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THE EFFECTS OF CONCRETE AND ABSTRACT REINFORCEMENT ON THE PERFORMANCE OF INSTITUTIONALIZED RETARDED MALES ON THE LEITER INTERNATIONAL PERFORMANCE SCALE

A Thesis
Submitted to the Faculty
of
Appalachian State University

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts

by
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May 1974

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Dedicated to:

My parents, to whom I owe my undergraduate education
and
Chris, whose endless support and understanding enabled me to complete my M.A. degree requirements.

Acknowledgments

I would like to express my appreciation to the faculty of the Psychology Department of Appalachian State University for their training and guidance which enabled me to complete this study and to my committee, with special appreciation extended to Dr. Robert Maris for his individual assistance and numerous suggestions.

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Abstract

Eighteen residents of an East Coast institution for mentally retarded males were randomly selected from the population of residents between the ages of 11 to 16 years old having no history of psychiatric or visual impairment to participate in an experiment designed to assess the effects of abstract (verbal praise) and concrete (M&Ms) reinforcement on the Leiter International Performance Scale. Subjects were randomly assigned to a counterbalanced within Ss repeated measures design employing a split-half technique of the L.I.P.S. The results revealed no difference in performance when concrete reinforcement was given for each correct response and a significant increase of 14 months in Mental Age when abstract reinforcement was given in the same manner. The application of the obtained results and suggestions for further research are discussed.

Introduction

One of the traditional roles of Psychology has been in the measurement and appraisal of intelligence. Today there are numerous tools employed to measure this inferred construct, but while most psychologists are in agreement as to how to obtain such measurements (through the use of standardized tests), there exists no universal agreement as to the definition of that which they are measuring.

In the construction of the majority of intelligence tests, it is assumed that intelligence can be assessed by identifying and measuring its component parts. However, as Wechsler (1958, p. 10) stated, three important points need to be made:

> The first is that discovery and isolation of the 'vectors' of the mind is only part of the problem involved in the definition of general intelligence; the second, that it is not possible to identify general intelligence with sheer intellectual ability; and the third, that general intelligence cannot be treated as an entity part, but must be envisaged as an aspect of a greater whole, namely, the total personality structure with which it shares common elements and with which it is integrally related.

Thus, while intelligence tests yield an estimate of intellectual abilities, 'general intelligence' is also composed of personality components which, while they may interact and affect the results of an intelligence test, are not directly measured by such tests. One personality variable which has been studied in relation to its effects on performance is motivation. Recently the role of motivation in intelligence test performance of retardates in particu-

lar has come under study.

Traditionally, retardation has been viewed as being due to some 'cognitive defect' (Zigler, 1966). Zigler (1966), however, compiled an extensive review of studies which were concerned with evaluating the motivational systems of the familial retardate as compared with that of normals and the effects of motivational differences on differences in performance. He found indications that "many of the behavioral differences between familial retardates and normal children of the same M.A. are a result of differences in the motivational systems of the two types of children rather than being due to the intellectual factor alone." (Zigler, 1966, p. 848). Zigler's review provided support for the following hypotheses (p. 855);

> 1. Institutionalized retarded children tend to have been relatively deprived of adult contact and approval and hence have a higher motivation to secure such contact and approval than do normal children.
> 2. While retarded children have a higher positive-reaction tendency than do normal children, due to a higher motivation to interact with an approving adult, they also have a higher negative-reaction tendency. This higher negative-reaction tendency is the result of a wariness which stems from the more frequent negative encounters that retarded children experience at the hands of adults.
> 3. The motive structure of the institutionalized retardate is influenced by an interaction effect between pre-institutional social history and the effect of institutionalization. This effect is made complex by the fact that institutionalization does not constitute a homogeneous psychological variable.
> 4. The positions of various reinforcers in a reinforcer hierarchy differ as a function of environmental events. Due to environmental differences experienced by institutionalized retarded children, the positions of reinforcers in their

reinforcer hierarchy will differ from the positions of the same reinforcers in the reinforcer hierarchy of normal children.
5. Institutionalized retarded children have learned to expect and settle for lower degrees of success than have normal children.

Zigler's review revealed a number of studies concerned with the motivational system of the familial retardate and its effect on performance, but very few studies have been conducted to assess the effects of the different motivational systems of retardates on intelligence test performance. Zigler and Butterfield (1968, p. 2) emphasized the importance of motivational factors on intelligence test performance when they stated that such performance reflects three distinct factors: "(a) formal cognitive processes; (b) informational achievements which reflect the content rather than the formal properties of cognition, and (c) motivational factors which involve a wide range of personality variables." Before approaching the research which has been done in this area, it is essential to discuss a particular assumption underlying intelligence testing.

All intelligence tests have prescribed instructions to be followed in the administration of the test if the results are to be compared with standardized norms. However, "Underlying all tests of ability is the assumption that the subject is 'doing his best'. Consequently, if conditions are to be kept uniform in this regard, every subject should be motivated to put forth his maximum efforts on the tests." (Anastasi, 1961, p. 48). Rapport is established between the examiner and testee prior to the testing situation to

ensure that the subject is operating at his optimal level. There are occasions, however, when rapport is not effective and "there will be times when the examiner must depart from the given instructions in order to achieve meaningful results." (Glasser and Zimmerman, 1967, p. 11) Thus, while attempting to motivate a subject during testing violates the procedure outlined in the prescribed administration, at the same time the assumption regarding the subject's optimal level is being met. A review of the literature has revealed only a few studies employing procedures to directly motivate the subject during the administration of an intelligence test.

Miller (1969) reported a case study of an 11 yr. old girl whose performance on the Wechsler Intelligence Scale for Children had declined from a normal level to the moderately retarded range of intellectual functioning with no other change in her overt behavior. Monetary reward contingencies were established for each correct response on each subtest and this procedure was adequate in restoring the child's intelligence test scores to their previous level of normal intellectual functioning. Thus, in this case, it seems that a procedure employed to increase the subject's motivation played a decisive role in determining measured intelligence. However, this was the case of only one individual child and, as Miller states, "the generality of the results of this case clearly needs to be established with more formal research." (Miller 1968, p. 838)

Feldman and Sullivan (1971) reported a study using relatively bright children in which they introduced 'enhanced rapport' and verbal reinforcement for the first correct response on each W.I.S.C. subtest and obtained significantly higher scores than those of the control group with no enhanced rapport or verbal reinforcement. While this study indicates that increased motivation yields an increase in intelligence test performance with relatively bright children, no specific information was provided in the report as to what constituted 'enhanced rapport' or any other subject information.

Edlund (1972) studied the effects of reinforcement (M&M candy) for each correct response on the Stanford-Binet. His subjects consisted of 11 pairs of five to seven year old children matched on the basis of a strong liking for candy, age, sex, and a revised Stanford - Binet Form L I.Q. score. The subjects' I.Q.s ranged from 71 to 107 and all subjects were attending public school. The procedure employed consisted of re - testing each of the two groups on an alternate form (Form M) of the Stanford - Binet according to standard procedures except that the experimental group was given one M&M after each correct response. The results revealed a statistically significant ($p < .01$) increase in scores for the experimental group with a median gain of 12 I.Q. points compared to a median gain of one I.Q. point for the control group.

In summary, these studies indicate the decisive role of motivation in the intelligence test behavior of 'normal'

children and suggest that procedures may be employed to optimize the subject's level of motivation during the testing situation in order to obtain more meaningful results.

A few studies which reflect the influence of motivational factors on the standardized test performance of retardates have been conducted. In 1957 Hunt and Patterson studied the effects of two types of reinforcement on performance on the Goodenough Draw - A - Man Test. The subjects were fifty mentally deficient boys diagnosed as familial retardates with a mean IQ of 61, range 30 - 80; and mean C.A. 12 - 0, range 7 - 14. The two types of reinforcement used consisted of concrete reinforcement (a sucker) and abstract reinforcement (verbal urging). The experimental procedure consisted of testing each child 3 successive times on the Goodenough Draw - A - Man Test using standardized instructions. Following this was a fourth administration of the test, this time with the examiner holding a sucker in front of the child during the instructions; the sucker being given to him at the end of this fourth trial. Following an interval of 31 days, the same procedure was repeated, except that on the fourth trial, after the standard instructions were given, the administrator said: "After you make the very best man you can, you may have a sucker, this sucker." Upon completion of the drawing, the examiner said: "Make it better, try harder. Then you get the sucker." This was repeated once, then the candy was given. The data consisted of the raw scores

on the drawing test. The results revealed that: (1) the subjects whose I.Q.s were in the 60 to 69 range were the only ones who had several significant differences ($p < .05$), (2) verbal urging was slightly more effective with the more able children, and (3) while the subjects were motivated more by the abstract factors in the testing situation, the strength of this motivation wears down with repitition and concrete reward restores it to its original strength.

Ayllon and Kelly (1972) employed a split - half version of the Metropolitan Readiness Test to assess the effect of token reinforcement on the test performance of 12 trainable retardates. The procedure used consisted of administering half the test (even or odd items) to each child and then, following a session in which the children were acquainted with tokens, the remaining test items were administered. During this second administration the children were given one token for each correct response at the end of each subtest. This second administration resulted in a mean increase of 6.25 points, this being significant at the 0.05 level.

While these two studies indicate the effect of increased motivation on the I.Q. test performance of the retarded, it is felt that the reports are open to rather serious criticism. In the Hunt and Patterson study there was no report of any reliability checks on the scoring method.

Regarding the Ayllon and Kelly article, no control

for practice effect on their re-test was described.

The purpose of the present study was to assess the possible effects of increased motivation on the performance of retardates on a standardized intelligence test. It is also the purpose of this study to assess possible differences achieved through the use of abstract versus concrete reinforcement.

Method

Subjects: The total population of residents from 11 to 16 years old with unknown etiologies and no history of any psychiatric or visual impairment was selected from an institution for mentally retarded males on the East Coast. These selection criteria yielded a population of 23 males, all of whom were randomly assigned numbers. From this population the first 20 (on the basis of their assigned numbers) were selected to participate in the experiment. The remaining three were held as stand-bys in the event of subject attrition. Between the selection of the subjects and the beginning of the experiment, five subjects were lost due to summer camp, vacations home, and hospitalization, leaving 18 subjects for the experiment.

Apparatus: The Leiter International Performance Scale (Leiter, 1948) was employed as the dependent measure. This particular standardized intelligence test was chosen because of its wide usage in the institutional systems and its lack of verbal examiner - subject interaction required in the administration of the tasks, thus eliminating such possible intervening variables as the tone of voice and other subtle verbal cues on the part of the examiner.

All subjects were tested in a private office equipped with a desk and two chairs. M&M candies were used as concrete reinforcers. The Leiter International Performance Scale Manual (Leiter, 1948) was used in the administration of the test.

Procedure: Each subject was randomly assigned to one of

the following treatments:

Standard (S) - Abstract (A): Half of the test items (odd or even) were given as prescribed in the L.I.P.S. manual; the other half were given as prescribed in the manual except that each correct response was followed by verbal praise ("good boy", "that's good") from the examiner.

Standard (S) - Concrete (C): Half of the test items (odd or even) were given as prescribed in the L.I.P.S. manual; the other half given as prescribed in the manual except that each correct response was followed by the examiner giving the subject one M&M.

The order of treatments and odd versus even items were given in a counterbalanced fashion which yielded the design outlined in Table I.

Each subject was tested between 3:30 and 4:30 p.m., Monday thru Friday, in July and August of 1973. The order of testing corresponded to assigned treatment numbers and the time interval between the first and second testing sessions for each subject varied at random, depending on who was available.

When each subject entered the office he was asked to be seated by the examiner. Following a few brief questions ("How are you today?", "What cottage are you from?"), the test was introduced and administered non - verbally. All subjects were tested individually and by the same examiner. The test was administered beginning with the first item and ending when two consecutive items were missed. This procedure was followed for each subject and each treatment.

Table I

S#	Order of Treatment	Order of Test Items	
1	A - S	E - 0	
2	S - C	0 - E	
3	C - S	E - 0	
4	S - A	0 - E	
5	C - S	E - 0	
6	S - A	0 - E	
7	S - C	E - 0	
8	A - S	0 - E	
9	S - C	E - 0	
10	S - A	0 - E	- Lost
11	A - S	E - 0	
12	C - S	0 - E	
13	C - S	E - 0	
14	A - S	0 - E	
15	S - A	E - 0	
16	S - C	0 - E	- Lost
17	S - A	E - 0	
18	C - S	0 - E	
19	S - C	E - o	
20	A - S	0 - E	

S - Standard
C - Concrete
A - Abstract
0 - Odd
E - Even

Results

All of the data collected for this study are presented in Table II.

The mean number of correct responses on the L.I.P.S. for each condition of each treatment group was as follows:

Standard - Concrete		Standard - Abstract	
6.11	6.11	7.56	9.89

A comparison of these means revealed no difference in the correct number of responses between those obtained under the concrete reinforcement conditions and those obtained under the standard conditions for the same group. However, a mean increase of 2.33 correct number of responses was obtained under the abstract reinforcement conditions when compared to those obtained under the standard conditions for the same group. This increase obtained under abstract reinforcement was found to be statistically significant at the .025 level of significance when the data was applied to the Wilcoxon Matched Pairs Signed Ranks Test (Siegel, 1956).

For the purpose of assessing the effect of abstract reinforcement on mental age, the data for the S - A group were converted into months [three months M.A. for each correct response (Leiter, 1948)] and multiplied by two (since only half the test was administered under each treatment condition). A comparison of the predicted M.A. for the results of the standard condition with that of the abstract condition reveals a mean increase in M.A. of 1¼ months from the abstract condition.

TABLE II

S#	C.A.	TEST RESULTS Standard	Treatment	Standard Predicted M.A. and I.Q.	Treatment Predicted M.A. and I.Q.	Previous Test Results
1	14-5	10	12 A	6-0, 51	7-0, 59	L6-3, 57 I.Q.
2	15-6	4	2 C	3-0, 28	2-0, 20	L2-3, 22
3	15-11	8	8 C	5-0, 43	5-0, 43	L5-6, 47
4	15-4	5	10 A	3-6, 32	6-0, 51	L3-3, 27
5	11-7	5	2 C	3-6, 35	2-0, 22	L2-3, 23
6	14-7	3	3 A	2-6, 24	2-6, 24	L3-0, 28
7	15-3	3	5 C	2-6, 24	3-6, 32	L2-3, 18
8	13-10	10	10 A	6-0, 51	6-0, 51	L5-6, 47
9	14-7	8	8 C	5-0, 43	5-0, 43	L 37
10						
11	15-11	5	4 A	3-6, 35	3-0, 28	L3-9, 34
12	12-4	1	4 C	1-6, 17	3-0, 29	L2-9, 28
13	14-9	7	8 C	4-6, 40	5-0, 43	W47v,51p,43f.s.
14	14-11	9	15 A	5-6, 47	8-6, 70	L5-6, 47
15	11-4	13	15 A	7-6, 71	8-6, 80	W57v,72p,61f.s.
16						
17	14-9	11	15 A	6-6, 55	8-6 70	W61v,65p,59f.s.
18	13-9	13	12 C	7-6, 63	7-0 59	W60v,68p,60f.s.
19	14-1	6	6 C	4-0, 36	4-0 36	L3-0, 28
20	13-7	2	5 A	2-0, 20	3-6 32	L2-3, 24

Note: The previous test results were taken from the Ss' Last routine evaluation L=L,I.P.S. and W=W.I.S.C.

A Pearson r correlation test (Bruning and Kintz, 1968) was applied to the difference scores (number of correct responses obtained from the abstract condition minus the number of correct responses obtained from the standard condition) of the S - A group and the previous test results (the results of each subject's last routine evaluation at the institution) to assess the relationship between I.Q. and effects of abstract reinforcement. The obtained correlation coefficient was .11 (N.S.).

A related t-test (Bruning and Kintz, 1968) was applied to the previous test results and the predicted I.Q.s from the standard condition [the correct number of responses was multiplied by two and converted into I.Q. scores (Leiter, 1948)] for both treatment groups. This test was conducted to assess the reliability of the standard scores obtained in the present study. The result of the t-test was a t of .28 (d.f. = 17, N.S.), indicating that the procedures employed in the present study to obtain standardized test scores yielded results which were consistent with the test results obtained from previous routine evaluation.

Discussion

The application of a concrete reward (one M&M) to each correct response of mentally retarded males on the Leiter International Performance Scale produced no difference in the correct number of responses when compared to those obtained from the same subjects under the standardized administration alone. This was felt to be quite unusual as it was the experience of the examiner that candy was not included in the regular diet of the residents and was usually considered quite a treat.

The application of an abstract reward (verbal praise) to each correct response of mentally retarded males on the Leiter International Performance Scale produced a significant increase in the number of correct responses when compared to those obtained from the same subjects under the standardized administration alone. When converted into months, this significant increase in performance yielded a mean increase of 14 months in Mental Age.

In comparing the results of the present study with some of Zigler's (1966) hypotheses, the present study indicates that retarded children are highly motivated to secure adult contact and approval. However, whether or not this motivation is higher than that of normal children could not be assessed by the present study due to the lack of an adequate comparison gruop. While Feldman and Sullivan's (1971) study indicates that relatively bright children are highly motivated to secure adult approval, a comparison

group of retardates was not included in that study.

Regarding Zigler's (1966) hypothesis concerning the differing reinforcer hierarchies of retardates and normals, comparing the findings of this study to those of Edlund's (1972) study, tends to lend support to this hypothesis. Edlund's reinforcer of one M&M following each correct response on the Standford-Binet with normal children was effective in significantly improving performance while the same procedure with retarded males in the present study yielded no difference in performance. However, a cross-study comparison is inadequate for hypothesis testing.

Another of Zigler's (1966) hypotheses dealt with institutionalized retarded children having learned to expect and settle for lower degrees of success than normal children. While the significant increase in performance on an intelligence test obtained in the present study under abstract reinforcement may also be due to a feedback factor, the concrete reinforcement group also received feedback on their responses with no increase in performance, thus not supporting this hypothesis.

While Hunt and Patterson (1957) also found abstract reinforcement to be more effective in increasing the I.Q. test performance of retardates than concrete reinforcement, their findings indicated this to be the case only with the 'more able' subjects where as in the present study the effect of abstract reinforcement was not dependent on I.Q.

Due to the limited population used for the present

study, it is felt that the generalizability cannot be extended beyond the characteristics of the present population. Generalizability is even further limited when one considers all of the various etiologies of retardation and the unique characteristics associated with each.

Due to the significant findings of the present study it is suggested that a more extensive study be undertaken to assess the effects of the present independent variables (concrete and abstract reinforcement) across levels of retardation and include a matched 'normal' group for comparison. Other suggestions would be to carry out a similar procedure across etiologies and to use as a possible comparison a matched group of non-institutionalized retardates.

In the light of the present findings and due to the great amount of emphasis placed on the I.Q. of the retarded, it is felt that the best suggestion which could be made at this point is to devise an instrument designed to assess the motivation (or lack of motivation) on the part of the subject and then to apply this to the results of the intelligence test. It is felt that this would better enable the examiner to predict potential I.Q. as opposed to obtained I.Q.

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