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A COMPARISON STUDY TO DETERMINE DEMONSTRABLE RELATIONSHIPS BETWEEN COLLECTIVE VS ISOLATE LEARNING PROCESSES WITH OPERANT LEARNING PERFORMANCES

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A COMPARISON STUDY TO DETERMINE DEMONSTRABLE RELATIONSHIPS  
BETWEEN COLLECTIVE V S ISOLATE LEARNING PROCESSES  
WITH OPERANT LEARNING PERFORMANCES

A DISSERTATION

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degree of

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BY

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Oklahoma City, Oklahoma

1965

A COMPARISON STUDY TO DETERMINE DEMONSTRABLE RELATIONSHIPS  
BETWEEN COLLECTIVE VS ISOLATE LEARNING PROCESSES  
WITH OPERANT LEARNING PERFORMANCES

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## TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS . . . . .	iii
LIST OF TABLES . . . . .	vi
PREFACE . . . . .	1
 Chapter	
I. THE PROBLEM: ITS BACKGROUND AND SCOPE . . . . .	3
Basis for undertaking study . . . . .	3
Review of terms used . . . . .	4
Statement of the Problem . . . . .	4
Retardation: Differentiation of groups . . . . .	5
Pertinent literature . . . . .	6
II. PSYCHOMETRIC EVALUATION . . . . .	7
Size of sample . . . . .	7
Psychodiagnostic instruments used . . . . .	7
Psychodiagnostic delineation . . . . .	8
Chronological ages of sample . . . . .	9
Mental age scores of sample . . . . .	9
Specific terms used . . . . .	10
Qualitative & Quantitative aspects of Binet . . . . .	11
III. OPERANT LEARNING TASKS . . . . .	12
Mazes . . . . .	12
Conflict Boards, Abstract & Concrete Detection and Recall and Retention . . . . .	13
Sequence Memory . . . . .	13
IV. STATISTICAL ANALYSIS OF THE SUBTESTS AND THE FINDINGS . .	15
I. Division within the subtests . . . . .	15
II. Testing for the homogeneity of variance . . . . .	15
Hypothesis Testing I. . . . .	16
Analysis of Variance . . . . .	16
Pearson Product Moment Correlations . . . . .	18

Chapter	Page
IV. (Cont.)	
Hypothesis Testing II. . . . .	23
Primary Hypotheses . . . . .	23
Secondary Hypotheses . . . . .	23
Discussion of Hypothesis Testing II. (Primary Hypotheses) . . . . .	24
Discussion of Hypothesis Testing II. (Secondary Hypotheses) . . . . .	25
Conclusions . . . . .	28
Duncan's Multiple Range Test . . . . .	29
V. DISCUSSION OF FINDINGS . . . . .	31
Conclusions . . . . .	36
Considerations . . . . .	39
Recommendations . . . . .	40
BIBLIOGRAPHY . . . . .	41

## LIST OF TABLES

Table	Page
I. Individual Total Scores for each subject . . . . .	19
II. Variances among subtests for each subject . . . . .	20
III. Analysis of Variance for operant learning tasks scores . .	21
IV. Correlation Coefficients among the subtests . . . . .	22
V. Duncan's Multiple Range Test . . . . .	30
Subtests and their means . . . . .	30
Subtraction of Subtest means . . . . .	30

## PREFACE

The multiple variables influencing one's attempts at mastery of a particular learning type activity have long been topics of concern among educators, learning theorists, as well as research investigators. The contention that collective and independent performance patterns with a similar set of learning situations will differ significantly, was first seriously challenged by several investigators around the first quarter of the century (1925).

In the present study emphasis was focused upon four selected groups of subjects which within their own select grouping all had in common an inferred constant variable which was presumedly effecting their rate of adaptability to a particular set of operant learning situations. Levels of performance among subjects within the individual groups were analyzed and compared to levels of performance between the four groups on independent as well as collective trials.

Two hundred subjects were initially screened for this study, yet only eighty-six were considered to be able to demonstrate the inferred constant variable characteristic to their group. Through several group discussions with persons actively involved in teaching 'educable' students specific variables were isolated which they



surmised to have significant bearing upon retarded learning performance among 'educable' students. These specific variables were incorporated into the nine hypotheses developed in the present study.

An operational approach to learning was selected for the present study rather than an experimental design utilizing conditional and/or instrumental models.<sup>1</sup>

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<sup>1</sup>0. Hobart Mowrer, Learning Theory and Behavior (New York, John Wiley & Sons, Inc., 1960), pp. 426-427.

A COMPARISON STUDY TO DETERMINE DEMONSTRABLE RELATIONSHIPS  
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CHAPTER I

THE PROBLEM: ITS BACKGROUND AND SCOPE

Introduction

The basis for undertaking research to study rates of adaptability among four different populations of subjects, as well as among individuals within the samples of each population, developed out of a series of group discussions with persons actively engaged in teaching specific academic skills to mixed groups of students who are not equated on any a'prior variable other than 'retardation'. The concept of retardation in the current research literature is a diverse concept to say the least. It is often used synonymously with terms such as 'mentally inefficient', 'intellectually impaired' and/or 'mentally handicapped'.

Frequently a specific classification system is employed by an academic institution for purposes of class placement, to comply with state laws and/or to conform to local board requirements. One such category in many classification systems is that of the mentally deficient individual. These persons being referred to as "trainable".<sup>1</sup>

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<sup>1</sup>Oliver Hodge, "A Guide for Teachers of Educable Mentally Handicapped Children," Oklahoma Curriculum Improvement Commission (Vol. I Primary) 1960, p. 3.

These individuals do not usually become competent with scholastic skills and are therefore not considered educable. Another category is that of the 'educable' group. These persons are considered educable to the extent of being able to acquire certain scholastic skills to a useful degree. Further, these students are considered to possess the potential of making some significant contribution to their own welfare, while the mentally deficient individual is not usually considered as having the capacity to make a responsible contribution to the maintenance of his own personal needs and usually requires continual guidance and supervision of adult figures.

A third category is that of the 'slow learner'. These students are generally not relegated to a highly structured educational curriculum as found in the special education classroom. These persons are quite often placed in a classroom of 'average' learners, yet are given some individual attention according to their academic progress, specific rate of learning, social adjustment, etc. For the present research study the subjects under consideration are those falling within the category labeled as 'educable'.

#### Statement of the Problem

Is there a significant difference between the rate of learning demonstrated by 'educable' students while performing individually as compared to their performing collectively with other 'educable' students? If this hypothesized difference is shown to exist are there any a priori variables that may be factored out as reliable predictors of learning performance? Further are several of the traditional predictors such as chronological age, mental age scores and/or intelligence quotients as

applicable to educable students as they appear to be to 'average' students? Further, do operant learning type activities offer a meaningful measure of situational adaptation to structured learning performances?

### Retardation: Differentiation of Groups

This diverse concept of retardation is frequently thought of with respect to levels of under-achievement on a series of standardized test items encompassing several areas of performance. These level of achievement (or under-achievement) are often quite narrow and not too infrequently are only a quantative measure of performance. A limited availability of qualified personnel in public as well as many private school evaluation programs frequently results in a quantative evaluation of student performance without an accompanying qualitative analysis of the same performance. Without an evaluation of the qualitative aspects in performance a differential estimate of an individual's potential is virtually impossible. It is this differential analysis of performance that the present study endeavors to treat among thr four groups as well as within the groups and among the individual subjects.

Four diagnostic patterns were selected for analysis from which four hypothesized groups were formed. The four groups were comprised of subjects being previously diagnosed as manifesting definite clinical patterns of neurological pathology (organicity occurring after birth), traumatics (emotionally disturbed without accompanying organicity), environmentally deprived (early environmental impoverishment without accompanying organicity, and mentally handicapped (limited initial endowment present at birth).

The discussions mentioned above were concerned with the differences in rates of adaptation among group and individual performance

patterns with a comparable set of learning tasks. Further, concern was expressed towards the apparent differing rate of learning reflected in the performance of retarded students having presumed dissimilar predisposing factors contributing to their retardation.

Considerable research literature is available citing various studies relevant to individual and group learning patterns. Yet these studies have primarily encompassed research of rather broad hypotheses<sup>2</sup> and/or specific trial performances characteristic to a particular sample.<sup>3</sup> Literature in the area of Social Psychology is permeated with group studies on broad concepts as well as particular behavior variables characteristic to a finite population.<sup>4</sup> The present study is not aimed at formulating or systematizing complex interacting behavioral indicies, rather it is focused upon determining relationships among a set of discrete variables reflected in the performance given by four hypothesized groups to structured learning situations.

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<sup>2</sup>Herbert Gurnee, "Group Learning," Psychological Monographs (American Psychological Association, 1962), p. 11.

<sup>3</sup>Ibid., p. 22.

<sup>4</sup>M. Sherif, The Psychology of Social Norms (New York: Harper Publishing Co., 1936).

## CHAPTER II

### PSYCHOMETRIC EVALUATION

Four populations were evaluated from which a sample of eighty-six subjects were selected. Only twenty of these eighty-six subjects were found to be able to demonstrate the inferred constant variable characteristic to their group by the consulting psychometrist. All diagnostic selection as accomplished by psychometrists holding Master of Arts degrees with special diagnostic skills.

Diagnostic instruments selected for placing subjects into appropriate groupings are as follows:

- (1) Neurologically Impaired
  - (a) Grassi Block Substitution Test
  - (b) Visual Motor Gestalt Test
- (2) Mentally Handicapped
  - (a) Visual Motor Gestalt Test
  - (b) Vineland Social Maturity Scale and/or Developmentally Histories
- (3) Traumatized
  - (a) House-Tree-Person (Machover interpretations).
  - (b) Rorschach
- (4) Environmentally Deprived
  - (a) House-Tree-Person (Buck, J. N. interpretations).
  - (b) Thematic Apperception Test

All subjects in the four above groupings were administered the 1960 form L-M Stanford Binet Intelligence Scale. The obtained mental age scores placed these subjects in the Moderately Retarded range of

intellectual functioning (as published by the American Psychiatric Association). This classification considers these individuals to be amenable to special training and guidance. The psychometrists involved in this experiment had prior professional experience with the techniques used for diagnostic evaluation.

### Psychodiagnostic Delineation

The Grassi Block Substitution Scale of 0 - 20 points was used with a subject obtaining sixteen (16) points or less being considered as demonstrating significant reflections, according to the Grassi hypothesis, of neurological pathology. The Grassi hypothesis is organized with two levels of concrete thinking and two upper levels to measure conceptual (abstract) thinking.<sup>1</sup> The Bender Gestalt was interpreted according to diagnostic patterns outlined in Psychological Monographs No. III<sup>2</sup> written by Laretta Bender (1938). The human figure portrayals given by the group of traumatic subjects were interpreted from the diagnostic patterns outlined by Karen Machover in her manual of Personality Projection in the Drawing of the Human Figure.<sup>3</sup> The human figure portrayals given by the Environmentally Deprived group were interpreted according to the diagnostic patterns outlined by J. Buck in his manual for the H-P-T Technique.<sup>4</sup> In addition, these figure drawings were scored for mental

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<sup>1</sup>Joseph R. Grassi, The Grassi Block Substitution Test for Measuring Organic Brain Pathology (Springfield, Ill.: Charles C. Thomas Publisher, 1953).

<sup>2</sup>Laretta Bender, A Visual Motor Gestalt Test and its Clinical Use (Amer. Orthopsychiat. Assoc., Res. Monogr., 1938).

<sup>3</sup>Karen Machover, Personality Projection in the Drawing of the Human Figure (Springfield, Ill.: Thomas Publisher, 1949).

<sup>4</sup>J. N. Buck, House-Tree-Person Drawing Technique (New York: Ronald Press, 1953).

ages according to the Goodenough profile scale.<sup>5</sup> Attention here was directed towards reflections of social maturity as well as mental age scores.

An abridged set of specially selected cards from the Thematic Apperception Test (TAT) were used according to card groupings researched by R. I. Watson (1951).<sup>6</sup> The method for presentation of these selected cards adhered to the presentation techniques outlined by Murray (1953).<sup>7</sup>

Chronological ages ranged from eight and one-half years to thirteen years of age among the four groups with twelve subjects being male and eight being female. Obtained mental age scores from administration of the 1960 Stanford Binet Intelligence Scale ranged from five years and one month to nine years and three months. The mean intelligence quotient was computed to be sixty-eight (68). Subtest scatter was broadest among the traumatic group and narrowest for the mentally handicapped. Range of subtest scatter for the neurologically impaired and mentally handicapped was not statistically different from one another, yet was significantly narrower than that achieved by the traumatic and environmentally deprived groups.

The concept of neurological pathology being reflected on a psychological level has received considerable attention in recent research literature. Unfortunately each researcher does not use the same language in reporting his findings. This is to say that three

<sup>5</sup>F. L. Goodenough, Measurement of Intelligence by Drawing (New York: Harcourt, Brace & World, Inc., 1954).

<sup>6</sup>R. I. Watson, The Clinical Method in Psychology (New York: Harper Publishing Co., 1951).

<sup>7</sup>H. A. Murry, Thematic Apperception Test (New York: Ronald Press, 1953).



major categories have become popular in reporting research findings presumably reflecting psychological manifestations that suggest the presence of organic involvement. These categories are namely:<sup>8</sup>

- (a) intellectual deterioration
- (b) intellectual inefficiency
- (c) intellectual impairment

Intellectual deterioration is often thought of as a loss of intellectual acumen as a result of organic involvement. Intellectual inefficiency implying the influence of a disturbed emotional state (viz., as seen in a neurotic condition). Intellectual impairment implying influence of a severely disturbed psychological state (viz., as seen in a psychotic condition). For the present study the concept of intellectual deterioration will apply to the subjects assigned to the neurologically impaired group. The concept of intellectual inefficiency will apply to the subjects assigned to the traumatic group. Of import here is the difference in date of onset in neurological involvement between the subjects assigned to the mentally handicapped group as compared to those assigned to the neurologically impaired group. Mentally handicapped subjects will be thought of as individuals who manifested some definite impairment in developmental functioning shortly after birth that was medically diagnosed as a cortical dysfunctioning or other neurological track dysfunctioning due to pre-natal developmental abnormalities. While the neurologically impaired subjects were considered to have suffered some degree of cortical or neurological track damage after birth which was not associated with the birth process

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<sup>8</sup>Joseph R. Grassi, The Grassi Block Substitution Test for Measuring Organic Brain Pathology (Springfield, Ill.: Charles C. Thomas, Publisher, 1953), p. 3.

primary. As stated above, a composite score on the Grassi of sixteen points or less was considered as a significant reflection of the presence of organic impairment. The 1960 Stanford Binet Intelligence Scale administration resulted in obtained mental age scores ranging from five years and one month to nine years and three months.

Stanford Binet subtest items involving visual motor materials, immediate span of attention and memory for meaningful and non-meaningful tasks, simple and complex conceptual thinking, abstract relationships, and tasks involving specific directions and instructions reflected the most significant performance differences in subtest scatter among the four groups. The mentally handicapped subjects demonstrated the narrowest range of subtest achievement while the traumatics demonstrated the widest spread of scatter. Many of the items failed by the mentally handicapped subjects were also failed by the neurologically impaired subjects, yet a qualitative analysis revealed a higher degree of quality and specificity reflected in the performance of the neurologically impaired subjects' performances. Further, the analysis revealed a qualitative difference between the environmentally deprived, and traumatics with a trend towards a higher quality in performance for the traumatic group. The environmentally deprived gave a comparable scatter, yet the quality of their performance was below that demonstrated by the traumatics. Hence, it becomes apparent that even though the four groups achieved relatively similar composite mental age scores on the Binet significant performance differences appear when a qualitative comparison is made between the four respective groups. These qualitative differences in performance will be further amplified in the discussion concerning group vs independent performance trials.

## CHAPTER III

### OPERANT LEARNING TASKS

The series of operant learning situations were composed of six sets of tasks. Each set of tasks was constructed to test for a subject's adaptability to a particular experimental variable. These variables involved detection of similarity and difference between concrete and abstract materials, verbal vs non-verbal performance, immediate span of attention and memory for meaningful and non-meaningful material, ability to follow instructions and directions, response to conflict, response to criticism, recall and recognition of familiar material and insightful thinking.

The sets of operant learning tasks are as follows:

Mazes: Two groups of mazes were constructed similar to those referred to as U-Maze patterns (semilinear) for group testing. These two groups were constructed from maze patterns developed by Husband.<sup>1</sup> Pattern of turns approximated LLRLRLRL construction.

Two groups of mazes were constructed similar to those belonging to the Porteus Maze Tests<sup>2</sup> for testing of independent learners. These two groups approximated the level of difficulty found in the Porteus Maze levels V through IX. Qualitative errors were not scored viz., lifting of pencil, yet the maze was inverted when lifting of the pencil was observed and a second trial given.

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<sup>1</sup>R. W. Husband, "Comparative Behavior on Different Types of Mazes," Journal of General Psychology, V (March, 1931), pp. 234-244.

<sup>2</sup>Stanley Porteus, The Maze Test and Clinical Psychology (Palo Alto, California: Pacific Books, 1959).

**Conflict Boards:** A board similar to that constructed by Daine & Rankin<sup>3</sup> to measure the reaction time variance to conflict evoking situations with employed to assess reaction to conflict experienced by independent learners.

A board similar to that constructed by Lemmon<sup>4</sup> to measure the reaction time variance to conflict evoking situations was employed to assess reaction to conflict evoking situations experienced by collective learners.

**Abstract & Concrete Detection:** A series of paired associate items were constructed incorporating abstract figures (semi-geometric designs) similar to those used by Heidbreder<sup>5</sup> in his sorting experiments. Separate sets were used for independent learners than those used in the collective learning trials.

A series of paired associate items were constructed incorporating concrete figures (e.g., trees, houses, automobiles, etc.) similar to those used by Binet (modified by Terman & Merrill) in the V year level on the Stanford Binet Intelligence Scale.<sup>6</sup> Separate sets were used for independent and collective learning trials.

**Recall & Retention:** A series of tasks were constructed to measure recall and retention similar to those developed by Hull<sup>7</sup> for independent learners with a similar set of tasks being modified for group presentation.

**Sequence Memory:** A series of tasks were constructed to measure anticipation in memory sequence similar to those developed by Smith<sup>8</sup> in his recognition studies in arrangement of stimuli for independent learners with a similar set being modified for group presentation.

<sup>3</sup>Robert Daine and Wm. Rankin, "The Variable of Conflict in Experimental Design," Unpublished Master's Thesis. University of Omaha, Omaha, Nebraska, 1960.

<sup>4</sup>V. W. Lemmon, "The Relation of Reaction Time to Measures of Intelligence, Memory and Learning," Archives of Psychology, LIV (November, 1927), pp. 33-40.

<sup>5</sup>E. Heidbreder, "The Attainment of Concepts," Journal of Psychology, XXIV (January, 1947), pp. 93-138.

<sup>6</sup>Lewis Terman and M. Merrill, Stanford Binet Intelligence Scale (Boston, Massachusetts: Riverside Press, 1960).

<sup>7</sup>Clark L. Hull, "The Meaningfulness of 320 Selected Nonsense Symbols," Psychological Review, XXXIX (May, 1933), pp. 730-734.

<sup>8</sup>W. G. Smith, "The Place of Repetition in Memory," Psychological Review, III (February, 1934), pp. 21-31.

Individuals participating in group interaction are subject to intervening variables assumedly not present during independent performances. These intervening variables may take the form of peer reinforcement, coative interaction, mimicking, stimulus cues, disagreement, etc. Collective efforts such as in classroom participation involves incidental as well as situational learning variables, while independent attempts are primarily situational in character. Considerable attention was given in an attempt to control for contaminating influences inherent in most group experimental designs. Method and procedure for presentation of materials, organization and sequence of items, and the selection of external controls employed were taken from Townsend's<sup>9</sup> manual for procedures to be considered in experimental design and methods.

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<sup>9</sup>S. C. Townsend, Introduction to Experimental Method (New York: McGraw-Hill Book Company, 1953).

## CHAPTER IV

### STATISTICAL ANALYSIS OF THE SUBTESTS AND THE FINDINGS

#### I. DIVISION WITHIN THE SUBTEST

There were twenty-five items in each of the four subtests. The subtests were divided into five parts with five items in each. The purpose of the division was to make possible the statistical analysis. The entries in Table 1, page 19 are the total scores obtained on each subtest by each subject. Variances were computed for each subject in each of the four subtests. This data may be studied in Table 2, page 20.

#### II. TESTING FOR THE HOMOGENEITY OF VARIANCE

The F table for two way classification of analysis of variance is shown in Table 3, page 21. The values for treatments among subtests, subjects, interaction and within blocks may be studied in this table.

For the null hypothesis that the  $k_1$  populations, from which  $k_1$  samples of sizes  $n_1, n_2, \dots, n_{80}$  have been taken, have the same variances we tested:

$$M = (h-1) \left[ k \cdot l \cdot \log_e \left( \sum_{i,j}^{k_1} s_{ij}^2 \right) - \sum_{i,j}^{k_1} \log_e \left[ s_{ij} \right] \right]$$

$k = 4, l = 20, \text{ and } h = 5.$

The computed 'M' from this formula was 92.735.

Bartlett's Test of Homogeneity of Variance was computed. This was because the statistic  $B'$  has a sampling distribution that approaches that of chi square and may be interpreted safely as chi square except when it falls near the boundary of a selected region of significance.

Bartlett's test was computed employing the formula:

$$B' = 2.3023 (n_1 - 1) \cdot (k \cdot \log_e^2 - \log_e s_1^2)$$

The computed  $B'$  from this formula was 89.735 which was rounded up to 89.74. Thus our  $B'$  (89.74) at the five per cent level of significance for a chi square critical value of 101.88 allows us to accept the null hypothesis.

The null Hypothesis:

$$H_0: S_1^2 = S^2 \dots S_1^2 = S_{80}^2$$

Therefore, there is no significant difference ( $\alpha = .05$ ) among the cell variances.

#### HYPOTHESIS TESTING I.

The following hypotheses tests were those tested by the analysis of variance procedure at the five per cent level of significance.

Hypothesis: The hypothesis for testing that all means of blocks are equal is as follows:

$$H_{tot}: M_{y11} = M_{y12} \dots = M_{y1j} \dots M_{ykl}$$

$$\alpha = .05 \quad F = 2.01, \bar{F} = 1.32$$

$$\begin{array}{ccc} F_{tot} & > & \bar{F}_{tot} \\ \hline \therefore \text{reject } H_{tot} & = & \therefore \text{reject } H_{tot} \end{array} \quad \begin{array}{ccc} 2.01 & > & 1.32 \end{array}$$

Therefore, this means that all means of the cells or blocks are not equal to each other or that there is a statistically significant difference between the means of the blocks or cells.

Hypothesis: The hypothesis for testing the interaction is as follows:

$$H_{ok1}: M_{y1j} = M_{y1} \quad M_{yj} - M_y$$

$$\alpha = .05$$

$$F = 1.58, \bar{F} = 1.39$$

$$\frac{F_{k1} > \bar{F}_{k1}}{\therefore \text{reject } H_{ok}} = \frac{1.58 > 1.39}{\therefore \text{reject } H_{ok}}$$

Therefore, this means that all cells or blocks (components of) are not equal to zero or that there is a statistically significant interaction.

Hypothesis: The hypothesis for testing the equality of means of the subtests is as follows:

$$H_{ok}: M_{y1} = M_{y2} \dots M_{yi} \dots = M_k = M_y$$

$$\alpha = .05$$

$$F = 5.37, \bar{F} = 2.78$$

$$\frac{F_k > \bar{F}_k}{\therefore \text{reject } H_{ok}} = \frac{5.37 > 2.78}{\therefore \text{reject } H_{ok}}$$

Therefore, this means that we must reject the hypothesis that the means of the subtests are equal or that there is a statistically significant difference between the subtest means.

Hypothesis: The hypothesis for testing the equality of means among subjects is as follows:

$$H_{o1}: M_{y1} = M_{y2} \dots M_{yj} \dots = M_{y1} = M_y$$

$$\alpha = .05$$

$$F = 1.45, \bar{F} = 1.76$$

$$\frac{F_1 > \bar{F}_1}{\therefore \text{reject } H_{o1}} = \frac{1.45 < 1.76}{\therefore \text{accept } H_{o1}}$$

Therefore, this means that we must accept the hypothesis that the means of the subjects are equal or that there is not a statistically significant difference between the subjects means.



## PEARSON PRODUCT MOMENT CORRELATIONS

The correlation coefficients between the subtests ranged from -.11 to .31. The correlation matrix for the Pearson Product Moment correlation coefficients is entered in Table 4, page 22. The critical value is shown at the bottom of the table. If the computed Pearson Product Moment correlation coefficient exceeds the critical value, one is to reject at the five per cent level of significance the null hypothesis that the populations have zero correlation.

It was seen that the correlation coefficients did not exceed, in any instance, the critical value of .444. Therefore, it was concluded that the four subtests were not significantly correlated with each other. This also implies that the subtests were four relatively independent measures of the operant learning situations tested.

TABLE I  
INDIVIDUAL TOTAL SCORES FOR EACH SUBTEST\*

Subjects	SUBTESTS				TOTAL
	CF <sup>a</sup>	MZ <sup>b</sup>	MY <sup>c</sup>	AC <sup>d</sup>	
1	9	18	13	10	50
2	10	18	10	11	49
3	12	14	13	13	52
4	8	19	17	12	56
5	20	17	13	8	56
6	9	17	19	17	62
7	16	14	18	14	62
8	16	13	15	14	58
9	14	11	16	14	55
10	20	17	13	6	56
11	14	19	17	20	70
12	13	18	22	18	71
13	20	21	17	14	72
14	16	21	13	17	67
15	20	17	11	18	66
16	17	19	23	17	76
17	15	23	17	20	75
18	9	19	19	22	69
19	13	16	15	21	65
20	15	24	13	12	64
Total	286	355	314	298	1251

<sup>a</sup>Conflict

<sup>b</sup>Mazes

<sup>c</sup>Memory Function

<sup>d</sup>Abstract - Concrete

\*The maximum score possible on each subtest is 25.

TABLE II  
VARIANCE AMONG SUBTESTS FOR EACH SUBJECT

Subjects	CF <sup>a</sup>	MZ <sup>b</sup>	MY <sup>c</sup>	AC <sup>d</sup>
1	2.20	2.20	1.30	2.50
2	1.70	.80	2.00	.70
3	1.00	3.20	2.00	1.30
4	1.30	1.80	.70	4.30
5	1.20	1.70	9.95	9.75
6	1.80	1.20	1.70	1.30
7	2.30	1.20	1.30	2.20
8	.70	.50	3.80	1.70
9	.70	1.70	3.30	1.50
10	1.30	1.80	1.70	1.30
11	2.50	.00	2.20	2.20
12	.50	1.30	.30	3.00
13	.70	1.30	1.30	1.50
14	.20	1.70	2.80	1.30
15	1.00	.30	3.70	1.30
16	1.70	.20	.70	3.50
17	.50	.30	1.30	1.00
18	1.30	.30	2.30	1.70
19	.20	2.70	3.30	1.70
20	.70	.30	.80	2.80

<sup>a</sup>Conflict

<sup>b</sup>Mazes

<sup>c</sup>Memory Function

<sup>d</sup>Abstract - Concrete

TABLE III  
ANALYSIS OF VARIANCE FOR OPERANT LEARNING TASKS SCORES

F table for two way classification Analysis of Variance				
Source	asq	df	msq	F
among subtest treatments	43.02	3	14.91	5.37
among subjects treatments	74.04	19	3.89	1.45
interaction	154.73	57	2.78	1.58
within blocks	549.00	320	1.77	
total	820.70	399		

## HYPOTHESIS TESTING II.

## Primary Hypotheses (null hypotheses).

Hypothesis I: It is hypothesized that there will be no significant difference between group performance trial means among the four diagnostic groups on operant learning tasks presented.

Hypothesis II: It is hypothesized that there will be no significant difference between independent performance trial means among the four diagnostic groups on the operant learning tasks presented.

Hypothesis III: It is hypothesized that there will be no significant difference between group and independent performance trial means among the four diagnostic groups on the operant learning tasks presented.

## Secondary Hypotheses (null hypotheses).

Hypothesis IV: It is hypothesized that individuals who are able to demonstrate a higher test intelligence will not achieve a more rapid adaptation to the operant learning tasks when compared to individuals of lower test intelligence while performing:

- (a) in collective learning trials
- (b) in isolated learning trials.

Hypothesis V: It is hypothesized that older individuals (chronological age) will not demonstrate a more rapid adaptation to the operant learning tasks when compared to the younger individuals (chronological age) while performing in isolated learning trials.

Hypothesis VI: It is hypothesized that there will be no significant difference between group and independent performance trial means when the operant learning task involves conflict to the appropriate response.

Hypothesis VII: It is hypothesized that there will be no significant difference in rate of adaptation to a set of operant learning tasks when detection of incorrect choices by the examiner is indicated to the subject(s) between:

- (a) collective learning trials
- (b) isolated learning trials.

Hypothesis VIII: It is hypothesized that there will be no significant difference in rate of adaptation to the presented operant learning tasks when rest periods are interspaced between a series of trials as opposed to a rest period being given at the end of a series of trials.

TABLE IV  
CORRELATION COEFFICIENTS<sup>a</sup> AMONG THE SUBTESTS

CORRELATION MATRIX				
SUBTESTS				
	MZ <sup>b</sup>	CF <sup>c</sup>	AC <sup>d</sup>	MY <sup>e</sup>
MZ	1.00	.31	-.19	-.11
CF		1.00	.12	.21
AC			1.00	.25
MY				1.00

<sup>a</sup>Critical value for correlation coefficient at the .05 level of significance is .444 (N = 20).

<sup>b</sup>Subtest for Mazes

<sup>c</sup>Subtest for Conflict

<sup>d</sup>Subtest for Abstraction and Concrete Detection

<sup>e</sup>Subtest for Memory functions

Hypothesis IX: It is hypothesized that there will be no significant difference in rate of adaptation when one group of subjects is allowed to freely use their rest periods as opposed to another group which is forced to engage in some structured group activity during its rest period.

#### DISCUSSION OF HYPOTHESIS TESTING II.

Null Hypothesis I was rejected. This hypothesis is concerned with determining the rate of adaptation to a presented set of operant learning tasks between four diagnostic groups while the members were learning collectively. This finding (rejection of hypothesis) reflects a statistically significant difference in rate of adaptation at the .05 per cent level of significance. This difference is interpreted to mean that the four diagnostic groups did in fact demonstrate significantly dissimilar rates of adaptation when a statistical comparison was made between their mean errors. A qualitative analysis revealed evidence to indicate that the group of environmentally deprived learned more rapidly than did the remaining three groups while learning in collective situations.

Null Hypothesis II was rejected. This hypothesis is concerned with determining the rate of adaptation to a selected set of operant learning tasks between the four diagnostic groups while the members were learning independently. This finding reflects a statistically significant difference in rate of adaptation at the .05 per cent level of significance. This difference is interpreted to mean that the members of each diagnostic group did in fact demonstrate dissimilar rate of learning as they performed independently when a statistical comparison was made between their mean errors. A qualitative analysis revealed evidence to indicate that the group of traumatics learned

more rapidly than did the members of the three remaining groups while learning independently.

Null Hypothesis III was rejected. This hypothesis is concerned with determining the difference between rates of adaptation when collective trial mean errors are compared to the trial mean errors of independent learners. This finding reflects a statistically significant difference in rate of adaptation at the .05 per cent level of significance. This difference is interpreted to mean that there was a significant difference in rates of learning between collective attempts as compared to independent attempts with similar sets of operant learning tasks. A qualitative analysis revealed evidence to indicate that the collective learners made a more rapid adaptation than did the independent learners. Variables such as peer cues, group reinforcement and imitation in response were considered to have influenced the rejection of this hypothesis.

#### DISCUSSION OF SECONDARY HYPOTHESIS TESTING II.

Null Hypothesis IV involves two sub-sections (a) collective learning trials and (b) independent learning trials. Sub-section (a) was accepted, while sub-section (b) was rejected. This rejection of (b) was at the .05 per cent level of significance, while (a) was unable to meet this criteria. This difference is interpreted to mean that subjects of higher test intelligence were able to achieve a more rapid rate of learning while learning independently yet were unable to demonstrate a similar rate of learning while performing collectively with subjects of lower test intelligence.



Null Hypothesis V was accepted. This hypothesis is concerned with the influence of chronological age on the rate of adaptation to a presented set of operant learning tasks among independent learners. This finding (acceptance of hypothesis) fails to reflect a significant difference in rate of adaptation at the .05 per cent level of significance. This lack of difference is interpreted to mean that older subjects were not able to demonstrate a more rapid rate of learning while performing independently. A qualitative analysis does reflect some difference in rate of learning with older subjects learning somewhat more rapidly, yet being unable to meet the critical value at the .05 per cent level of significance.

Null Hypothesis VI was rejected. This hypothesis is concerned with determining the influence of conflict in response to the appropriate stimulus in a series of operant learning tasks. This finding (rejection of hypothesis) reflects a statistically significant difference at the .05 per cent level of significance. This difference is interpreted to mean that independent learners were able to demonstrate a more rapid adaptation to the presented series of operant learning tasks when conflict in response to the appropriate stimulus was present in their performance.

Null Hypothesis VII was accepted. This hypothesis is concerned with the rate of adaptation among subjects when their incorrect choices were reported to them by the examiner in independent as well as collective learning situations. This finding (acceptance of hypothesis) fails to reflect a statistically significant difference at the .05 per cent level of significance. Mean errors in performance increased noticeably during the first four trials, yet then a progressive decrement was observed

towards the end of the set of trials. The decrement in means errors for each trial was comparably similar for both independent and collective learning patterns. A qualitative analysis revealed that independent learners profited more quickly than did collective learners, yet there was not a statistically significant difference at the .05 per cent level of significance when total performance means were compared.

Null Hypothesis VIII was rejected. This hypothesis is concerned with the influence of rest period placement following a series of operant learning tasks as opposed to interspacing of rest periods between trials among a series of tasks. This finding (rejection of hypothesis) reflects a statistically significant difference in the rate of adaptation at the .05 per cent level of significance. This difference is interpreted to mean that subjects who were given rest periods in between their learning trials demonstrated a more rapid adaptation than did subjects who were given a rest period after a series of trials which were massed together before testing was administered for proficiency.

Null Hypothesis IX was rejected. This hypothesis is concerned with the influence on rate of adaptation to a series of operant learning tasks when subjects are allowed to freely use their rest periods as opposed to subjects who are forced to engage in some structured group activity during its rest periods. This finding (rejection of hypothesis) reflects a statistically significant difference at the .05 per cent level of significance. This difference is interpreted to mean that allowing subjects to freely use their rest periods in between performance trials facilitates the learning process more effectively than forcing subjects to engage in a structured group activity during their rest periods; such as color naming, picture identification, etc.

## CONCLUSIONS

The test for homogeneity of variance was computed. The null hypothesis for this test was accepted i.e., the  $k$  populations, from which  $k$  samples of sizes  $n_1, n_2 \dots n_{80}$  have been taken, have the same variance or that there is no significant difference among the cell variances. The acceptance of this null hypothesis indicates a homogeneous relationship between the subjects in the four groups. This finding is understandable in the light of the fact that all subjects demonstrated relatively similar retarded levels of test intelligence on the stanford binet.

The hypothesis test for testing the equality of the means among the subjects was also accepted. The acceptance of this null hypothesis implies that the subjects used for this experiment were relatively closely matched in their general levels of retardation. The acceptance of this hypothesis also lends support to the hypothesis test for homogeneity of variance, i.e., that the subjects were homogeneous.

The hypothesis test for testing the equality of means of the subtests was rejected. The rejection of this hypothesis implies that the means of the subtests are not equal. This means that there is a difference in the overall performance of the subjects on the respective subtests.

The hypothesis test for testing the interaction was rejected. The interaction between subjects and subtests was significantly different. This means that different subjects scored differently on the different sets of operant learning tasks. Thus this would imply that the operant learning tasks had a significant degree of discriminative value when dealing with homogeneous subjects with respect to their levels of performance.

The correlation coefficients did not exceed the critical value of .444 and thus the null hypothesis for this test was accepted. This implies at the .05 per cent level of significance the population of x's and y's has a zero correlation, or that the four subtests are not significantly correlated with each other. These results imply that the operant learning situations were measuring relatively different aspects of the subjects performance capabilities.

Duncan's Multiple Range Test<sup>1</sup> was computed for the sets of learning tasks. The table for this test may be studied on page 30. The results of this test are presented as follows:

<u>CF</u>	<u>AC</u>	<u>MY</u>	<u>MZ</u>

The purpose of this test was to find the degree of relationship between the operant learning tasks as to their difficulty level for the subjects. Sets of tasks CF, AC and MY did not differ significantly as to their difficulty level in comparison to MZ. This is to say that the set of tasks involving mazes (MZ) was the easiest of all the tasks presented, while the remaining tasks did not differ significantly among themselves as to difficulty for the subjects.

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<sup>1</sup>Frank McGuigan, Experimental Psychology, (New Jersey: Prentice-Hall, 1960), pp. 173-8.

TABLE V  
DUNCAN'S MULTIPLE RANGE TEST

Values of $r_p$ and $R_p$ for 4 groups with 60 df			
% P	2	3	4
$s_e^{(a)}$	3.71	3.71	3.71
$r_p^{(b)}$	2.66	2.80	3.11
$R_p^{(c)}$	2.27	2.40	2.49
$(a)s_e$ = Square root of the error variance			
$(b)r_p$ = "least significant standardized ranges"			
$(c)R_p$ = "least significant ranges"			
Subtests and their means			
CF <sup>a</sup>	AC <sup>b</sup>	MY <sup>d</sup>	MZ <sup>e</sup>
12.82	13.79	14.79	17.31
<sup>a</sup> Conflict <sup>b</sup> Abstract - Concrete		<sup>d</sup> Memory Function <sup>e</sup> Mazes	
Subtraction of Subtest Means			
CF - MZ = 4.65		AC - MZ = 3.55	
CF - MY = 1.65		AC - MY = 1.00	
CF - AC = .85		MY - MZ = 2.55	

McGuigan, F. S. Experimental Psychology, (New Jersey: Prentice Hall, Inc., 1960), pp. 173-8.

## CHAPTER V

### DISCUSSION

The term 'learning' for the present study has been thought of with respect to the acquisition, retention, and communication of operant symbols. It was assumed that rates of adaptation to a particular set of variables among a group of individuals varies according to their potential to learn (initial endowment), ease in retaining what is learned (memory function), and the effective communication of what is retained (scorable performance).

The present study was concerned with demonstrating significant differences in adaptative performance that was hypothesized to be present among four groups of subjects when presented with a variety of operant learning situations. The subjects were grouped according to a particular constant variable characteristic to their group which presumably would significantly influence its (the group) performance when contrasted with the remaining three group performance patterns.

Selected psychodiagnostic instruments were administered to assure reliable placement of subjects in the appropriate groups. The pilot study involving two hundred individuals resulted in elimination of subjects who were judged not to be able to demonstrate with a consistent degree of reliability the inferred constant variable characteristic to their group. The reduction of the original experimental

sample ( $N = 200$ ) to the test sample ( $N = 20$ ) was considered by several collaborators to be too stringent a measure in selection. Yet the persons responsible for the psychodiagnostic selection maintained that the inferred constant variables demanded rigid adherence to the operational definitions affixed to each. They further maintained that a relatively small group of subjects considered to be persons who were able to definitely demonstrate the inferred constant variable characteristic to their group would make for a more meaningful (reliability) study than would a larger group. With this larger group being not so predictable and who were possibly significantly contaminated by one or more of the other inferred constant variables characteristic to the remaining three groups. In addition they maintained that the qualitative aspects in performance for the present study were as important, if not more so, than were the quantitative measures obtained. Thus the smaller sample ( $N = 20$ ) was selected for statistical evaluation in an attempt to control against the presence of contaminating variable influences.

The statistical treatment involving an analysis of variance and Duncan's Multiple Range Test indicated a homogeneous relationship between subjects in the four groups, a difference in overall performance of the subjects on the respective subtests, that the operant learning tasks had a significant degree of discriminative value when dealing with homogeneous subjects, that the operant learning tasks were measuring relatively different aspects of the subject's capability, and that the operant learning tasks did not differ significantly as to their difficulty level other than MZ (mazes) being the easiest of all the tasks presented. Statistical treatment involving 't' tests for the primary

and secondary performance hypotheses indicated that the four groups demonstrated significantly dissimilar rates of learning while performing collectively, that subjects in each group demonstrated significantly dissimilar rates of learning while performing independently, and that there was a significantly dissimilar rate of learning reflected between collective and independent performance patterns. The collective learners making a more rapid adaptation. Further, the results essentially confirmed the projected escalation of initial errors, measures of central tendency, and indications to suggest possible points of subjective equality between individual and group performance patterns.

Six sets of operant learning tasks were developed from a series of neo-classical learning studies (with replication). These operant designs involved detection of similarity and difference between concrete and abstract materials, verbal v s non-verbal performance, immediate span of attention and memory for meaningful and non-meaningful material, ability to follow instructions and directions, response to conflict, response to criticism, recall and recognition of familiar material and insightful thinking. The operant learning tasks were grouped into four subtests with two forms for each subtest. Form A was designed for group presentation while form B was structured for individual-subject administration.

Nine hypotheses were tested with the primary null hypotheses being rejected. These rejections suggested that a statistical level of significance had been reached to indicate that (a) the four groups did differ significantly in their rate of adaptation to the operant learning tasks presented, (b) that the individuals within each group did differ



significantly in their rate of adaptation to the operant learning tasks and (c) that there was a significant difference between individual and group learning performances.

Statistical treatment given to the six secondary hypotheses resulted in: (a) evidence interpreted to indicate that subjects of higher intelligence were able to achieve a more rapid rate of learning while performing independently in comparison to subjects of lower intelligence (i.e., test intelligence), (b) evidence interpreted to indicate that older subjects (chronological age) did not demonstrate a more rapid adaptation to the operant learning tasks while performing independently, (c) evidence interpreted to indicate that independent learners were able to demonstrate a more rapid adaptation to the operant learning tasks than did the collective learning attempts when conflict in response to the appropriate stimulus was present in their performance, (d) evidence interpreted to indicate that a retarded adaptation to the operant learning tasks was present in collective as well as independent attempts when detection of incorrect choices were reported to the subjects by the examiner and that independent learners profited more quickly to this reporting, yet not to the extent that the selected level of significance would support this difference, (e) evidence interpreted to indicate that rest periods given in between trial performances tended to significantly influence the rate of learning in comparison to rest periods being placed at the end of a massed series of trials and (f) evidence interpreted to indicate that subjects who were allowed to freely use their rest periods (viz., not forced to engage in structured activities) adapted more readily to the operant

learning tasks than did those subjects who were forced to engage in a structured group activity during their rest periods.

## CONCLUSIONS

In view of the results reported above it appears the psychodiagnostic instruments were reliable and effective indicators of the inferred constant variables characteristic of each group. The operant learning tasks appeared to be adequate discriminators of performance with respect to the areas being tested. The hypothesis testing reflected significant statistical evidence to suggest that 'educable' students do differ in their learning attempts when performing collectively as well as independently. The hypothesis tests further suggested that the performance differences were to a significant degree a reflection of the a priori factors attributed to the inferred constant variables.

The hypothesis tests further suggested that 'educable' students of higher intelligence (test intelligence) used in this study were more capable of profiting from individual attempts at learning than were the less intelligent students. Thus, it would appear that the more intelligent the 'educable' student the more opportunity he should be offered to learn outside of the traditional group approach observed in the classroom today. In addition it appears that older subjects who demonstrate similar test intelligence as observed in younger subjects do not necessarily learn more rapidly or more effectively merely as a result of increased chronological age. Students who were confronted with conflict to the appropriate stimulus accompanied by an ascending level of difficulty were able to profit more in an individual learning situation under these situations than were the students functioning under the same situations yet attempting to learn collectively.

The placement of rest periods appears to significantly effect 'educable' students attempts at learning with the most effective learning being demonstrated when they are allowed unrestricted use of their rest periods as opposed to being forced to engage in some structured group activity taking place in the classroom between performance trials. Further, it appears that a massing of performance trials before a rest period is given is a less effective measure than to give rest periods in between sets of performance trials.

Throughout the results cited above a quantative trend is noted to indicate that collective learners tend to learn more rapidly on operant learning tasks where no specific variable was being tested for other than mean errors per trial and/or overall performance adaptability. A qualitative trend is noted to indicate that independent learners tended to learn more rapidly on operant learning tasks where a specific design variable was being tested e.g., conflict, incorrect responses, intelligence; when compared to performance patterns given by collective learners to the same variables.

Subjects placed in the environmentally deprived group demonstrated a more rapid adaptation to collective learning situations than did the remaining three groups. Subjects placed in the traumatic group demonstrated a more rapid adaptation to independent learning situations than did the remaining three groups. Subjects placed in the mentally handicapped and neurologically impaired groups demonstrated an overall performance below that achieved by the other two diagnostic groups. A qualitative analysis revealed a trend to indicate that the group of neurologically impaired subjects demonstrated a higher level of quality in their

response content than did the mentally handicapped. Since a content analysis was not undertaken in the present study results of this trend are not available for reporting.

## CONSIDERATIONS

The primary purpose of this investigation was to determine the degree to which a set of a priori inferred constant variables influenced the learning performance among four groups of 'educable' students. Through several group discussions with persons actively involved in teaching 'educable' students specific variables were isolated which they surmised to have significant bearing upon retarded learning performance among 'educable' students. These specific variables were incorporated into the nine hypotheses employed in the present study.

It seems doubtful that the degree of homogeneity among subjects in the present study could be uniformly achieved in the everyday classroom. Yet the individual and collective performance characteristics demonstrated by each of the four groups would seem to offer some initial criteria for teachers to take into earnest consideration when planning their portion of the classroom curriculum as applied to 'educable' students as well as the techniques they select for instruction. Further, this study directs attention towards the importance of adequate discernment of predisposing factors effecting classroom achievement for the individual student above an index of retarded test intelligence.

## RECOMMENDATIONS

Research involving inferred constant variables as dealt with in the present study is often hampered by a lack of availability of subjects who are able to reliably demonstrate diagnostic characteristics which are relatively uncontaminated by a variety of intervening variables. If additional investigation is undertaken involving 'educable' students' learning patterns with operant learning situations, a content analysis of subject responses might prove beneficial in making a more comprehensive differentiation between the qualitative and quantitative aspects in performance. Further emphasis placed upon rigid diagnostic selection should receive considerable attention. This is to say that a large initial 'n' appears necessary when dealing with these types of variables to obtain a homogeneous and relatively uncontaminated test sample.

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