DOCUMENT RESUME

ED 048 709		EC 031 985
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TITLE	Reaction to Frustration as a Function of Learning Potential Status. Volume 1, Number 9.	
INSTITUTION	Research Inst. for Educational Problems, Cambridge, Mass.	
PUB DATE	70	
NOTE	14p.	
EDRS PRICE	EDRS Price MF-$0.65 HC-$3.29	
DESCRIPTORS	Adolescents, *Educable Mentally Handicapped, *Exceptional Child Research, *Learning Characteristics, Response Mode, *Stress Variables	

ABSTRACT

Twenty seven educable retarded children (ages 11 to 16) were divided into three groups based on learning potential status: highscorers, gainers, and nongainers. A dexterity test and a mirror drawing of a six-pointed star were administered, the latter in a stress-producing manner. Learning potential status mainly predicted the rate of learning on the motor task. The hypothesis that highscorers and gainers would cope more adequately with stress than nongainers was somewhat supported. Nongainers showed an initial appearance of adequacy which they were unable to maintain. One conclusion is that there is great heterogeneity of performance among identified educable retardates. (RJ)

STUDIES IN LEARNING POTENTIAL

REACTION TO FRUSTRATION
AS A FUNCTION OF LEARNING POTENTIAL STATUS

by

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Volume 1, Number 9
1970

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REACTION TO FRUSTRATION AS A FUNCTION OF LEARNING POTENTIAL STATUS [1]

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Budoff and his associates have reported considerable heterogeneity in ability to reason and learn when a learning potential (LP) strategy of assessment is employed in contrast to the usual individual intelligence test criterion with educable mentally retarded (EMR) students. The learning potential assessment employs nonverbal reasoning problems, in a paradigm that permits the child the opportunity to become familiar with the tasks by means of an individual instructional session coached in a context of positive support, aimed at building a sense of competence (see Budoff & Friedman, 1964, for details of the procedure). Three patterns of response to this type of assessment are evident within the narrow EMR IQ range (60-80 IQ). Some Ss (high scorers) demonstrate excellent understanding on the trial prior to training, figuring out the problems as they proceed from easy to harder instances, and perform at levels typical of higher IQ children. Other Ss (gainers) perform poorly on the pretest administration, but do improve their scores markedly following instruction. The third group of Ss (nongainers) perform poorly initially and do not profit from the instructional procedure.

The children in these LP categories have been found to perform at different levels on other psychometric and learning tasks, strongly suggesting that the ability displayed on the LP task was not task specific. Small differences between learning potential status groups are evident on verbally biased individual intelligence tests, e.g., the Stanford Binet and Wechsler verbal scale (Budoff, 1967). The heterogeneity in performance among special class children grouped within this trichotomy occur on tasks in which competence does not depend on proficiency in the verbal-conceptual or reading areas. High scorers and gainers performed significantly higher than nongainers on such tasks as Raven's Progressive Matrices, and Wechsler performance scale, attaining scores in the dull-normal to average ability range. The scores of the nongainers tend to be in the retarded ranges, and are not significantly different on these tests than their verbally biased IQ scores. High scorers and gainers also learned more rapidly and efficiently on a double alternation problem and a paired associate learning task (Budoff, 1967), and gainers tended to be less rigid than nongainers and mental age controls (Budoff and Pagell, 1968). Motivational data suggests that high scorers and gainers express feelings about themselves that are commonly described for school under-achievers (Budoff, 1965; Harrison and Budoff, 1969).

Learning potential status also predicted ability to profit and improve one's understanding in a laboratory science electricity curriculum that made minimal verbal demands on the students. Understanding was evaluated nonverbally. The high-able students by the LP criterion (high scorers and gainers) learned more than nongainer EMRs, and as much as low school achieving dull-normal to average IQ children of similar LP status. The data increasingly support a hypothesis that the high-able LP students (high scorers and gainers) are educationally (but not intellectually) handicapped; the low able nongainer acts very much like the mentally retarded child is described.

One can argue that the demonstrated ability to learn and perform at a level consonant with higher ability children suggests also that there should be motivational differences among Ss in the differing LP groups. High-able Ss (high scorers and gainers) do express different feelings about themselves than the low-able Ss (nongainers) on a self-report self-concept scale (Harrison & Budoff, 1969). They are less impulsive (Mankinen, 1969) and see themselves as being more acceptable to their families and peers than do the nongainers (Folman, 1969). The present paper presents evidence of additional motivational differences between the various LP groups.

Budoff and Liebowitz (1964) described a behavioral strategy for demonstrating differences in the ability of institutionalized EMRs to cope with frustration in a task which measures increased competence in finger dexterity and eye-hand coordination. Introduction of a stressor (mirror tracing) allows one to view the degree with which this learning curve is disrupted when the Ss are re-administered the motor task. A third administration following a period of relaxed conversation with E permits one to observe continuing disruptive effects of the stressor. Those Ss most able to cope with the behavioral stress and a physiological stressor [showing spontaneous warming of a finger submerged in ice-cold water--(a Lewis wave)], were also those who were reported as being well-adjusted to the dormitory and were not prone to uncontrolled outbursts amid the frustrations of living in overcrowded institutional dormitories. Those reported as most prone to disruptions in the dormitory also showed great disruption when frustrated on this behavioral task and tended not to warm spontaneously. This behavioral paradigm was studied with groups of high scorers, gainers, and nongainers to determine ability to cope with the mild
The hypotheses: that the high able (LP) Ss (high scorers and gainers) would 1) demonstrate more competence on the motor tasks, and 2) would function on the motor task with less distruption following a mild frustration than the low able (LP) nongainers.

Method

Subjects

Twenty-seven children from two special classes, 6 girls and 21 boys whose IQs ranged from 61 to 80 and CA from 11 to 16 served as Ss for this experiment. The subjects were divided into the three LP groups as determined by the Kohs procedure (Budoff & Friedman, 1964) and matched according to sex, age, and IQ. Table 1 presents the means and SDs for CA, IQ, and LP status.

Insert Table 1 about here

Dependent Variable

Pins and Collars, a subtest of the Crawford Small Parts Dexterity Test (Crawford and Crawford, 1956) requires the S to use tweezers to insert small pins in close-fitting holes in a plate and to place small collars over the protruding pins. The holes are laid out in six regular rows of six holes each, and S completes one row before going on to the next. Thus, time and error scores are easily obtained for each row. Plotting errors (or time) against ordinal row number reveals a negatively accelerated learning curve for most Ss. Previous research (Liebowitz & Budoff, 1964) has shown that the continuity of this curve (over three sets of six rows) can be broken by interpolated stress and can be restored by interpolated reassuring conversation. In the present experiment, the task was administered three times: once before stress, immediately following stress, and again after a relaxed conversation.

Stress induction

The mild stressor required a mirror drawing of a star. The standard apparatus was maintained except that the usual five-pointed star with double lines 1/4 inch apart was modified to a six-pointed star in which the double lines were drawn 1/8 inch apart. This was done to increase the difficulty of the task and its frustration value.

Procedure

The two tasks were administered to each S at one session as follows:

1. The Motor Task for Measuring the Effects of Stress. The S sat opposite the E and the materials were placed on a table in front of the S. The standard instructions were administered with the additional instruction that S was to complete the six rows of pins and collars at his own speed but should work carefully.

S was permitted to practice the task for one row before beginning this prefrustration trial. On all trials E maintained as neutral an attitude as possible, neither encouraging nor discouraging the S in his performance. This first administration yielded a base line against which to compare the S's subsequent performance on this task. The six rows, plus the practice row, allowed him to gain some initial competence as was evident in progressively fewer errors and less time required per row. This task was re-administered immediately following the frustrator as a measure of the immediate impact of the frustration experience, and a third time after a period of ten minutes of relaxation and talking pleasantly with the E as a measure of recovery from the frustration-stress.

2. The Frustrator Task. The mirror drawing task was administered immediately following the first trial of the motor task. The experimenter placed the materials in front of the subject and gave him the following instructions:

> All you have to do is trace around the star without touching the lines. Don't touch the lines either on the inside here (experimenter points) or the outside here (experimenter points). Every time you touch the line that will be a mistake. I'm going to time you, and you have very little time, so work very quickly. Remember, you have to work as fast as you can, but be very sure you don't touch the lines, or that will be a mistake. Do you have any questions?

To maximize the feeling of frustration, the process of counting his errors was made evident to the subject. As he completed the fifth point of the star, he was told he had no more time and could not complete the task.

The number of times the pins or collars missed the holes or fell from the tweezers while S was attempting to place them during each administration was tallied. This error score and time per trial constituted the dependent measures of the study. Errors on the mirror tracing task were tallied and analyzed as a measure of response to the frustration.

Results

The time and error data for the motor task were subjected to separate analyses of variance in which learning potential status (3 levels), and sex (2) constituted the between groups variables; and trials (pretest, immediate and delayed post-stressor) constituted the within Ss effects. These analyses were repeated with the effects of CA and IQ partialled out. The learning potential status trichotomy assumes a continuum from most able (high scorer) to least able (nongainer). The two degrees of freedom associated with learning potential were analyzed separately for the linear (1_{df}) (high scorer versus nongainer) and quadratic components (high scorer and nongainer versus gainer, (1_{df}).

The first hypothesis, that there would be differences in proficiency among the LP groups on the motor task, was supported (linear component, LP main effect $F = 6.814$, $p < .05$ for errors; $F = 5.616$ and $p < .05$ for time). High scorers, gainers, and nongainers, in that order, made more errors, and required more time to complete the task.

Insert Table 2 and Figure 1 about here

The two degrees of freedom associated with the three phases of the motor task were analyzed separately. Linear improvement in performance, as defined by reduction in errors and time required over successive phases, reflects increased proficiency on the motor task. The quadratic component (immediately post frustration versus pretest and delayed post stressor phases, 1_{df}) describes the experimental effect of the frustrator, since there should be a reduction in efficiency, reflected by increased errors on the immediate post-frustration phase (phase two), but fewer errors following the recovery period (phase three). The main effects for both components were significant, indicating increased competence on the task, and a disruptive effect of the frustration (phases, linear component, $F = 8.568$, $p < .01$; and quadratic component $F = 12.041$, $p < .01$ for errors; $F = 24.61$, $p < .001$, $F = 2.859$, $p < .10$ for the two components for the time score).

Analysis of the interactions of the phase and LP components indicated that the high scorers and gainers did demonstrate greater proficiency, i.e., fewer errors, during each phase of the task than the nongainers ($Phase_{linear} \times LP_{linear}$ interaction, $F = 7.686$, $p = < .01$) providing further support for the hypothesis that these psychometrically homogeneous "EMRs" do differ in proficiency on the motor task than did the high scorers or nongainers ($Phase_{linear} \times LP_{quadratic}$ interaction, $F = 4.332$, $p < .05$).

Learning potential status also predicted response to the frustrator, providing some support for the second hypothesis ($Phase_{quadratic} \times LP_{linear}$ interaction, $F = 2.696$ ($p < .05$) and 2.41 ($p < .06$)(one-tailed test), for the error and time scores, respectively). High scorers evidenced the least disruption following frustration, nongainers the most, gainers taking an intermediate position when the scores were summed over trials in each phase. As Figure 1 indicates, the high scorers and gainers demonstrated fewer errors by the close of the pre-frustration phase and some increase in errors following frustration, with their best level of performance following the recovery period. The performance of the nongainer group differed however. They performed erratically during the pre-frustration phase, though tending to show some improvement by the lost trial. Their immediate response to frustration was a better level of performance for two trials followed by a dramatic increase in errors on the remaining four trials that indicated a worse level of performance than any pre-frustration trial. A similar pattern was evident during the recovery phase--good initial performance followed by an increase in errors on each succeeding trial.

Response to Frustrator

The response to the mirror tracing task was analyzed separately for the errors made and time required to complete the task in an analysis of variance design in which LP status (3 levels) and sex (3) were the between groups variables with the effects of chronological age and IQ partialled out. The learning potential effect, linear component, was significant ($p < .001$) for the error score. As predicted, high scorers made fewest errors (33.78 + 25.3) gainers had an intermediate position (59.00 + 27.6), while nongainers made the most errors (84.33 + 25.27). While E observed that all Ss tended to experience difficulty and frustration in drawing the star, LP status predicted the degree of control imposed. This is illustrated by the mean time expended per error made. High scorers expended more time per error indicating greater ability to impose control in the frustrating situation, while nongainers demonstrated least control, expending least time per error.

Discussion

Learning potential status mainly predicted rate of learning on the motor task. There was a trend in support of the hypothesis that high able learning potential Ss (high scorers and gainers) would cope with stress more adequately than the low able LP nongainer Ss. As Figure 1 indicates, the performance of high scorers and gainers are essentially very similar during all three phases of the experiment. The performance of the nongainer group, however, differs in some interesting aspects. They perform erratically during the pre-frustration phase. They show a markedly delayed response to frustration, however, unlike the other groups, and unlike the response that would be expected. They demonstrate very marked proficiency early in the post-recovery phase, but are unable to maintain this, and their performance slowly deteriorates, The pattern would suggest that these Ss are unable to maintain their initial appearance of adequacy. This behavior was also evident in their responses to an interview. On the initial, generally phrased question of a series, their responses often resembled most the responses of the average IQ sample from regular clases. On succeeding questions in a series which sought more specific information, their responses became vague and nonspecific, while their high-able (LP) special class peers and the regular class controls tended to answer more specifically (Folman, 1969).

The results of this experiment suggest additional support for the data cited earlier that the Ss in these several LP categories differ in motivational and intellective abilities. They tend to provide additional support for the hypothesis that the high able learning potential student is an educationally handicapped child. Further study will reveal the extent to which these children are similar to or different than the low achieving child of higher IQ on intellective and motivational variables.

What is certainly clear at this juncture is that there is great heterogeneity of performance among psychometrically defined EMRs. The data from our laboratory also indicate that a variety of paradigms are productive with adolescent special class students from economically poor backgrounds. Interviews and self-report (yes-no) scales have discriminated among these students successfully. Indirect measures, such as sentence completion items and TAT type pictures have proven less successful, in that order, perhaps because of the perceived artificiality of the test situations. They also do experience relative difficulty in expressing themselves verbally in a complex, differentiated manner, but a skilled familiar interviewer seems able to elicit sufficient information from the more able Ss that tends to be similar to their regular class peers.

The present study, using a paradigm which required overt behavioral responses, replicates a previous study and validates its use for indicating differences in ability to cope with frustration among EMRs (Budoff & Liebowitz, 1964). The present results would probably be more sharply evident among somewhat younger community Ss. Even so, consistent differences were obtained using a behavioral micro-situation which mimics response to a mild stress. By contrast, Lipman (1959) and Foreman (1962) failed to discriminate overtly aggressive from well-adjusted institutionalized EMRs, relying primarily on the Rosenzweig Picture Frustration Test or simply the mirror tracing task. It would seem that miniature situations which represent a laboratory-simulation of the behavioral dynamic required for coping with a frustration-stress has much greater promise for successful prediction and/or discrimination of ability to cope adequately than reliance on verbal data with Ss who do not express themselves easily or complexly. The exception in our experience, is when the S is very familiar with the research group and the interviewer is skilled, or the personality measures not too artificial in their demands.

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FOOTNOTES

1. This research was supported by Grant 32-31-0000-6019 from the Research Division, Bureau of the Handicapped, U. S. Office of Education. Special thanks for making this study possible must be extended to Mr. Charles P. Ruddy, Associate Superintendent, Mr. Vincent P. Conners, Directory of the Special Class Department, and Mr. George Sawyer, Principal of the Patrick Gavin Junior High School, of the Boston, Massachusetts School Department.

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TABLE 1

MEANS AND STANDARD DEVIATIONS FOR CA AND IQ OF THE
SPECIAL CLASS STUDY SAMPLE SUBDIVIDED BY LEARNING POTENTIAL STATUS

	High Scorers	Gainers	Nongainers
CA (in months)			
Mean	164	162	162
S. D.	17.97	18.24	21.56
IQ			
Mean	73	72	71
S. D.	5.47	6.55	5.38

TABLE 2

SUMMARY OF ANALYSIS OF VARIANCE FOR ERRORS ON THE MOTOR TASK OVER THE THREE PHASES OF THE EXPERIMENT (NO COVARIATES)

Source	df	M.S.	F	p
Between Ss	(26)			
Learning Potential (LP)	(2)			
LP_{linear}	1	16397.794	6.814	<.05
$LP_{quadratic}$	1	6715.116	2.790	<.10
Sex	1	1144.022		
LP_{lin} x Sex	1	248.001		
LP_{quad} x Sex	1	191.482		
Ss/groups	21	2406.442		
Within Ss	(54)			
Phase (P)	(2)			
P_{linear}	1	1666.666	8.568	<.01
$P_{quadratic}$	1	2342.321	12.641	<.01
Phase x LP	(4)			
P_{lin} x LP_{lin}	1	1495.111	7.686	<.01
P_{lin} x LP_{quad}	1	243.000		
P_{quad} x LP_{lin}	1	524.481	2.696	<.05 [1]
P_{quad} x LP_{quad}	1	8.346		
Phase x Sex	(2)			
P_{lin} x Sex	1	45.762		
P_{quad} x Sex	1	44.028		
Phase x LP x Sex	(4)			
P_{lin} x LP_{lin} x Sex	1	113.335		
P_{lin} x LP_{quad} x Sex	1	1.339		
P_{quad} x LP_{lin} x Sex	1	472.239		
P_{quad} x LP_{quad} x Sex	1	21.345		
Ss/groups x Phase	42	194.522		

1 one-tailed test

TABLE 3

SUMMARY OF ANALYSIS OF VARIANCE BY TIME REQUIRED ON THE MOTOR TASK OVER THE THREE PHASES OF THE EXPERIMENT (NO COVARIATES)

Source	df	M.S.	F	p
Between Ss	(26)			
Learning Potential (LP)	(2)			
LP_{linear}	1	579082.641	5.616	<.05
$LP_{quadratic}$	1	157921.955	1.532	NS
Sex	1	46787.181		
LP_{lin} x Sex	1	36.012		
LP_{quad} x Sex	1	3322.319		
Ss/groups	21	103107.773		
Within Ss	(54)			
Phase (P)	(2)			
P_{linear}	1	205843.555	24.613	<.001
$P_{quadratic}$	1	23907.562	2.859	<.10
Phase x LP	(4)			
P_{lin} x LP_{lin}	1	14884.016	1.780	
P_{lin} x LP_{quad}	1	36226.688	4.332	<.05
P_{quad} x LP_{lin}	1	20501.314	2.451	<.06 [1]
P_{quad} x LP_{quad}	1	624.989		
Phase x Sex	(2)			
P_{lin} x Sex	1	299.703		
P_{quad} x Sex	1	26701.717	3.193	<.10
Phase x LP x Sex	(4)			
P_{lin} x LP_{lin} x Sex	1	1037.158		
P_{lin} x LP_{quad} x Sex	1	1502.017		
P_{quad} x LP_{lin} x Sex	1	20174.280	2.412	NS
P_{quad} x LP_{quad} x Sex	1	3260.000		
Ss/groups x Phase	42	8363.228		

1 one-tailed test

Figure 1. Error scores as a function of LP over phases of experiment.