as age has increased, but not to a degree that is statistically significant (.05), and not as much as would likely be predicted based on previous studies relating to performance over the life span.

In addition to the above tests, two additional tests were used in the 1967 studies, utilizing the placement of a dot in a grid pattern. Results were similar to those shown in Fig. 1.

The Channel Capacity Concept

It has been theorized, and illustrated to some extent, that as the complexity of the stimulus situation (number of alternatives) increases, the accuracy of the judgments will decline. This error factor would become so great that at some point additional inputs would no longer result in increased output and the amount of information transmitted will in fact decline, even though the amount of information inherent in the tests increases. This is the channel capacity concept where the channel (organism) becomes the limiting factor. This theoretical concept is illustrated in Fig. 2.

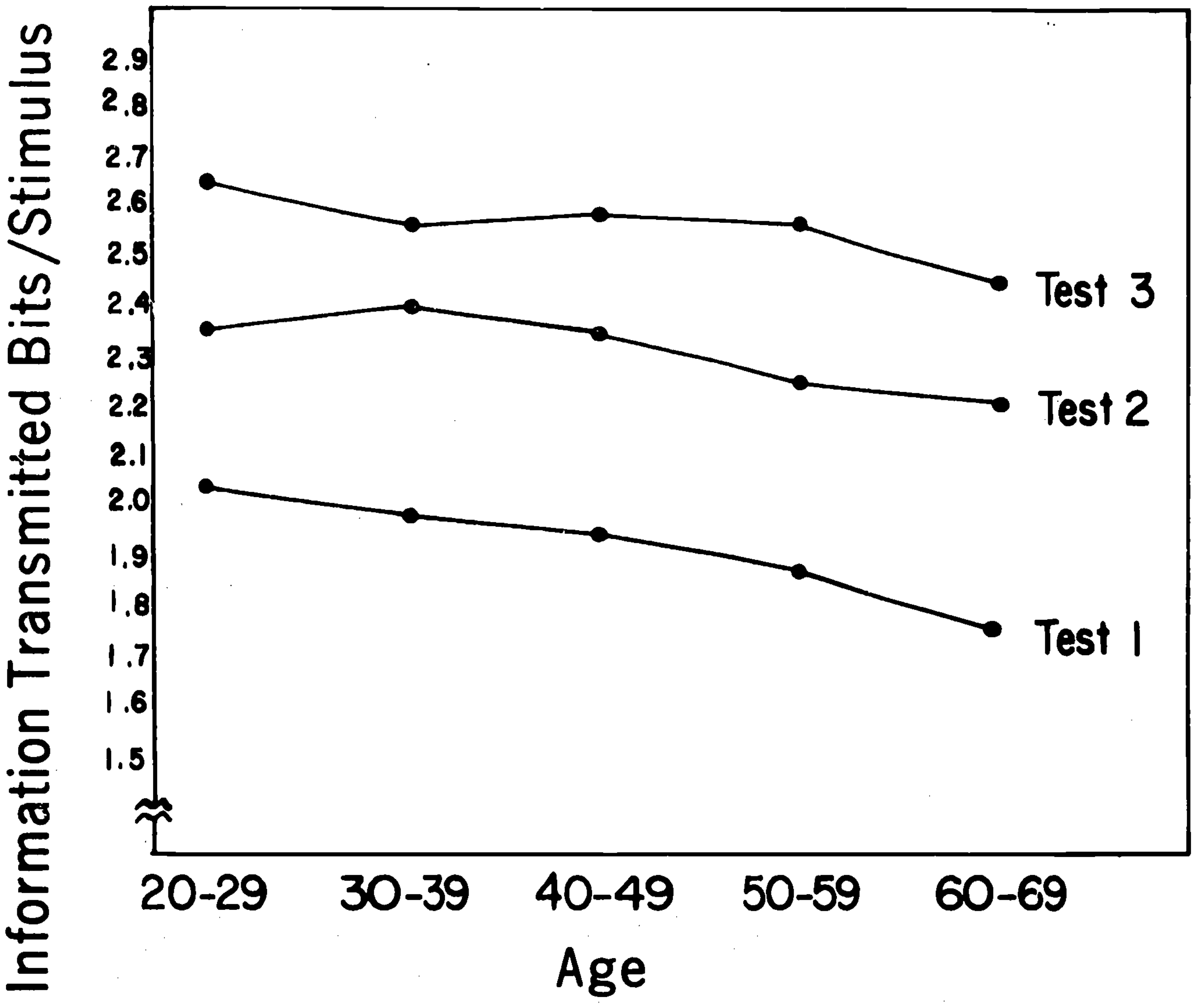


Fig. 1. Information transmitted scores by 10-year age grouping for three tests, 141 subjects, ages 23-68.

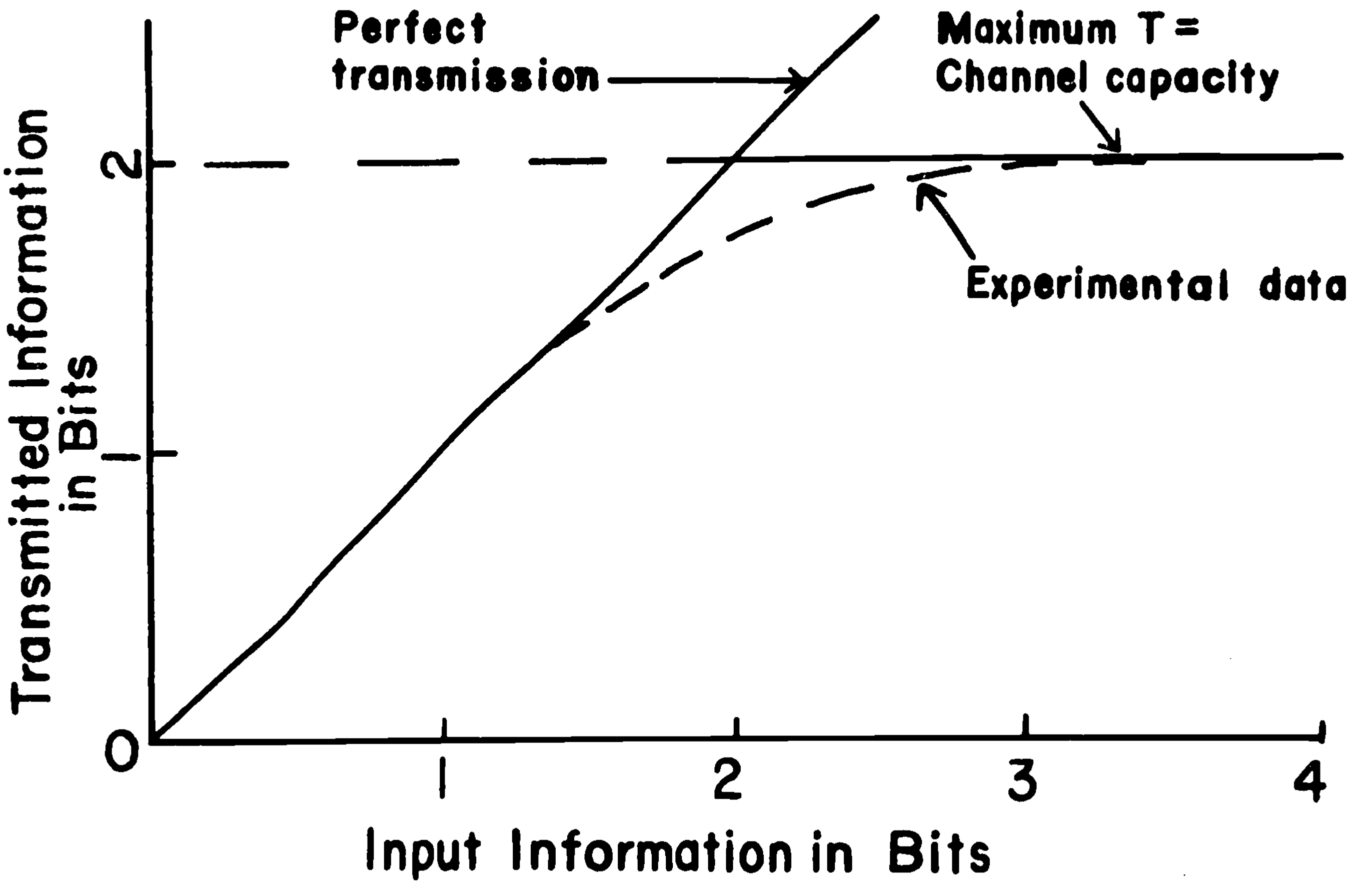


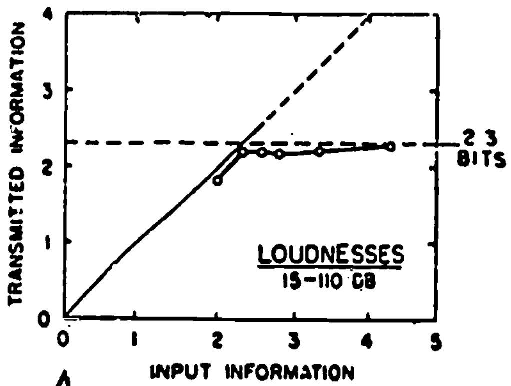
Fig. 2. Illustrative graph showing the amount of transmitted information as a function of the amount of input information for a system with a channel capacity of 2 bits. (Miller, 1953)

Work carried out by several psychologists up to 1956 was summarized in an article by George A. Miller. (15) Titled "The magical Number Seven, Plus or Minus Two: Some limits on Our Capacity for Processing Information," the article summarized research showing channel capacity studies using visual, auditory, and taste stimuli. Miller stated:

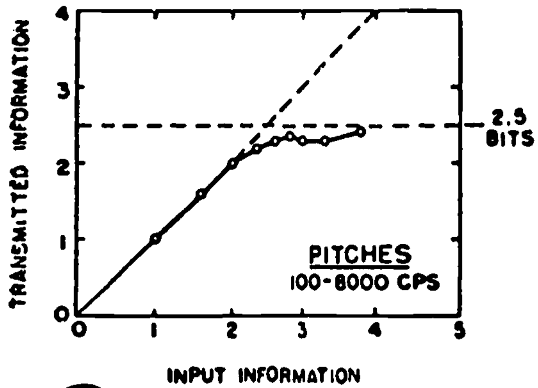
> The experimental problem is to increase the amount of input information and to measure the amount of transmitted information. If the observer's absolute judgments are quite accurate, then nearly all of the input information will be transmitted and will be recoverable from his responses. If he makes errors, then the transmitted information may be considerably less than the input. We expect that, as we increase the amount of input information, the observer will begin to make more and more errors; we can test the limits of accuracy of his absolute judgments. If the human observer is a reasonable kind of communication system, then when we increase the amount of input information the transmitted information will increase at first and will eventually level off at some asymptotic value. This asymptotic value we take to be the <u>channel capacity</u> of the observer: it represents the greatest amount of information that he can give us about the stimulus on the basis of an absolute judgment. The channel capacity is the upper limit on the extent to which the observer can match his responses to the stimuli we give him.

Miller suggested, as the title of his article indicates, that this asymptotic value would be around 2.8 bits ($\log_2$ of 7) or perhaps in the range of 2.32 to 3.17 bits ($\log_2$ of 5 and 9).

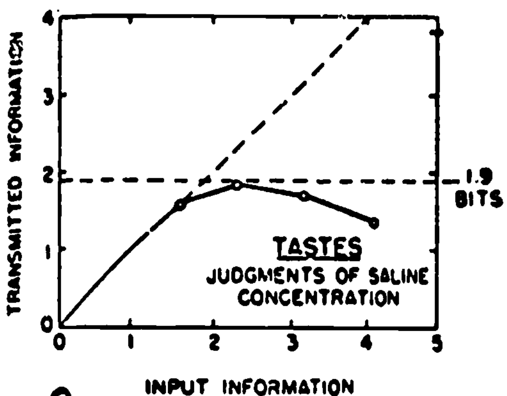
Fig. 3 contains the results of several experiments where the researcher had used a varying stimulus input. Note that in Fig. 3-C (judgments of saline concentration) the curve reached a peak and turned down. On the other



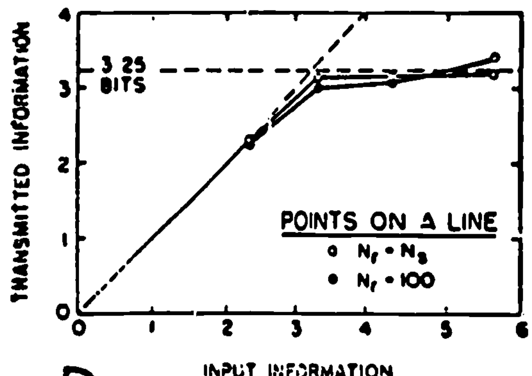
A. Data from Garner (7) on the channel capacity for absolute judgments of auditory loudness.



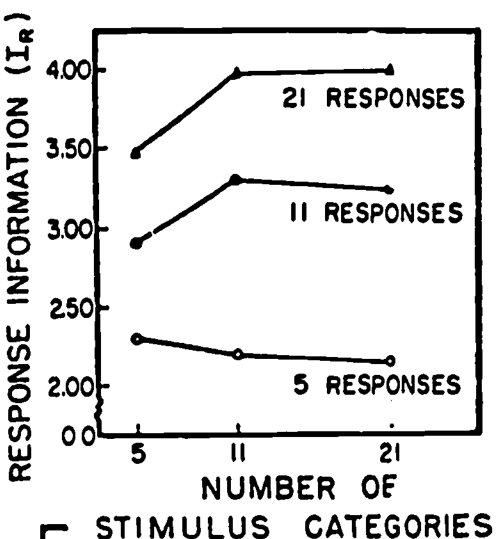
B. Data from Pollack (17, 18) on the amount of information that is transmitted by listeners who make absolute judgments of auditory pitch. As the amount of input information is increased by increasing from 2 to 14 the number of different pitches to be judged, the amount of transmitted information approaches as its upper limit a channel capacity of about 2.5 bits per judgment.



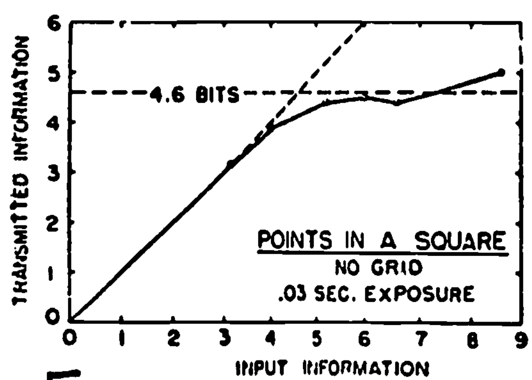
C. Data from Beebe-Center, Rogers, and O'Connell (1) on the channel capacity for absolute judgments of saltiness.



D. Data from Hake and Garner (8) on the channel capacity for absolute judgments of the position of a pointer in a linear interval.



E. Total response uncertainty (I_r) as a function of the number of stimulus and response categories. The data from the 2-42 and the 2-82 mm. sq. range have been averaged.



F. Data from Klemmer and Frick (13) on the channel capacity for absolute judgments of the position of a dot in a square.

Fig. 3. Estimates of channel capacity from experiments using auditory, taste, and visual stimuli. (E is from Eriksen and Hake, "Absolute Judgments . . ."; the remainder are from George A. Miller, "The Magical Number Seven . . .")

graphs the line was still moving upward, although there had been considerable leveling off.

In the research that has been conducted by the author, mean scores for the three size-of-squares tests were as follows:

Test 1: Mean of 1.94 or 65% of maximum score of 3.0.

Test 2: Mean of 2.32 or 63% of maximum score of 3.70.

Test 3: Mean of 2.56 or 60% of maximum score of 4.32.

Considering group averages alone, there was only limited evidence that channel capacity was being approached. However, on an individual test score basis, six subjects scored less on Test 3 than on Test 2, suggesting that for these individuals channel capacity was reached in the range of 2.5-2.8 bits per stimulus.

An objective of this project was to repeat the study using the three size-of-squares tests, with the addition of two tests containing greater amounts of information than the three existing tests. The purpose was to establish information channel capacities for individuals, by age groups, and to develop an age relationship to information channel capacity of adults. This activity became Phase I of the project.

Another factor which deserves further exploration is the variation between individuals in their information processing abilities, particularly as related to age. The concept of individual difference has long been demonstrated as a viable concept in social science research. A casual analysis of the data collected by the author indicated that individual variation, within age groups, may be greater than the difference attributed to age. Phase II of the project was an exploratory study to investigate individual variance that might be exhibited with the particular methodology of absolute judgments and visual stimuli used to measure information processing abilities.

METHODS AND PROCEDURES

Phase I

In May 1970 a personal letter was mailed to the principal of every school in the Raleigh and Wake County, N. C. school systems. A total of 80 letters were sent, soliciting participants for the study. Between 60 and 70 teachers responded, indicating their willingness to participate in the study.

Anticipating some dropout, around 60 of the subjects were signed up to participate on the four scheduled testing dates. Fifty-five of the scheduled participants attended, giving just over the planned number of 50 for this phase of the study.

The subjects selected did not meet the desired goals in that there was a preponderence of females, and the distribution was skewed toward the older end of the age range. However, the subjects did range from age 20 to 66, well across the planned age range. They adequately met the criteria of good eyesight and similar educational characteristics.

The subjects were exposed to five tests, judging size of squares on a dark background, in groups of 11-18. The tests were given in two periods of approximately two hours each.

The stimuli were projected by slide projector on a screen in a semi-darkened room after a brief orientation or learning period for each test. Time between stimulus presentations was 8 seconds, with a duration time of 1/10 second. The stimuli, presented in random order, were replicated five times. Responses were made on a pre-printed response sheet.*

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*For a detailed description of testing procedures and statistical analysis, see Carpenter, The Relationship Between Age and Information Processing Capacity of Adults (Reference No. 4).

Three tests, used in previous research, were included. Two new tests were developed. The five tests were as follows:

Test 1: Size range of 8; maximum information in test, 3.0 bits.

Test 2: Size range of 13; maximum information in test, 3.70 bits.

Test 3: Size range of 20; maximum information in test, 4.32 bits.

Test 4: Size range of 30; maximum information in test, 4.91 bits.

Test 5: Size range of 40; maximum information in test, 5.32 bits.

Phase II

Eleven subjects participated in Phase II. With the exception of two subjects, the 11 were participants in Phase I of the study. These were two individuals who had indicated exceptional ability to judge size of squares in pre-testing or demonstrational tests; they had not participated in official studies carried out by the author.

Subject No. 57 (female) was a 62-year-old bookkeeper with high school plus technical training. Subject 56 was a 49-year-old male with a doctorate in music.

The remaining nine subjects were selected volunteers from the first group participating in Phase I. For the 11 subjects in Phase II, four were above the test means on three or more of the five tests in Phase I; six subjects were below the test means on three or more of the five tests, giving groups of high and low performers on the size of squares tests.

In addition to the Phase I series of tests, these subjects were exposed to three tests in which they were asked to locate a dot in a grid pattern. These multi-dimensional stimulus testing materials were as follows:

Test 7: 6 x 6 matrix; maximum information in test, 5.17 bits.

Test 8: 7 x 7 matrix; maximum information in test, 5.62 bits.

Test 9: 8 x 8 matrix; maximum information in test, 6.0 bits.

RESULTS

The objectives of Phase I of the study were to replicate two previous studies (with additional stimulus materials) investigating information processing abilities of adults, and to seek to determine information channel capacities of adults as related to age.

Information Processing Ability

As shown in Table 1 and Fig. 4, there was some decline in information processing ability as age of the subjects increased. In two of the five tests this decrease was statistically significant.

Table 1. Statistical analysis of five tests used in the experiment to determine significance of relationship between age and information processing capacity.

Test	Test Mean	Correlation Coefficient*	Level of Significance
1	2.07	- .60	.01
2	2.48	- .22	NS**
3	2.74	- .19	NS
4	3.41	.10	NS
5	3.87	- .81	.01

*The linear correlation between age and test scores, with the negative sign indicating a decline in performance as age increases.

**At .05 level.

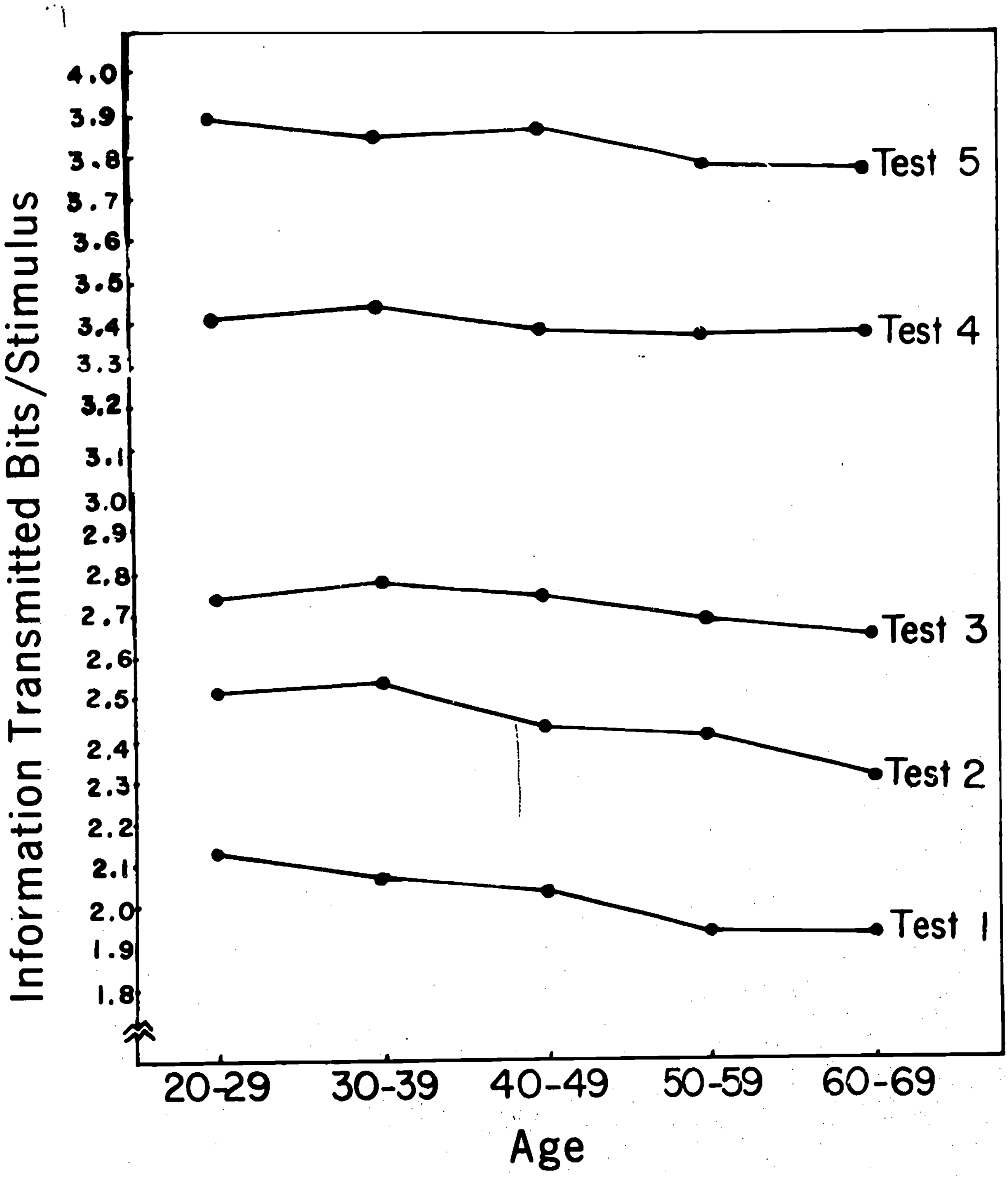

Fig. 4. Information transmitted scores by 10-year age grouping for five tests, 55 subjects, ages 20-66.

These findings were in line with previous work (Fig. 1), and were as expected. Overall, there was a decline fairly consistent across the age range, but not without considerable variation between tests and between age groups. This variation is credited to individual differences and inconsistent performance by an individual as he proceeds through the testing sequence (see individual scores, Appendix).

Channel Capacity

A second objective of Phase I of the study was to use the concept of channel capacity, defined earlier as the amount of information which can be transmitted through a given channel in a communication system when the channel itself is the limiting factor. Based on hypotheses advanced by Miller and other psychologists (Figs. 2 and 3), it was assumed that the two additional tests with stimulus inputs of 4.91 and 5.32 bits of information per stimulus would provide a technique for measuring and determining channel capacity as defined here. As shown in Fig. 5, the methodology used did not provide such a measurement.

Subjects at all ages were able to make increasingly higher scores as they performed in the tests with the greater amount of information. Although the error factor was readily apparent and the number of correct responses declined as the complexity of the tests increased, with the system of analysis employed scores continued to climb. In fact, for each of the 55 subjects, scores on a succeeding test were greater than that on a preceeding test.

Individual Differences

Table 2 gives the scores for all subjects participating in this phase of the study, and their respective score rankings within each of the nine tests. Tables 3 and 4 break out the rankings for the size of squares and the dot placement series of tests.

Scoring consistency within the two series of tests was low. Notice in Table 3 that Subject 57 exhibited the top

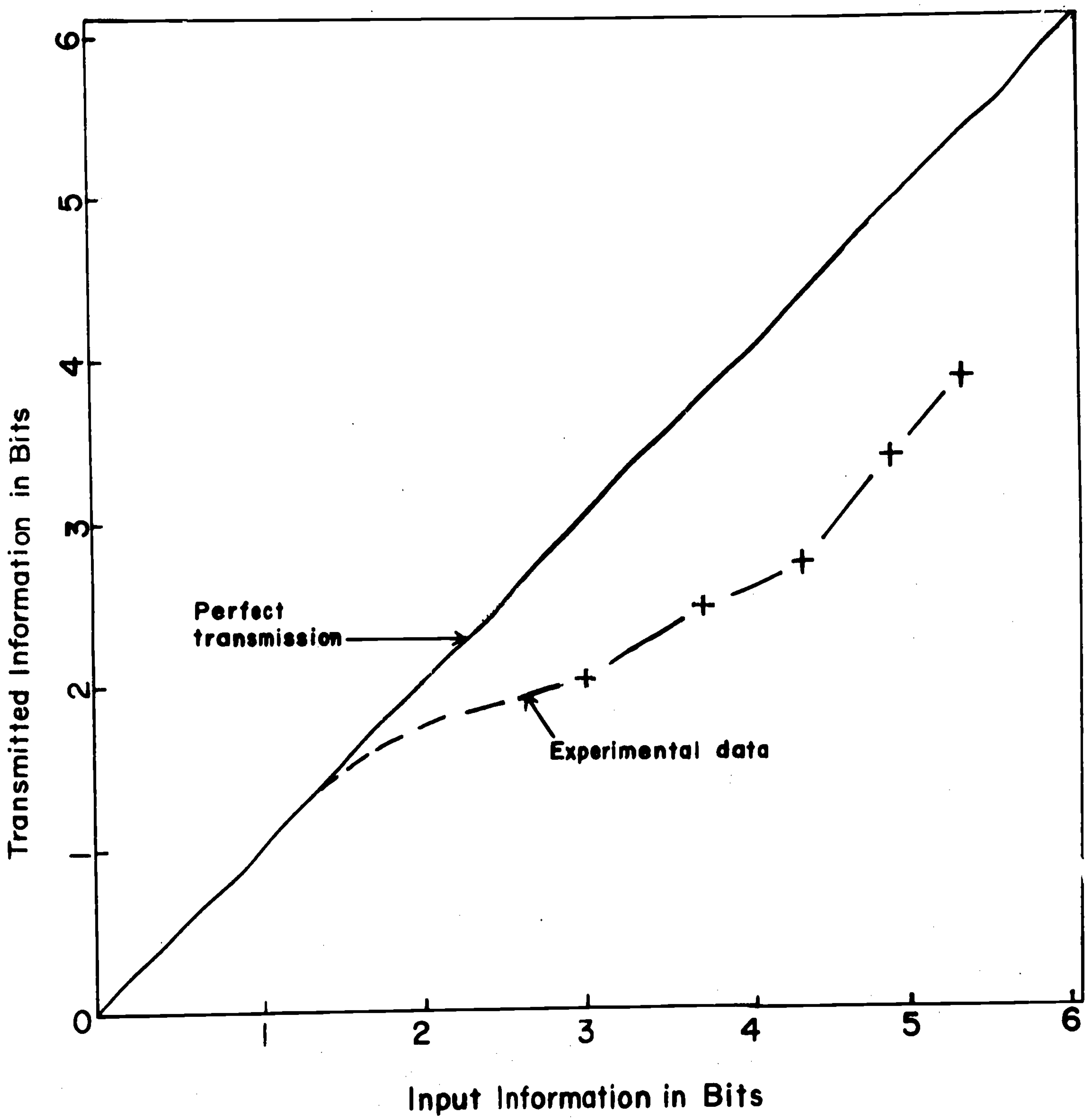

Fig. 5. Mean scores for five tests relating input information to amount of information transmitted.

Table 2. Scores for 11 subjects in eight tests and relative rankings of each subject in each test, Phase II.

Subj.	Age	Test 1		Test 2		Test 3		Test 4		Test 5		Test 7		Test 8		Test 9	
		Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank
1	20	2.15	4	2.41	9	2.66	6	3.35	8	4.00	2	4.72	3	5.03	4	5.65	2
8	24	2.00	6	2.59	5	2.62	7	3.28	10	3.95	3	4.53	7	4.84	9	5.43	9
13	25	2.31	3	2.73	4	2.79	4	3.44	5	3.94	4	4.78	1	5.33	2	5.61	3
40	44	2.03	5	2.06	11	2.37	11	2.94	11	3.88	7	4.56	5	4.98	5	5.31	10
41	45	1.97	8	2.80	2	2.93	2	3.59	2	3.92	6	4.66	4	5.07	3	5.58	4
42	45	1.70	11	2.43	8	2.59	8	3.48	4	3.94	5	3.93	11	4.52	11	5.00	11
45	49	1.92	9	2.40	10	2.59	9	3.43	6	3.76	10	4.75	2	5.36	1	5.90	1
47	50	1.86	10	2.49	6	2.76	5	3.34	9	3.87	8	4.54	6	4.94	6	5.51	5
54	61	1.99	7	2.47	7	2.55	10	3.43	7	3.66	11	4.31	10	4.85	8	5.48	7
56	49	2.40	2	2.99	1	3.03	1	3.66	1	4.04	1	4.48	8	4.74	10	5.46	8
57	62	2.49	1	2.76	3	2.85	3	3.55	3	3.80	9	4.43	9	4.94	7	5.48	6

Table 3. Relative rankings of 11 subjects in five size of squares tests, and comparative accumulated rank for all tests.

		Test						
Subject	Age	1	2	3	4	5	Total	Rank
1	20	4	9	6	8	2	29	5
8	24	6	5	7	10	3	31	6
13	25	3	4	4	5	4	20	3.5
40	44	5	11	11	11	7	45	11
41	45	8	2	2	2	6	20	3.5
42	45	11	8	8	4	5	36	7
45	49	9	10	9	6	10	44	10
47	50	10	6	5	9	8	38	8
54	61	7	7	10	7	11	42	9
56	49	2	1	1	1	1	6	1
57	62	1	3	3	3	9	19	2

Table 4. Relative rankings of 11 subjects in three dot placement tests, and comparative accumulated rank for all tests.

		Test				
Subject	Age	7	8	9	Total	Rank
1	20	3	4	2	9	3
8	24	7	9	9	25	8.5
13	25	1	2	3	6	2
40	44	5	5	10	20	6
41	45	4	3	4	11	4
42	45	11	11	11	33	11
45	49	2	1	1	4	1
47	50	6	6	5	17	5
54	61	10	8	7	25	8.5
56	49	8	10	8	26	10
57	62	9	7	6	22	7

Table 5. Comparative rankings within tests of 11 subjects between two series of tests (size of squares and dot placement).

Subject	Test Series: Squares	Test Series: Dot
1	5	3
8	6	8.5
13	3.5	2
40	11	6
41	3.5	4
42	7	11
45	10	1
47	8	5
54	9	8.5
56	1	10
57	2	7

performance on Test 1 and then ranked 3rd for Tests 2, 3 and 4, but dropped to 9th on Test 5. In the other direction subject 42 exhibited the poorest score of the 11 subjects on Test 1, but gradually improved and ended up in the top half for Tests 4 and 5. Subject 41 would illustrate a U-shaped curve with the best scores coming on Tests 2, 3 and 4.

Somewhat similar patterns show up on the dot placement test results recorded in Table 4.

There is little correlation between performance on the size of squares tests and the dot placement tests (Table 5) Subject 56, who was far out front as the top performer for the size of squares test (Table 3), was next to the bottom on judging dot placement (Table 4). On the other hand, Subject 45, who ranked No. 10 on the squares test, was the top performer in the dot placement tests.

An analysis by the rank-difference method gives a non-significant correlation of -.14 for the rankings as shown in Table 5.

A review of the data from Tests 1-5 indicates considerable variation of individual test scores from the test means (standard deviations of .221, .240, .167, .134, and .134 for the five tests), but there was no relationship to age in these variances.

These 11 subjects were also exposed to Test 3 with a duration time of 1/25 second. All subjects were able to make judgments that were in line with their performance when exposed to the same test with a 1/10 second duration time.

CONCLUSIONS

The data collected in this study adds to the previous work along this line, fortifying the earlier results which depicted a gradual but consistent decline in information processing capacity as age increases. As in previous studies, there were dips and peaks in the curves reflecting inconsistent performance over the series of several tests making up the testing period.

With the data from the 55 subjects added to that of the 141 subjects in the previous studies, comparable data is now available on 196 subjects representing a wide span of the human age range, and increasing to some extent the value of the previous work.

Channel Capacity

The channel capacity aspect of this study might have been the first real test of the hypothesis advanced by Miller in 1956, using the methodology of information theory. As shown in Fig. 5, channel capacity was not reached. In fact, there was no evidence from this data that such a point would be reached, regardless of the additional amount of stimulus information input.

In view of the findings, there are several avenues of analysis and a need for a more detailed look at some of the research results (represented in Fig. 3) which had led to the speculation advanced by Miller. In Fig. 3-C, where judgments were made of a saline concentration, without question the amount of information transmitted had reached a peak and turned down, since the amount of transmitted information on the two tests with greatest input information were lower than the amount transmitted with a lower amount of stimulus input. Perhaps the situation where the sense of taste is involved is different than where one of the other senses is involved. In figures 3-A, 3-B, 3-D, and 3-F the curves were in fact still arching upward, although in the case of 3-F at one point the curve had turned down, but then ascended.

Three assumptions made in arriving at the hypothesis on channel capacity as stated by Miller may have been faulty: (1) That information processing abilities would be the same for all senses; (2) that the graphs may have been misread to indicate that a peak of performance had been reached or was about to be reached, when this was not the case; (3) that the concepts and methodology derived from information theory would detect the channel capacity of the human organism when acting as a communication system, when it would not.

The latter statement says that the data collected in this study in no ways nullifies or denies the channel capacity concept. What it does do is to raise a question of doubt that this capacity can be identified by the methodology and criteria which have been used.

Individual Differences

This research has revealed considerable variation in individual ability to make the visual discrimination judgments called for. Association with age and with sex have been identified. There are obviously other factors at work, some of which might have a cross-linkage with the age factor.

In relation to sex, as in past studies by the author there was a sex factor in abilities as measured in these studies. In each test males performed better than females. Comparative scores were: Test 1, 2.15 and 2.05; Test 2, 2.58 and 2.46; Test 3, 2.79 and 2.73; Test 4, 3.48 and 3.40; Test 5, 3.91 and 3.85.

Also, as in past studies there was greater variation of individual test scores from the test means on the tests where the least amount of discrimination was called for. The average individual test score variation from the mean for each test was as follows: Test 1, .18; Test 2, .19; Test 3, .13; Test 4, .10; Test 5, .11.

The limitations of a particular methodology to adequately describe an individual's abilities is illustrated in the contrasting performance between the two types of images (square size and dot placement) for a particular individual. The individual differences exhibited here point up the need for sizeable numbers when making judgments of the human population.

Practical Application

Since this research was started in 1967, there has come on the education-information scene a type of presentation known as multi-media. In such a presentation a number of visual images are flashed onto a large screen (or many screens) in rapid-fire order. The theory is advanced that through an emotional impact, along with the requisition of specific information, the desired message is communicated.

The advent of multi-media has led to a change in the conventional illustrated-lecture type of presentation, which is a combination of verbal presentation supplemented with a visual presentation using slides or film. The change has been in the speed with which images are flashed on the screen or in the limited amount of time in which they are left on the screen. Reasons advanced for such a presentation are that greater interest is created and there is greater emotional impact inherent in such a presentation.

This approach to audio-visual presentation has grown rapidly, despite a lack of research evidence that it is a successful approach. This research has no bearing on the theory of emotional impact. However, these studies have confirmed that age alone is not a limiting factor in human ability to recognize visual images at fast rates of presentations, since subjects at all ages in these tests were able to make accurate judgments at speeds of both 1/10 and 1/25 second.

These studies should provide some degree of comfort to adult educators faced with the challenge of teaching middle age and older adults.

Further Research

Public school teachers have purposefully been selected for this series of studies on the assumption that training and an acquaintance with images flashed on a screen should be similar for all subjects. Also, it was presumed that such a group would possess eye care and eyesight as similar as could possibly be obtained for a study covering a wide age range.

It is now time to turn attention to other groups, or individuals with other characteristics, which would in turn become the independent variable to be studied. One such group would be those culturally deprived in their youth or throughout their life. There is evidence that youngsters brought up in a culturally disadvantaged environment are lacking in both verbal and visual skills. It has not been determined to what extent these visual discrimination deficiencies exist throughout the life span, The methodology which has been used in these experiments, of a basic nature and reasonably culture free, would probably provide useful indicators of learning and performance abilities of such adults.

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APPENDIX

Individual Test Scores for All Tests.

Subj. No.	Age	Tests 1	2	3	4	5
1	20	2.15	2.41	2.66	3.35	4.00
2	21	2.59	2.75	3.00	3.78	4.14
3	22	2.40	2.39	2.73	3.30	3.96
4	23	2.18	2.45	2.80	3.33	3.87
5	23	2.48	2.94	2.79	3.50	4.02
6	23	2.14	2.74	2.67	3.46	4.01
7	23	2.01	2.16	2.60	3.28	3.86
8	24	2.00	2.59	2.62	3.28	3.95
9	24	1.90	2.57	2.92	3.41	3.81
10	24	2.32	2.61	2.96	3.30	3.79
11	24	2.10	2.71	2.80	3.50	3.93
12	24	1.88	2.32	2.73	3.37	3.84
13	25	2.31	2.73	2.79	3.44	3.94
14	25	2.01	2.65	2.75	3.52	4.00
15	25	2.10	2.48	2.62	3.35	3.93
16	25	2.27	2.61	2.73	3.48	3.70
17	26	2.17	1.88	2.47	3.26	3.83
18	26	1.73	2.43	2.79	3.41	3.92
19	26	2.33	2.01	2.36	3.26	3.69
20	26	2.03	2.60	2.85	3.54	3.77
21	27	2.22	2.38	2.80	3.45	3.95
22	27	1.70	2.32	2.54	3.26	3.58
23	28	1.97	2.96	2.77	3.50	3.97
24	28	1.70	2.17	2.76	3.36	3.96
25	29	2.21	2.41	2.76	3.31	3.85
26	29	2.36	2.87	2.84	3.65	4.04
27	30	2.03	2.58	2.92	3.49	3.95
28	30	2.12	2.47	2.81	3.52	3.95
29	32	2.17	2.62	2.69	3.36	3.95
30	33	2.27	2.89	3.03	3.41	3.95
31	33	2.18	2.14	2.74	3.35	3.82
32	33	2.15	2.39	2.56	3.28	3.65
33	34	1.71	2.39	2.52	3.33	3.65
34	35	2.18	2.76	2.97	3.48	3.91

No.	Age	Tests 1	2	3	4	5
35	36	2.04	2.65	2.87	3.66	3.72
36	38	1.92	2.54	2.81	3.55	3.91
37	41	2.33	2.26	2.68	3.54	4.01
38	42	2.00	2.33	2.79	3.46	3.96
39	43	2.47	2.51	2.90	3.36	3.99
40	44	2.03	2.06	2.37	2.94	3.88
41	45	1.97	2.80	2.93	3.59	3.92
42	45	1.70	2.43	2.59	3.48	3.94
43	45	2.06	2.61	3.10	3.59	3.82
44	48	2.11	2.37	2.85	3.13	3.74
45	49	1.92	2.40	2.59	3.43	3.76
46	49	1.69	2.40	2.55	3.38	3.64
47	50	1.86	2.49	2.76	3.34	3.87
48	52	2.00	2.19	2.68	3.31	3.78
49	52	1.75	2.18	2.34	3.35	3.47
50	53	1.89	2.81	2.90	3.33	3.90
51	54	1.80	2.46	2.92	3.40	3.67
52	55	2.31	2.27	2.64	3.44	3.75
53	56	1.84	2.41	2.58	3.40	3.99
54	61	1.99	2.47	2.55	3.43	3.66
55	66	1.83	2.12	2.71	3.32	3.85