This dissertation has been microfilmed exactly as received

63-6402

GAMBLE, Rondal Ross, 1930-
AN EXPERIMENTAL STUDY USING SEMI-CONCRETE AND ABSTRACT MATERIALS IN A PAIRED-ASSOCIATION LEARNING TASK.

The University of Oklahoma, Ph.D., 1963
Education, psychology

University Microfilms, Inc., Ann Arbor, Michigan

Downloaded from SHAREOK. Persistent Handle URL: https://hdl.handle.net/11244/1651

THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

AN EXPERIMENTAL STUDY USING SEMI-CONCRETE AND ABSTRACT MATERIALS IN A PAIRED-ASSOCIATION LEARNING TASK

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

BY

RONDAL ROSS GAMBLE

Norman, Oklahoma

1963

AN EXPERIMENTAL STUDY USING SEMI-CONCRETE AND ABSTRACT MATERIALS IN A PAIRED-ASSOCIATION LEARNING TASK

APPROVED BY

P. T. Teska

W. B. Ragan

Minayu Shuri

Ruth E. Elder

DISSERTATION COMMITTEE

ACKNOWLEDGEMENT

The author is especially indebted to Dr. P. T. Teska for the encouragement, interest and assistance he has given. His suggestions and confidence have contributed greatly to the writer's training.

The writer appreciates the time and suggestions that the other members of his committee have given so freely: Dr. Musafer Sherif, Dr. William Ragan and Miss Ruth Elder.

Appreciation is extended to Mr. Lester Reed, principal, Mrs. Villa Rae Carter, Special Education teacher, and to the staff and students of Jefferson Junior High School, who participated so cooperatively with the research. Recognition is extended to Miss Sue Sharpe, Mr. Jon Hannum, Miss Janie Myers and Mrs. Peggy Gamble for their assistance.

The author appreciates the confidence, love and understanding of his wife, Mary Jo, and his daughters Rhonda Jo and Linda Kay.

TABLE OF CONTENTS

	Page
LIST OF TABLES	v
Chapter	
I. INTRODUCTION	1
Review of the Experimental Literature	3
II. STATEMENT OF THE PROBLEM	11
Hypotheses	13
III. PROCEDURE OF THE STUDY	14
The Pilot Study	14
The Test Instrument	17
The Subjects	19
The Procedure	20
The Obtained Data	22
IV. THE RESULTS	23
Summary of Results	50
V. SUMMARY AND CONCLUSIONS	51
Implications for Research	55
BIBLIOGRAPHY	57

LIST OF TABLES

Table		Page
1.	Number of trials in reaching criterion of learning semi-concrete material by three groups of students.	26
2.	Trial ranks in reaching criterion of learning semi-concrete material by three groups of students.	27
3.	Comparison of bright and normal subjects on trials to criterion of learning semi-concrete material	29
4.	Comparison of bright and retarded subjects on trials to criterion of learning semi-concrete material	30
5.	Comparison of normal and retarded subjects on trials to criterion of learning semi-concrete material	31
6.	Number of errors in reaching criterion of learning semi-concrete material by three groups of subjects.	32
7.	Error ranks in reaching criterion of learning semi-concrete material by three groups of subjects.	33
8.	Comparison of bright and normal subjects on errors to criterion of learning semi-concrete material	35
9.	Comparison of bright and retarded subjects on errors to criterion of learning semi-concrete material	35
10.	Comparison of normal and retarded subjects on errors to criterion of learning semi-concrete material	36

Table Page

11. Number of trials in reaching criterion of learning semi-abstract materials by three groups of subjects. 37

12. Trial ranks in reaching criterion of learning semi-abstract material by three groups of subjects. 38

13. Comparison of bright and normal subjects on trials to criterion of learning semi-abstract material 40

14. Comparison of bright and retarded subjects on trials to criterion of learning semi-abstract material 41

15. Comparison of normal and retarded subjects on trials to criterion of learning semi-abstract material 41

16. Number of errors in reaching criterion of learning semi-abstract material by three groups of subjects. 43

17. Error ranks in reaching criterion of learning semi-abstract material by three groups of subjects. 44

18. Comparison of bright and normal subjects on errors to criterion of learning semi-abstract material 46

19. Comparison of bright and retarded subjects on errors to criterion of learning semi-abstract material 46

20. Comparison of normal and retarded subjects on errors to criterion of learning semi-abstract material 47

21. Ratio between the number of trials required to learn the semi-concrete and semi-abstract material. 48

22. Ratio ranks between the number of trials required to learn the semi-concrete and semi-abstract material. 49

AN EXPERIMENTAL STUDY USING SEMI-CONCRETE AND ABSTRACT MATERIALS IN A PAIRED-ASSOCIATIVE LEARNING TASK

CHAPTER I

INTRODUCTION

In education the selection of the most effective materials for pedagogical purposes in order to obtain optimal performance from children of different mental levels has been a problem of major importance. Educators are constantly searching for appropriate material to encourage maximum academic productivity in the classroom situation.

When the child starts his formal educational program, he is exposed to materials of an "abstract" nature, e.g., materials which are unfamiliar, and that have little or no relationship to the child's "real" world. An illustration of some of the materials which are relatively meaningless to the beginning pupil are: the alphabet, printed words, numbers and other symbols. Some children are able to incorporate and assimilate this material fairly rapidly, while others have great difficulty with it. The general level of intelligence is commonly considered to be the determining factor which

ascertains the type of material from which children are able to gain meaning more easily.

There are indications in education and psychology that a great deal of importance is affixed to the ability to learn abstract and concrete materials. Educators employ divergent educational practices which utilize abstract and concrete materials differentially in order to teach more effectively the bright and retarded pupil. One criterion for interpreting many psychodiagnostic instruments is based on the assumptions that bright individuals are able to think in terms of abstractions and that retardates utilize concrete concepts in their mental processes. The personality theories which are influential in the development and implementation of measurements and education contain assertions which indicate that retardates may possess a facility for concrete facts but that they lack the intellectual fluidity for abstract mental activities. However these assumptions are based mostly upon clinical observations or very limited and inconclusive experimental data which are discussed more fully in the Review of the Experimental Literature.

Statements which identify learning ability with intelligence are found so frequently that a careless reader might form the opinion that such identification is beyond dispute and that the evidence in support of it is so well known that there

is no need to present it.[1] Professional workers in the area of mental subnormality have had to depend primarily on information which for the most part has come from clinical observations. The reliance on this procedure was necessary in the initial stages of understanding mental development. However, the lack of experimentally established information has not been conducive to furthering research, supporting personality theories or establishing educational practices of a scientifically sound nature. Therefore, an objective criterion of observation and evaluation of data should be utilized in order to develop a stable and unified basis for the better understanding and development of human potentiality.

One common assumption which merits further investigation is the claim that the patterns of thinking of retarded individuals are simpler and more concrete than those of normal persons. This study represents an attempt to distinguish between mentally retarded and other children on the criterion of their funtioning on learning tasks composed of different kinds of materials.

Review of the Experimental Literature

Found throughout the literature of mental retardation is the conclusion that the ability to learn concrete or abstract material correlates closely with the individual's

---

[1] H. Woodrow, "The Ability to Learn," Psychological Review, 1946, 53, p. 149.

score on an intelligence test. This popular point of view is found repeatedly in the literature without the accompaniment of relevant supporting evidence which is illustrated in the following typical statements which are cited without attempting to be exhaustive: "In general terms, it (mental retardation) describes inherent limitations of the individual's growth in ability to perform tasks of abstraction . . ."[1]; "The more concrete the task, the better they (moderately retarded children) function."[2] We conceive the major dynamic difference between a feeble-minded and a normal child . . . to consist of a greater stiffness, a smaller capacity for dynamic rearrangement . . ."[3]; and Brown, a writer in the field of speech, states that "it is well established in the popular mind that abstraction is a lofty cognitive process."[4]

Dr. Kurt Lewin postulated a concept of rigidity in respect to a theory of the feeble-minded which is based in part on unpublished studies comparing the behavior of retardates and normal children in tasks of physical satiation, resumption of interrupted actions, and substitute value of

---

[1] Thomas E. Jordon, The Mentally Retarded, (Columbus, Ohio: Chas. E. Merrill Books, Inc., 1961). p. 2.

[2] Max L. Hutt and Robert Gwyn Gibby, The Mentally Retarded Child, (Boston, Allyn and Bacon, 1958). p. 105.

[3] Kurt Lewin, A Dynamic Theory of Personality: selected papers Trans Donald K. Adams and Karl E. Zener, (New York: McGraw Hill, 1935). p. 210.

[4] Roger Brown, Words and Things, (Glencoe, Illinois: The Free Press, 1958). p. 265.

substitute actions. The findings indicated definite differences between normal and feeble-minded children. The children were instructed to draw moon faces continuously until they wished to stop. When they stopped, they were considered to be "satiated." Normal children did not refuse to continue with "free drawing" (to draw anything they wished) after satiation. The feeble-minded were more completely engrossed in drawing the moon faces and when they stopped for rest or other purposes, they stopped more completely than did the normals. The normal children were observed to be less abrupt and interrupted their activity less often than did the feeble-minded. Speaking of the normal child, Lewin reports that "he responds to the conflict in more elastic, yielding fashion. He more readily finds a way."[1] In the studies related to the resumption of interrupted activities, the feeble-minded showed a greater tendency to resume the interrupted task than did the normal children. In the studies of substitution it was much more difficult to locate goals that served as a substitute for an activity for the feeble-minded. Their personal criterion of success was more primitive for goal satisfaction than those of normals. The results of these studies were interpreted to indicate the feeble-minded children are more pedantic, more rigid, and behave in a more absolute manner than do normal children.[2]

---

[1] Lewin, op. cit., p. 201. [2] Ibid., pp. 194-238.

Lewin also comments on the effect of the structural property which the feeble-minded has in common with the child of a younger chronological age, "Indeed the tendency to concreteness and primitiveness appears to be a general feature of the childlike or otherwise undifferentiated person."[1] Even more directly he states that:

> I am constrained to believe that a much more fundamental property of the feeble-minded is here operative; namely, a functional rigidity, an immobility of the psychic material, which itself constitutes the true cause of the intellectual difficulties.[2]

J. S. Kounin proposes that there are three uncontrolled factors other than dynamic rigidity which may have operated to produce phenomenological rigidity influencing the results in the studies cited by Lewin. (1) The degree of differentiation of the person. The mental age of the retarded and the normal child were not equated in these studies. (2) The degree of differentiation of the relevant areas. It is possible that the area of drawing may have been more differentiated in the normal children and that tney could "think of" more to draw. (3) The security of the two groups. An individual may feel insecure and exhibit rigid behavior because he is afraid of attempting the new and so clings to what he does know.[3]

---

[1] Lewin, op. cit., pp. 222-223.

[2] Ibid., p. 202.

[3] J. S. Kounin, "Experimental Studies of Rigidity. I. The Measurement of Rigidity in Normal and Feeble-Minded Persons." Character and Personality, 1941, 9, pp. 251-272.

Psychological testing is another area where abstractness is correlated highly with an individual's intelligence. The Rorschach Ink Blot Projective Technique is one of the widely used and accepted psychological examinations. The subject is shown ink blots which are not representations of known, real objects, and is asked of what they remind him. In responding to an ink blot as a whole (W) percept the subject must use perceptual organization activity. Rorschach in the original monograph considered this factor indirectly in his reference to the W. The W represented to Rorschach the capacity of the individual to combine, abstract, and generalize. The W was also considered by Rorschach as one of the components of intelligence.[1]

There have been several approaches developed later in order to evaluate this organizational activity in which an attempt is made to measure the ability for abstract organization. The most widely accepted approach was developed by Samuel J. Beck. The organizational factor which he calls Z is utilized to depict the capacity of the individual to combine and abstract organized perception from the Rorschach.[2]

---

[1] Herman Rorschach, Psychodiagnostics, "A Diagnostic Test Based on Perception." Bern: Hans Huber, 1942.

[2] Samuel J. Beck, Rorschach's Test, Vol. I. Basic Processes. New York: Grune and Stratton, 1950.

According to Beck Z is "an index of intellective energy as such . . . the intellectual functioning per se."[1] It is an index of thinking power. It shows the power to grasp relations. It directly varies with intelligence.[2]

In an investigation of the approaches to organization activity in relation to the Rorschach, Marguerite Hertz discusses the contribution of various workers in attempting to quantify the organization response. In summary Hertz states that "Comparatively little systematic work has been done with the organization factor in the Rorschach."[3] She further suggests that presently the justification of this pattern is in terms of the available research, theoretical rationale, and clinical observation.[4]

Kurt Goldstein et al extensively investigated differing aspects of "attitude" in an effort to devise methods of differentiating between various degrees of abstract and concrete behavior. The tests used are chiefly performance tests and exclude a procedure based on language as much as possible. Goldstein conceived the concrete attitude as realistic, being confined to the immediate apprehension of the thing or situation in its particular uniqueness and never mediated by

---

[1] Ibid., p. 12.

[2] Marguerite R. Hertz, "The Organization Activity," Rorschach Psychology, ed. Maria A. Rickers-Ovsiznkina (New York: Wiley, 1960), p. 28.

[3] Ibid. [4] Ibid.

discursive reasoning. The abstract attitude goes beyond just the "real" and implies conscious activity in reasoning and awareness. The concrete attitude is implicitly meaningful in nature while the abstract attitude is not.[1]

Although a tremendous amount of information has been gathered in Goldstein's monumental work in the investigation of concrete and abstract behavior, it is confined primarily to an adult population and deals with pathological individuals. For this reason his results are not readily applicable to this study.

A review of the experimental studies of the learning in mentally retarded individuals during the period from 1907 to 1945 was written by Marion White McPherson in 1948. In summary of this review she states that "the outstanding impression gained from this review of learning in the subnormal is one of lack of information."[2]

In a fourteen year review of the research on the learning of the mental deficient from 1943 to 1957, McPherson indicated that there is a "need of more extensive and more

---

[1] Kurt Goldstein and Martin Scheerer, "Abstract and Concrete Behavior an Experimental Study with Special Tests," Psychological Monographs, Vol. 53, No. 2, Whole No. 239, 1941.

[2] Marion White McPherson, "A Survey of Experimental Studies of Learning in Individuals Who Achieve Subnormal Ratings on Standardized Psychometric Measures," American Journal of Mental Deficiency, LII-LIII, (1948).

adequately integrated experimental investigations."[1] Four of the studies investigated in this review involved learning nonsense syllable or common words in a verbal type of learning task. She summarized the review by saying that "there is evidence that intellectual level is not an adequate predictor of the learning of mental defectives . . ."[2]

There is a lack of experimental evidence which supports a preferred type of material for the optimal learning of school children of different mental levels. This indicates the appropriateness of an investigation of the performance on different types of material by children of different levels of mentality. Especially important are the implications to be gained from using materials that are comparable to those to which beginning school children are exposed.

---

[1]Marion White McPherson, "Learning and Mental Deficiency," American Journal of Mental Deficiency, LXII, 1958, p. 875.

[2]Ibid., p. 877.

CHAPTER II

STATEMENT OF THE PROBLEM

The purpose of this study was to determine the effect, if any, of the type of material on the learning rates of bright, normal and retarded junior high school children in an associative-learning task using two different types of material.

The present study was limited to the effect of semi-abstract and semi-concrete materials on the learning rates of bright, normal and retarded children, in a paired-associative learning task. The learning task consisted of twelve pairs of semi-concrete and twelve pairs of semi-abstract items.

Concrete items are "real" objects such as a chair, table, car, house, etc. The more symbolic the representation of a "real" object is, the more abstract it becomes. A miniature representation of a chair (toy chair) is a more abstract than the "real" object, a picture of the object is more abstract than the toy, the printed word is more abstract than the picture, etc. Because of the inherent difficulty in utilizing "concrete" items or miniature representations of the items in this study, the pictures of the objects were used. These pictures of "real" objects will be called semi-concrete

items in order to differentiate them from the abstract task. The semi-concrete items contain a high degree of specificity, simplicity and familiarity to the subject. The items are of such a nature that they are common in the past experiences of the subjects, or they may be readily associated with objects which are meaningful in the subject's environment.

The abstract items are of such a nature that they contain little or no specificity or familiarity to the subject. They are items which are structurally unrelated to concrete items which are commonly found in the environment of the subject. Therefore they are relatively meaningless to the subject in terms of his past experience. Meaningless lines of different configurations derived from shorthand symbols are utilized for the abstract learning task.

The items were arranged so that they were controlled in respect to their similarity in pairing both the abstract and the semi-concrete items. For example, items that had similar lines such as  and  were not paired, and items that are commonly associated such as hat and coat were not paired. The absolute control of this variable is not possible because of the differential experiences of individuals. However, these particular effects which cannot be controlled should cancel each other during the length of the experiment.

Hypotheses

1. There is no statistically significant difference in the number of trials required to meet the criterion of learning in a paired-associative learning task utilizing semi-concrete material of bright, normal and retarded children.

2. There is no statistically significant difference in the number of errors in meeting the criterion of learning in a paired-associative learning task utilizing semi-concrete material of bright, normal and retarded children.

3. There is no statistically significant difference in the number of trials required to meet the criterion of learning in a paired-associative learning task utilizing semi-abstract material of bright, normal and retarded children.

4. There is no statistically significant difference in the number of errors in meeting the criterion of learning in a paired-associative learning task utilizing semi-abstract material of bright, normal and retarded children.

5. There is no statistically significant difference in the ratio of the number of trials required to obtain the criterion of learning between semi-abstract and semi-concrete material of bright, normal and retarded children.

CHAPTER III

PROCEDURE OF THE STUDY

The Pilot Study

The subjects in the pilot study consisted of thirty three children with no reported school failure, behavioral problems or gross abnormal behavior. None of the children were known to have hearing impairments, visual disabilities or speech defects. They ranged from five to fifteen years in chronological age. All of the subjects tested in the normal range or above on the Goodenough Draw-A-Man Intelligence Test.

An associative learning task was chosen for the pilot study because associative learning is one of the most common forms of acquiring information. Not only is it a technique used by educators but it is a universally recognized method of learning. The association of two or more items related in time and space is one of the most widely utilized means of recall. The recognition of one item facilitates the recall of the other(s). Some examples of commonly associated materials are: the recitation of the alphabet, serial counting of numerals, traffic light identification, association of

historical dates and events, and the association of first and last names.

The associative learning task was the learning of two sets of twelve pairs of drawings which were paired together on six-inch by four-inch cards. One set of drawings were of "real" objects, e.g., pan, tree, cup, skate, etc., which have been designated as semi-concrete items in this study. The other set of drawings, named abstract items, consist of lines which did not depict objects that are commonly found in the subject's environment. It must be recognized, however, that individuals tend to name, or organize stimuli into personally meaningful patterns for purposes of identification and recall. This phenomenon is reported in the studies of remembering that were conducted by F. C. Bartlet.[1]

> This influence has limits, however. In Bartlet's experiments, a simple drawing "И" was called "N". Yet the name hardly ever affected subsequent reproductions of such simple patterns. The figure called "N" was correctly reproduced by every subject.[2]

As the figures become more complex, the name assigned to them becomes more influential in how they are remembered.[3] For this reason the drawings used in this study were purposefully maintained with as little detail as was feasible.

---

[1] F. C. Bartlet, Remembering: A Study in Experimental and Social Psychology. Cambridge: University Press, 1932.

[2] Musafer Sherif and Carolyn W. Sherif, An Outline of Social Psychology, (New York: Harper, 1956). p. 459.

[3] Ibid., p. 459.

The drawings of semi-abstract items did not resemble real objects, commonly found in the subject's environment, whereas the semi-concrete items did.

The length of the test consisted of twelve pairs in a series. Eisman used eight pairs in her study and was critical of the results that she obtained since the series may not have been long enough to be discriminative.[1] Doctoral studies[2] recently done at the University of Oklahoma under the direction of P. T. Teska indicated that the length of paired-associative series should optimally consist of twelve pairs. The twelve-pair list was found to discriminate between groups of twelve first, fourth and eighth grade students. The difference was significant at the .05 per cent level of confidence using Chi-Square as the test of significance. The list was lengthened to sixteen, twenty, and twenty-four pairs. They were not found to be more discriminative than the twelve-pair list. An eight-pair list was not found to be as

---

[1] B. S. Eisman, "Paired Associate Learning, Generalization, and Retention as a Function of Intelligence," American Journal of Mental Deficiency, LXII (1958), pp. 481-489.

[2] Fay Marsh Teague, "An Experimental Study Using Single Sensory and Multi-Sensory Stimuli Presentation in a Paired-Associative Learning Task" (unpublished Ph. D. dissertation, College of Education, University of Oklahoma, 1962), pp. 16-17.

Gladys Webber Hiner, "A Comparison of Associative Learning Rates of Bright, Normal and Retarded Children" (unpublished Ph. D. dissertation, College of Education, University of Oklahoma, 1962), pp. 12-13.

discriminative as the twelve-pair list. The twelve-pair list was shown to be of optimal length for easy administration and discrimination.

It was desired to keep the arrangement of the pairs of stimuli constant, as random order would introduce an uncontrollable variable. It was determined that the items be arranged on the response cards with all response stimuli shown in random order so that serial learning could be controlled. A total of ten response cards with all response stimuli shown in random order on each card was used for each set. If the subject needed more than ten trials to reach the criterion of learning the response cards were reused.

The Test Instrument

The learning materials consisted of two booklets of semi-concrete and two booklets of semi-abstract materials. Each booklet consisted of sixteen, six-inch by four-inch white cardboard cards bound by a plastic spiral binder. Booklet 1C contained thirteen cards on which there was one pair of outline drawings, a blank card between the sample card and stimuli cards and a blank card serving as the back and front of the booklet. Booklet 2C contained thirteen cards on which appeared the first picture of the pair shown in booklet 1C. The first card was used as a sample card for instructional purposes, the remaining twelve constituted the measuring device. Booklet 2C was constructed with the same size, shape,

number and arrangement of cards as booklet 1C. The two booklets containing the abstract materials were constructed the same as those for the semi-concrete items with the exception of the nature of the drawings.

The pictures for the semi-concrete items contained in booklet 1C and 2C were simple outline drawings of common objects; they were not obviously affect arousing, and commonly associated items were not paired.

The items utilized for semi-abstract materials in booklet 1A and 2A were meaningless lines of different configuration. They are modified symbols that are used in shorthand with some modifications to avoid similarities. Items that had similar lines were not paired.

The response cards consisted of ten eleven-inch by twelve and one-half inch white cardboard cards for each type of material. All of the response items were drawn in random order on each card in order to eliminate the possibility of serial learning from the response cards.

The Examiner utilized individual record sheets for each subject which contained: the name of the Subject; the Subject's birth date; the Subject's age; the Subject's I. Q.; the type of stimuli presented; the record of the responses made by the Subject; the total number of errors made by the Subject; and the total number of trials required to reach the criterion of learning. A stop watch was available to aid in

timing the presentation of the stimuli, the timing of the intertrial period, and the timing of the response period.

The Subjects

The subjects used in this study were ninety boys and girls in the seventh and eighth grades from Jefferson Jr. High School in Oklahoma City, Oklahoma. The students come primarily from lower-middle and middle-middle socio-economic homes.

The subjects ranged in age from 156 months to 180 months. The subjects were reportedly without behavioral problems or gross abnormal behavior. All of the children were reported to have normal sensory ability. None of the subjects were known to have uncorrected visual disability or hearing impairments.

A combination of the House-Tree-Person (H.-T.-P.) and Machover projective drawing test were given to all subjects in order to screen out the subjects with severe pathological symptoms that might unduly influence their performance on the test.

The subjects consisted of three groups, thirty in each group, of bright, normal and retarded students. The bright subjects ranged in I. Q. from 125 to 150; the normal subjects ranged from 100 to 107 I. Q.; and the retarded ranged in I. Q. from 54 to 79. The subjects were divided

into these groups according to their performance on the California Mental Maturity Test.

The Procedure

Each subject was tested individually in a location that was comfortable, well-lighted, well-ventilated and was free from interruptions.

The following instructions were given to each subject:

> Here are a number of cards. Each card has two pictures on it. Look at both pictures on each card carefully. (The Examiner shows the Subject either 1C or 1A sample stimulus.) Then I will show you a set of cards like these. (The Examiner shows the Subject the sample card with the corresponding first picture only of the stimulus pair in either booklet 2C or 2A.) You are to point to the picture on the response card that was with this first picture. You are to point to the drawing on this card that is missing. (The Examiner shows the Subject the card containing the sample picture included with eleven other response items drawn on the sample response card.) Look at these, remember which two drawings go together. Point to the drawing that goes with this one.

If the Subject correctly identifies the sample stimulus the test items are then presented. If the Subject does not correctly identify the sample stimulus he is again shown the sample stimulus on booklet 1C or 1A until he is able to correctly point to the missing drawing. Then the test items are administered.

The twelve paired pictures were presented to each subject visually at the rate of one every three seconds. Then, the first picture of each pair was presented in booklet two at the rate of one every five seconds. The order of

presentation of semi-concrete or semi-abstract materials to the subjects was divided to control any confounding effects that may occur.

The criterion of learning consisted of correctly identifying all twelve items in the same trial. Each subject was given both the semi-concrete and semi-abstract items until a criterion of learning was reached. The Subject was given no indication of the correctness of his responses. The Examiner recorded each response made by each Subject. A failure to respond in the time limit was reported as a failure. If any of the responses were incorrect during a trial the Subject was given another trial. Intertrial intervals were ten seconds in duration. During the intertrial interval, the Examiner said:

> Now we shall look at the pictures again. Try to remember what two pictures go together. Point to the picture that is missing.

A different arrangement of items on the response card was used for each trial for ten trials. If the Subject did not reach a criterion of learning in ten trials the ten response cards were utilized again.

If the Subject became restless or questioned the Examiner about the results of the test, the Examiner said:

> We shall keep looking at the pairs of pictures until you remember all of them.

The Obtained Data

The following data were obtained for each of the 90 children participating in the study: name, age, I. Q. response to each test item, total number of errors made by each subject, and the total number of trials necessary to reach a criterion of learning.

CHAPTER IV

THE RESULTS

Three groups, thirty in each group, of bright, normal and retarded junior high children participated in a paired-associative learning task which consisted of semi-concrete and semi-abstract material. The purpose of the study was to determine if there was a statistically significant difference between the three groups in the rate of learning; if there was a statistically significant difference between the three groups in the number of errors; and if there was a statistically significant difference between the three groups in ratio of the number of trials required to reach the criterion of learning of semi-abstract and semi-concrete material.

The statistical technique chosen for treatment of the data was a nonparametric statistic, the Kruskal-Wallis One Way Analysis of Variance by Ranks. In the Kruskal Wallis test, each of the raw scores were replaced by ranks. All of the scores from the three groups were ranked in a single series. The smallest score was replaced by rank 1, the next to the smallest by rank 2 and the largest score by rank 90. In case of tied scores, the average of the rank was assigned to each of the observations involved.

The first null hypothesis tested was that there is no statistically significant difference in the number of trials required to meet the criterion of learning in a paired-associative learning task utilizing semi-concrete materials of bright, normal and retarded children. The two paired-associative tasks were administered to ninety subjects in the three groups.

The number of trials required for reaching a criterion of learning was considered to represent at least an ordinal measurement of the rate of learning of the children. Three independent groups were being investigated and the Kruskal-Wallis One Way Analysis of Variance by ranks is appropriate. The significance level chosen was .05. The probability associated with the occurrence under the null hypotheses of values as large as an observed H is determined by reference to the Table of Critical Values of Chi Square.[1]

The formula for the Kruskal-Wallis One Way Analysis of Variance follows:

$$H = \frac{12}{N\ (N+1)} \sum_{j}^{k} \frac{Rj^2}{nj} - 3\ (N+1)^2$$

To correct for tied scores the obtained H may be divided by $1 - \frac{T}{N^3 - N}$. However, this increases the value

---

[1]Sidney Siegel, Nonparametric Statistics for the Behavioral Sciences, (New York: McGraw Hill Book Co., Inc., 1956), p. 249.

of H. In order to maintain the test as conservative as was possible, the correction factor was not applied in this study.[1]

H is distributed approximately as chi square with k - 1 degrees of freedom. N = 90, the total number of subjects. n_1 = 30, the number of bright subjects, n_2 = 30, the number of normal subjects, and n_3 = 30, the number of retarded subjects participating in the study.

Table 1 shows the number of trials required by each subject in reaching the criterion of learning on the concrete material. Table 2 shows the ranks assigned to these scores.

From the data shown in Table 2 the following value of H was computed:

$$H = \frac{12}{90(91)}\,(24{,}282.075 + 64{,}125.630 + 114{,}639.008) - 3(91)$$

H = 24.63

df = 2

p .05 = 5.99

Since the probability was larger than the previously set level of significance the null hypothesis was rejected. There is a statistically significant difference in the number of trials required to meet the criterion of learning in a paired-associative learning task utilizing semi-concrete materials of bright, normal and retarded children.

---

[1] Ibid., p. 192.

TABLE 1

NUMBER OF TRIALS IN REACHING CRITERION OF LEARNING CONCRETE MATERIALS BY THREE GROUPS OF SUBJECTS

Bright Group	Normal Group	Retarded Group
3	6	4
5	6	5
3	5	9
4	6	6
1	1	10
2	2	3
5	2	8
4	2	5
3	4	3
3	4	3
3	1	7
3	2	3
5	6	10
3	6	8
4	7	5
3	6	5
4	5	6
2	6	15
2	6	9
4	3	6
2	5	6
2	6	5
4	2	4
4	3	9
4	6	5
5	7	7
5	5	11
2	5	9
5	7	3
2	5	7
101	137	196
M=3.37	M=4.57	M=6.53

TABLE 2

TRIAL RANKS IN REACHING CRITERION OF LEARNING CONCRETE MATERIALS BY THREE GROUPS OF SUBJECTS

Bright Group	Normal Group	Retarded Group
23.0	67.5	36.5
51.5	67.5	51.5
23.0	51.5	84.5
36.5	67.5	67.5
2.0	2.0	87.5
9.5	9.5	23.0
51.5	9.5	81.5
36.5	9.5	51.5
23.0	36.5	23.0
23.0	36.5	23.0
23.0	2.0	77.5
23.0	9.5	23.0
51.5	67.5	87.5
23.0	67.5	81.5
36.5	77.5	51.5
23.0	67.5	51.5
36.5	51.5	67.5
9.5	67.5	90.0
9.5	67.5	84.5
36.5	23.0	67.5
9.5	51.5	67.5
9.5	67.5	51.5
36.5	9.5	36.5
36.5	23.0	84.5
36.5	67.5	51.5
51.5	77.5	77.5
51.5	51.5	89.0
9.5	51.5	84.5
51.5	77.5	23.0
9.5	51.5	77.5
853.5	1387.0	1854.5
M=28.43	M=46.23	M=61.15

The rejection of the first null hypothesis necessitated further analysis of the data. The following null sub-hypotheses were proposed:

1. There is no statistically significant difference in the number of trials required in reaching a criterion of learning of semi-concrete material on a paired-associative learning task by bright and normal subjects.

2. There is no statistically significant difference in the number of trials required in reaching a criterion of learning of semi-concrete material on a paired-associative learning task by bright and retarded subjects.

3. There is no statistically significant difference in the number of trials required in reaching a criterion of learning of semi-concrete material on a paired-associative learning task by normal and retarded subjects.

The Mann-Whitney U Test was an appropriate nonparametric statistical technique for evaluation of the three proposed null sub-hypotheses. The following is the formula for the Mann-Whitney U Test:

$$U = n_1 n_2 + \frac{n_1 (n_1 - 1)}{2} - R_1$$

$$z = \frac{U - \frac{n_1 n_2}{2}}{\sqrt{\frac{n_1 n_2}{N (N-1)} \quad \frac{N^3 - N}{2}}}$$

Comparison of the bright group with the normal group on trials to criterion of learning semi-concrete material revealed the data shown in Table 3. The data in Table 3 yielded a z value of 2.49 with a probability of .0064. The z value was larger than the previously set probability of .05; therefore, the first null sub-hypothesis was rejected. There was a significant difference between the trials to criterion of learning semi-concrete material of bright and normal subjects. The bright subjects required fewer trials to learn the semi-concrete material.

TABLE 3

COMPARISON OF BRIGHT AND NORMAL SUBJECTS ON TRIALS TO CRITERION OF LEARNING SEMI-CONCRETE MATERIAL

Group	N	Total Trials	M	Total Ranks	z Value	P
Bright	30	101	3.37	746.0	2.49	.0064
Normal	30	137	4.57	1104.5		

The data shown in Table 4 yielded a z value of 4.76 with a probability of less than .00003. Utilizing the previously set probability of .05, the second null sub-hypothesis was rejected. There was a significant difference between the trials to criterion of learning semi-concrete material of

bright and retarded subjects. The bright subjects required fewer trials to learn the semi-concrete material.

TABLE 4

COMPARISON OF BRIGHT AND RETARDED SUBJECTS ON TRIALS TO CRITERION OF LEARNING SEMI-CONCRETE MATERIAL

Group	N	Total Trials	M	Total Ranks	z Value	p
Bright	30	101	3.37	593.0	4.76	$<.00003$
Retarded	30	196	6.53	1237.0		

The data in Table 5 produced a z value of 2.45 with a probability of .0071. Using the previously set criterion of significance of .05, the z value was larger than an .05 value; therefore, the third null sub-hypothesis was rejected. There was a significant difference between the trials to criterion of learning semi-concrete material of normal and retarded subjects. The normal subjects required fewer trials to learn the semi-concrete material.

The second null hypothesis tested was that there is no statistically significant difference in the number of errors in meeting the criterion of learning in a paired-associative learning task utilizing semi-concrete material of bright, normal and retarded children. The paired-associative task was administered to ninety subjects, thirty in each of the groups.

TABLE 5

COMPARISON OF NORMAL AND RETARDED SUBJECTS ON TRIALS TO CRITERION OF LEARNING SEMI-CONCRETE MATERIAL

Groups	N	Total Trials	M	Total Ranks	z Value	p
Normal	30	137	4.57	747.5	2.45	.0071
Retarded	30	196	6.53	1082.5		

Table 6 shows the number of errors made by each subject in reaching the criterion of learning on the semi-concrete material. Table 7 shows the ranks assigned to this data.

The value of H was computed:

$H = .001465 \quad (24,282.075 + 64,125.630 + 114,639.008) - 273$

$H = 24.632$

$df = 2$

$p \text{ at } .05 = 5.99$

The probability obtained was larger than the previously set level of significance, therefore, the null hypothesis was rejected. There is a statistically significant difference in the number of errors in meeting the criterion of learning in a paired-associative learning task utilizing semi-concrete material of bright, normal and retarded children.

The following null sub-hypotheses were proposed in order to analyze the data further:

TABLE 6

NUMBER OF ERRORS IN REACHING CRITERION OF LEARNING SEMI-CONCRETE MATERIALS BY THREE GROUPS OF SUBJECTS

Bright Group	Normal Group	Retarded Group
14	13	14
21	27	14
10	27	32
15	22	24
0	0	24
1	4	7
28	3	32
17	4	24
8	13	8
9	11	8
14	0	37
8	9	12
18	35	24
10	41	35
13	38	20
6	28	18
5	13	28
4	18	79
3	28	41
11	14	17
2	22	35
5	25	16
13	4	15
11	6	52
16	24	17
33	25	44
16	17	56
6	25	54
25	27	8
1	28	48
343	551	743
M=11.43	M=19.36	M=24.76

TABLE 7

ERROR RANKS IN REACHING CRITERION OF LEARNING SEMI-CONCRETE MATERIALS BY THREE GROUPS OF SUBJECTS

Bright Group	Normal Group	Retarded Group
38.0	33.0	38.0
56.0	69.0	38.0
25.5	69.0	76.5
42.5	57.5	61.0
2.0	2.0	61.0
4.0	10.0	17.0
73.0	7.5	76.5
49.5	10.0	61.0
20.0	33.0	20.0
23.5	28.0	20.0
38.0	2.0	82.0
20.0	23.5	30.0
53.0	80.0	61.0
25.5	84.5	80.0
33.0	83.0	55.0
15.0	73.0	53.0
12.5	33.0	73.0
10.0	53.0	90.0
7.5	73.0	84.5
28.0	38.0	49.5
6.0	57.5	80.0
12.5	65.5	46.0
33.0	10.0	42.5
28.0	15.0	87.0
46.0	61.0	49.5
78.0	65.5	85.0
46.0	49.5	89.0
15.0	65.5	88.0
65.5	69.0	20.0
4.5	73.0	86.0
911.5	1393.5	1799.0
M=30.36	M=46.45	M=59.96

1. There is no statistically significant difference in the number of errors made in reaching a criterion of learning of semi-concrete material of bright and normal subjects.

2. There is no statistically significant difference in the number of errors made in reaching the criterion of learning of semi-concrete material of bright and retarded subjects.

3. There is no statistically significant difference in the number of errors made in reaching a criterion of learning of semi-concrete material of normal and retarded subjects.

A nonparametric statistical technique, the Mann-Whitney U Test, was chosen for testing the three proposed null sub-hypotheses. The data shown in Table 8 yielded a z value of 2.29 with a probability of .0110. This z value was larger than the previously set probability of .05. The first null sub-hypothesis was rejected. There was a statistically significant difference between the errors to criterion of learning semi-concrete material of bright and normal subjects. The bright subjects produced fewer errors.

The data in Table 9 yielded a z value of 4.43 with a probability of less than .00003. This z value was larger than the previously set probability of .05. The second null sub-hypothesis was rejected. There was a statistically significant difference between the errors to criterion of learning semi-concrete material of bright and retarded subjects. The bright subjects produced fewer errors.

TABLE 8

COMPARISON OF BRIGHT AND NORMAL SUBJECTS ON ERRORS TO CRITERION OF LEARNING SEMI-CONCRETE MATERIAL

Group	N	Total Errors	M	Total Ranks	z Value	p
Bright	30	343	11.43	759.5	2.29	.0110
Normal	30	551	18.36	1056.5		

TABLE 9

COMPARISON OF BRIGHT AND RETARDED SUBJECTS ON ERRORS TO CRITERION OF LEARNING SEMI-CONCRETE MATERIAL

Group	N	Total Errors	M	Total Ranks	z Value	p
Bright	30	343	11.43	614.0	4.43	< .00003
Retarded	30	843	28.10	1216.0		

Comparison of the normal subjects with the retarded subjects as shown in Table 10, yielded a z value of 2.05 with a probability of .0202. The z value was larger than the value required for the .05 level; therefore, the third null sub-hypothesis was rejected. There was a statistically significant difference between the errors to criterion of learning semi-concrete material of normal and retarded subjects. The normal subjects produced fewer errors.

TABLE 10

COMPARISON OF NORMAL AND RETARDED SUBJECTS ON ERRORS TO CRITERION OF LEARNING SEMI-CONCRETE MATERIAL

Group	N	Total Errors	M	Total Ranks	z Value	p
Normal	30	551	18.36	776.0	2.05	.0202
Retarded	30	843	28.10	1054.0		

The third null hypothesis tested was that there is no statistically significant difference in the number of trials required to meet the criterion of learning in a paired-associative learning task utilizing semi-abstract material of bright, normal and retarded children. The paired-associative task was administered to ninety subjects, thirty in each of the three groups.

Table 11 shows the number of trials required by each subject to reach the criterion of learning on the semi-abstract material. Table 12 shows the ranks assigned to this data.

The value of H was computed:

$H = .001465 \quad (18,056.5 + 67,118.0 + 136,687.0) - 273$

$H = 52.027$

$df = 2$

$p \text{ at } .05 = 5.99$

TABLE 11

NUMBER OF TRIALS IN REACHING CRITERION OF LEARNING SEMI-ABSTRACT MATERIALS BY THREE GROUPS OF SUBJECTS

Bright Group	Normal Group	Retarded Group
5	14	19
10	16	29
5	8	28
6	9	11
7	9	20
8	15	18
7	9	13
8	6	7
5	9	7
4	6	14
3	6	11
4	10	10
5	8	9
6	10	11
7	12	15
3	11	19
6	6	11
4	7	24
5	13	20
7	17	14
5	9	10
5	7	21
6	7	6
9	10	14
10	7	6
8	6	16
6	6	20
7	13	18
13	12	17
5	9	15
89	287	453
M=2.63	M=9.56	M=15.10

TABLE 12

TRIAL RANKS IN REACHING CRITERION OF LEARNING SEMI-ABSTRACT MATERIALS BY THREE GROUPS OF SUBJECTS

Bright Group	Normal Group	Retarded Group
11.5	70.5	82.5
54.5	76.5	90.0
11.5	42.0	89.0
22.0	48.0	60.0
34.0	48.0	85.0
42.0	74.0	80.5
34.0	48.0	66.5
42.0	22.0	34.0
11.5	48.0	34.0
4.0	22.0	70.5
1.5	22.0	60.0
4.0	54.5	54.5
11.5	42.0	48.0
22.0	54.5	60.0
34.0	63.5	74.0
1.5	60.0	82.5
22.0	22.0	60.0
4.0	34.0	88.0
11.5	66.5	85.0
33.5	78.5	70.5
11.5	48.0	54.5
11.5	34.0	87.0
22.0	34.0	22.0
48.0	54.5	70.5
54.5	34.0	22.0
42.0	22.0	76.5
22.0	22.0	85.0
34.0	66.5	80.5
66.5	63.5	78.5
11.5	48.0	74.0
736.0	1419.0	2025.0
M=24.53	M=47.30	M=67.50

The probability was larger than the previously set level of significance a = .05; therefore, the third null hypothesis was rejected. There is a statistically significant difference in the number of trials required to meet the criterion of learning in a paired-associative learning task utilizing semi-abstract material of bright, normal and retarded children.

The following null sub-hypotheses were proposed in order to analyze the data further:

1. There is no statistically significant difference in the number of trials required to meet the criterion of learning of semi-abstract material on a paired-associative learning task of bright and normal subjects.

2. There is no statistically significant difference in the number of trials required to meet the criterion of learning of semi-abstract material on a paired-associative learning task of bright and retarded subjects.

3. There is no statistically significant difference in the number of trials required to meet the criterion of learning of semi-abstract material on a paired-associative learning task of normal and retarded subjects.

A nonparametric statistical technique, the Mann-Whitney U Test, was chosen for testing the three proposed null sub-hypotheses. The data shown in Table 13 yielded a z value of 4.18 with a probability of less than .00003. This z value was larger than the previously set probability of .05;

therefore, the first null sub-hypothesis was rejected. There was a statistically significant difference between the number of trials required to meet the criterion of learning of semi-abstract material on a paired-associative learning task of bright and normal subjects. The bright subjects required fewer trials.

TABLE 13

COMPARISON OF BRIGHT AND NORMAL SUBJECTS ON TRIALS TO CRITERION OF LEARNING SEMI-ABSTRACT MATERIAL

Group	N	Total Trials	M	Total Ranks	z Value	p
Bright	30	89	2.63	632.0	4.18	<.00003
Normal	30	287	9.56	1198.0		

The data shown in Table 14 yielded a z value of 5.76 with a probability of less than .00003. This z value was larger than the previously set probability of .05; therefore, the second null sub-hypothesis was rejected. There was a statistically significant difference in the number of trials required to meet the criterion of learning of semi-abstract material on a paired-associative learning task of bright and retarded subjects. The bright subjects required fewer trials.

The data shown in Table 15 yielded a z value of 3.82 with a probability of .00007. The z value is larger than the

TABLE 14

COMPARISON OF BRIGHT AND RETARDED SUBJECTS ON TRIALS TO CRITERION OF LEARNING SEMI-ABSTRACT MATERIAL

Group	N	Total Trials	M	Total Ranks	z Value	p
Bright	30	89	2.63	525.0	5.76	.00003
Retarded	30	453	15.10	1305.0		

TABLE 15

COMPARISON OF NORMAL AND RETARDED SUBJECTS ON TRIALS TO CRITERION OF LEARNING SEMI-ABSTRACT MATERIAL

Group	N	Total Trials	M	Total Ranks	z Value	p
Normal	30	287	9.56	656.0	3.82	.00007
Retarded	30	453	15.10	1174.0		

value required for the .05 level of significance; therefore, the third null sub-hypothesis was rejected. There was a statistically significant difference in the number of trials required to meet the criterion of learning of semi-abstract material on a paired-associative learning task of normal and retarded subjects. The normal subjects required fewer trials.

The fourth null hypothesis tested was that there is no statistically significant difference in the number of

errors in meeting the criterion of learning in a paired-associative learning task utilizing semi-abstract material of bright, normal and retarded children. The paired-associative task was administered to ninety subjects, thirty in each of the three groups.

Table 16 shows the number of errors made by each subject in meeting the criterion of learning on the semi-abstract material. Table 17 shows the ranks assigned to this data.

The value of H was computed:

$H = .001465 \quad (18,850.013 + 64,960.050 + 126,360.030) - 273$

$H = 34.899$

$df = 2$

$p \text{ at } .05 = 5.99$

The probability obtained for H was larger than the previously set level of significance a = .05; therefore, the fourth null hypothesis was rejected. There is a statistically significant difference in the number of errors in meeting the criterion of learning in a paired-associative learning task utilizing semi-abstract material of bright, normal and retarded children.

The following null sub-hypotheses were proposed in order to analyze the data further:

1. There is no statistically significant difference in the number of errors in meeting the criterion of learning

TABLE 16

NUMBER OF ERRORS IN REACHING CRITERION OF LEARNING SEMI-ABSTRACT MATERIALS BY THREE GROUPS OF SUBJECTS

Bright Group	Normal Group	Retarded Group
24	68	98
53	72	140
21	34	160
26	49	55
36	50	133
36	74	94
41	51	94
21	33	30
17	30	27
22	21	40
13	31	50
18	40	77
17	36	32
33	47	57
29	55	91
9	46	113
30	26	47
12	38	118
26	65	130
29	90	85
21	37	36
24	27	121
21	31	31
47	63	67
55	30	25
56	19	116
27	28	97
27	52	88
48	51	27
22	45	73
861	1339	2352
M=28.67	M=44.63	M=78.40

TABLE 17

ERROR RANKS IN REACHING CRITERION OF LEARNING SEMI-ABSTRACT MATERIALS BY THREE GROUPS OF SUBJECTS

Bright Group	Normal Group	Retarded Group
15.5	70.0	82.0
61.0	71.0	89.0
10.0	39.0	90.0
19.0	55.0	63.0
41.5	56.5	88.0
41.5	73.0	79.5
48.0	58.5	79.5
10.0	37.5	30.5
4.5	30.5	23.0
13.5	10.0	46.5
3.0	34.0	56.5
6.0	46.5	74.0
4.5	41.5	36.0
37.5	52.0	66.0
27.5	63.0	78.0
1.0	50.0	83.0
30.5	19.0	52.0
2.0	45.0	85.0
19.0	68.0	87.0
27.5	77.0	75.0
10.0	44.0	41.5
15.5	23.0	86.0
10.0	34.0	34.0
52.0	67.0	69.0
63.0	30.5	17.0
65.0	7.0	84.0
23.0	26.0	81.0
23.0	60.0	76.0
54.0	58.5	23.0
13.5	49.0	72.0
752.0	1396.0	1947.0
M=25.06	M=46.53	M=64.90

in a paired-associative learning task utilizing semi-abstract material of bright and normal subjects.

2. There is no statistically significant difference in the number of errors in meeting the criterion of learning in a paired-associative learning task utilizing semi-abstract material of bright and retarded subjects.

3. There is no statistically significant difference in the number of errors in meeting the criterion of learning in a paired-associative learning task utilizing semi-abstract material of normal and retarded subjects.

A nonparametric statistical technique, the Mann-Whitney U Test, was chosen for testing the three proposed null sub-hypotheses. The data shown in Table 18 yielded a z value of 3.76 with a probability of .00011. This z value was larger than the previously set probability of .05; therefore, the first null sub-hypothesis was rejected. There is a statistically significant difference in the number of errors in meeting the criterion of learning in a paired-associative learning task utilizing semi-abstract material of bright and normal subjects. The bright subjects made fewer errors.

The data shown in Table 19 yielded a z value of 5.30 with a probability of less than .00003. This z value was larger than the previously set probability of .05; therefore, the second null sub-hypothesis was rejected. There is a statistically significant difference in the number of errors in meeting the criterion of learning in a paired-associative

learning task utilizing semi-abstract material of bright and retarded subjects. The bright subjects made fewer errors.

TABLE 18

COMPARISON OF BRIGHT AND NORMAL SUBJECTS ON ERRORS TO CRITERION OF LEARNING SEMI-ABSTRACT MATERIAL

Group	N	Total Errors	M	Total Ranks	z Value	p
Bright	30	861	28.67	660.5	3.76	.00011
Normal	30	1339	44.63	1169.5		

TABLE 19

COMPARISON OF BRIGHT AND RETARDED SUBJECTS ON ERRORS TO CRITERION OF LEARNING SEMI-ABSTRACT MATERIAL

Group	N	Total Errors	M	Total Ranks	z Value	p
Bright	30	861	28.67	556.5	5.30	$<$.00003
Retarded	30	2352	78.40	1266.5		

The data shown in Table 20 yielded a z value of 6.64 with a probability of less than .00003. This z value was larger than the previously set probability of .05; therefore, the third null sub-hypothesis was rejected. There is a statistically significant difference in the number of errors in

meeting the criterion of learning in a paired-associative learning task utilizing semi-abstract material of normal and retarded subjects. The normal subjects made fewer errors.

TABLE 20

COMPARISON OF NORMAL AND RETARDED SUBJECTS ON ERRORS TO CRITERION OF LEARNING SEMI-ABSTRACT MATERIAL

Group	N	Total Errors	M	Total Ranks	z Value	p
Normal	30	1339	44.63	665.5	6.64	$<.00003$
Retarded	30	2352	78.40	1121.5		

Table 21 shows the ratio between the number of trials required by each subject in reaching the criterion of learning the semi-concrete and the semi-abstract tasks. The ratios were obtained by dividing the number of trials required to reach the criterion of learning the semi-concrete task by the trials required to reach the criterion of learning the semi-abstract task. The obtained ratios were multiplied by one hundred in order to remove the decimal. Table 22 shows the ranks assigned to these ratios.

The value of H was computed:

$H = .001465 \quad (73,606.53 + 63,618.70 + 51,460.21) - 273$

$H = 3.42$

$df = 2$

$p \text{ at } .05 = 5.99$

TABLE 21

RATIO BETWEEN THE NUMBER OF TRIALS REQUIRED TO LEARN THE SEMI-CONCRETE AND SEMI-ABSTRACT MATERIAL

Bright Group	Normal Group	Retarded Group
60	43	21
50	38	17
60	63	32
67	67	55
14	11	50
25	13	17
71	22	62
50	33	71
60	44	45
75	67	21
100	17	64
75	20	30
100	75	111
50	80	73
57	58	33
100	55	26
34	83	55
50	86	63
40	46	45
57	18	43
40	56	60
40	86	24
67	29	67
44	30	64
40	86	83
63	117	44
83	83	55
29	38	50
38	58	18
40	56	47
1729	1678	1444
M=57.63	M=55.93	M=48.13

TABLE 22

RATIO RANKS BETWEEN THE NUMBER OF TRIALS REQUIRED TO LEARN THE SEMI-CONCRETE AND SEMI-ABSTRACT MATERIAL

Bright Group	Normal Group	Retarded Group
58.5	33.0	10.5
43.5	25.0	5.0
58.5	63.0	20.0
69.0	69.0	48.5
3.0	1.0	43.5
14.0	2.0	5.0
72.5	12.0	61.0
43.5	21.5	72.5
58.5	36.0	33.0
76.0	69.0	10.5
87.0	5.0	65.5
76.0	9.0	18.5
87.0	76.0	89.0
43.5	78.0	74.0
53.5	65.5	21.5
87.0	48.5	15.0
23.0	80.5	48.5
43.5	84.0	63.0
29.0	39.0	38.0
53.5	7.5	33.0
29.0	51.5	58.5
29.0	84.0	13.0
69.0	16.5	69.0
36.0	18.5	65.5
29.0	84.0	80.5
63.0	90.0	36.0
80.5	80.5	48.5
16.5	25.0	43.5
25.0	55.5	7.5
29.0	51.5	40.0
1486.0	1381.5	1242.5
M=49.53	M=46.05	M=41.08

The probability obtained for H was smaller than the previously set level of significance a = .05; therefore, the fifth null hypothesis was accepted. There is no statistically significant difference in the ratio of the number of trials required to obtain the criterion of learning between semi-abstract and semi-concrete material of bright, normal and retarded children.

Summary of Results

In summary, there was statistically significant difference in the number of trials required to meet the criterion of learning the semi-concrete and the semi-abstract tasks of bright, normal and retarded children. Further analysis showed that the bright children learned the semi-concrete and the semi-abstract material in fewer trials and with fewer errors than did the normal or retarded subjects. There was no statistically significant difference found in the ratio of the number of trials required to obtain the criterion of learning between semi-abstract and semi-concrete material of bright, normal and retarded children.

CHAPTER V

SUMMARY AND CONCLUSIONS

The purpose of the present study was to examine the effect, if any, of the type of material on the learning rates of children with different levels of intelligence on a paired-associative learning task. The assumptions regarding differential ability to integrate abstract and concrete materials influence psychological diagnosis and educational practices.

Educators employ divergent educational practices which utilize abstract and concrete materials differentially in order to more effectively teach the bright and retarded pupil. One of the criteria for interpreting psychodiagnostic instruments, such as the Rorschach Projective test,[1] is based on the assumption that bright people are able to utilize abstractions easily and that retardates utilize concrete concepts in their mental processes. Personality theorists, such as Kurt Lewin,[2] who are influential in the development of measurements and education, indicate that retardates may possess a facility with concrete facts but that they lack the mental ability for abstract activities.

---

[1] Rorschach, op. cit.

[2] Lewin, op. cit., A Dynamic Theory of Personality.

The concept that differential performance on concrete or abstract material is highly correlated with intelligence was investigated. The ability to incorporate and assimilate abstractions as a relative function of mentality has been generally accepted, but with scarce and inconsistant experimental verification.

This study was designed primarily to investigate the differences, if any, in the rate of learning, the number of errors committed and the ratio between the rate of learning semi-abstract and semi-concrete material of bright, normal and retarded children. Each of the ninety subjects participated in learning both types of material. Each subject was given both of the twelve paired-associative learning tasks until he reached the criterion of learning. The number of trials required to reach the criterion of learning and the number of errors made in reaching the criterion were recorded for each subject.

Results of the study did not sustain the first null hypothesis: There is a statistically significant difference in the number of trials required to meet the criterion of learning in a paired-associative learning task utilizing semi-concrete material of bright, normal and retarded children.

Three null sub-hypotheses were proposed in order to make further analysis of the data. They stated that there was no statistically significant difference in the number of

trials required to reach the criterion of learning in any of the two independent samples, three comparisons being possible.

The results showed that there was a statistically significant difference in each of the three groups. The bright group required fewer trials than the other groups and the normal group required fewer trials than the retarded group in meeting the criterion of learning.

Results of the study did not sustain the second null hypothesis: There is a statistically significant difference in the number of errors in meeting the criterion of learning in a paired associative learning task utilizing semi-concrete material of bright, normal and retarded children.

Three null sub-hypotheses were proposed in order to further analyze the data. They stated that there was no statistically significant difference in the number of errors made in reaching the criterion of learning in any of the two independent samples. The results showed that there was a statistically significant difference in each of the three groups. The bright group made fewer errors than the other groups and the normal group made fewer errors than the retardates in meeting the criterion of learning.

The obtained results did not sustain the third null hypothesis: There is a statistically significant difference in the number of trials required to meet the criterion of learning in a paired-associative learning task utilizing semi-abstract material of bright, normal and retarded children.

Three null sub-hypotheses were proposed in order to make further analysis of the data. They stated that there was no statistically significant difference in the number of trials required to reach the criterion of learning in any of the two independent samples, three comparisons being possible.

The results showed that there was a statistically significant difference in each of the three groups. The bright group required fewer trials than the other groups and the normal group required fewer trials than the retarded group.

Results of the study did not sustain the fourth null hypothesis: There was a statistically significant difference in the number of errors in meeting the criterion of learning in a paired-associative learning task utilizing semi-abstract material of bright, normal and retarded children.

In order to make further analysis of the data three null sub-hypotheses were proposed. They stated that there was no statistically significant difference in the number of trials required to reach the criterion of learning in any of the two independent samples, three comparisons being possible.

The results showed that there was a statistically significant difference in each of the three groups. The bright group made fewer errors than the other groups and the normal group required fewer errors to reach the criterion of learning than the retarded group.

Results of the study sustained the fifth null hypothesis: There was no statistically significant difference in

the ratio of the number of trials required to obtain the criterion of learning between semi-abstract and semi-concrete material of bright, normal and retarded children.

Results of the study showed that more trials are required by retarded children to learn both semi-concrete and semi-abstract material. These findings indicated a generally lowered level for retardation with the possibility that they might have difficulty with either type of material.

The assumption that children of all mental levels learn concrete material more rapidly and with fewer mistakes than their comparable performance with abstract material is upheld. When possible it appears desirable, in light of this verification, to utilize concrete teaching materials as aids to instruction.

Children of different mental levels were not shown to have different relative rates of learning of semi-concrete and semi-abstract tasks. Clinically observed differences may frequently involve tasks that are inherently more difficult than the learning tasks used in the present study.

Implications for Research

Although the test items were chosen and paired on the basis of no obvious potentially affect arousal, individual perception appeared to have influenced the learning tasks on some items. This would seem to indicate a possible investigation involving an item analysis with respect to selected personality variables of the subjects.

Another factor which was noted was the consistent impulsive type of movements of some subjects in the direction of the correct response without apparent awareness, even though he subsequently made an incorrect choice. This factor should be investigated.

Also noted was the apparent inclincation of some subjects to give the correct response before or after its proper place. The present study was concerned with the number of errors made and not with the type of errors. Further studies may find profitable information by recording and investigating the types of errors made by subjects in learning experiments.

Other areas that could be investigated using this type of material include: children of different cultural backgrounds, children with matched mental ages, children with physical disabilities, children with hearing impairments, children with reading difficulties, and emotionally disturbed children.

BIBLIOGRAPHY

Books

Bartlet, F. C. Remembering: A Study in Experimental and Social Psychology. Cambridge: University Press, 1932.

Beck, Samuel J. Rorschach's Test. Vol. I. Basic Processes. New York: Grune and Stratton, 1950.

Brown, Roger. Words and Things. Glencoe, Illinois: The Free Press, 1958.

Hertz, Marguerite R. Rorschach Psychology. edited by Rickers-Ovsiznki. New York: Wiley, 1960.

Hutt, Max L. and Gibby, Robert Gwyn. The Mentally Retarded Child. Boston: Allyn and Bacon, 1958.

Jordon, Thomas E. The Mentally Retarded. Columbus, Ohio: Chas. E. Merrill Books, Inc., 1961.

Lewin, Kurt. A Dynamic Theory of Personality: Selected Papers. Trans. Donald K. Adams and Karl E. Zener, New York: McGraw Hill, 1935.

Rorschach, Herman. Psychodiagnostics: A Diagnostic Test Based on Perception. Trans. P. Lemkau and B. Kronenburg. Bern: Hans Huber, 1942.

Sherif, Musafer and Sherif, Carolyn W. An Outline of Social Psychology. Cambridge: University Press, 1932.

Siegel, Sidney. Nonparametric Statistics for the Behavioral Sciences. New York: McGraw Hill Book Company, Inc., 1956.

Periodicals

Eisman, B. S. "Paired Associative Learning, Generalization, and Retention as a Function of Intelligence," American Journal of Mental Deficiency, LXII (1958).

Goldstein, Kurt and Scheerer, Martin. "Abstract and Concrete Behavior: An Experimental Study with Special Tests," Psychological Monographs, Vol. 53, No. 2, Whole No. 239, (1941).

Kounin, J. S. "Experimental Studies of Rigidity. I. The Measurement of Rigidity in Normal and Feeble-minded Persons," Character and Personality, (1941), 9.

McPherson, Marion White. "A Survey of Experimental Studies of Learning in Individuals Who Achieve Subnormal Ratings on Standardized Psychometric Measures," American Journal of Mental Deficiency, LII-LIII, (1948).

McPherson, Marion White. "Learning and Mental Deficiency," American Journal of Mental Deficiency, LXII, (1958).

Woodrow, H. "The Ability to Learn," Psychological Review, 53, (1946).

Dissertations

Hiner, Gladys Webber, "A Comparison of Associative Learning Rates of Bright, Normal and Retarded Children," (unpublished Ph. D. dissertation, College of Education, University of Oklahoma, 1962.)

Teague, Fay Marsh. "An Experimental Study Using Single Sensory and Multi-Sensory Stimuli Presentation in a Paired-Associative Learning Task," (unpublished Ph. D. dissertation, College of Education, University of Oklahoma, 1962.)