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ABSTRACT

To compare social versus mechanical presentation of stimulus material under prompted or trial-and-error (confirmation) conditions of learning, institutionalized educable and trainable mentally handicapped children were tested on a discrimination learning task. Results were felt to indicate that social reinforcement may not be as motivating for trainable as for educable subjects; and that prompted learning is not as effective as trial-and-error learning for discrimination tasks and trainable subjects. (CD)

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AN INVESTIGATION OF FACTORS INFLUENCING LEARNING IN THE MENTALLY RETARDED, AND THEIR USE IN THE DESIGN OF INSTRUCTIONAL MATERIALS

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Differential Effects of Motivational Variables in Two Levels of Mental Retardation

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U. S DEPARTMENT OF
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Bureau of Research

DIFFERENTIAL EFFECTS OF MOTIVATIONAL

VARIABLES IN TWO LEVELS OF MENTAL RETARDATION

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Abstract

Seitz and Farmer (1969 demonstrated the interaction of intrinsic motivational variables with conditions of learning in guided, or prompted (P) and trial-and-error, or confirmation (C) studies using institutional and non-institutional educable subjects. In this study institutionalized educable and trainable MR children were compared in a discrimination learning task in an identical paradigm. Results indicate that social reinforcement may not be as motivating for trainable as for educable Ss, and further that guided learning is not as effective as trial-and-error learning for this type of task and trainable Ss.

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Introduction

The relative efficacy of "errorless", or prompted (P) conditions of learning and trial-and-error, or confirmation (C) conditions of learning in discrimination learning studies has been shown to be influenced by a variety of treatment variables. Method of presentation of stimuli has been demonstrated to be a significant factor in determining relative performance under these conditions (Hawker, 1968; Seitz, 1969), as well as in determining rate of learning (Hawker, 1966). Zigler (1969) has delineated a series of motivational factors which can interact with experimental variables in discrimination learning studies. Seitz and Farmer (1969) have shown that differences in the manner of presenting stimulus material (social versus mechanical) can interact with condtition of learning.

The purpose of this research was to compare the effect of the last variable mentioned, social versus mechanical presentation, across educable and trainable levels of retardation under P and C conditions of learning. This comparison was necessarily complicated by a number of differences between educable and trainable level MR children and by differences in consistancy and type of reinforcement. This has imposed practical considerations on the experimental design. The measures of learning taken have important implications for the level of generality to which the results of this study may be drawn.

Levels of mental retardation are defined by IQ ranges-30 to 50 for trainables, and 50 to 70 for educables. Jensen and Rohwer (1968) however, point out that to an indeterminant extent IQ measures confound developmental level and learning rate, which seems to function independently of developmental level *per se*. Thus IQ may be considered a rough, longterm measure of "rate of acquisition of knowledge" and MA may be considered a rough measure of developmental level. These measures do not, however, give any accurate index of how quickly individuals can acquire and utilize new information (i.e. their learning rate). Jensen (1965) demonstrated in a comparison of retarded young adults and normal children balanced in MA (9 years) that retardates had learning rates three to four times slower than normal children.

One important difference between educable and trainable level children is the presence of, or degree of organic disturbance associated with retardation. Our samples, according to Heber's (1961) classification of clinically diagnosed etiological types, consisted of cultural familial retardates or children with no manifest organic disturbance (retarded for unknown reasons) in the educable sample. The majority of the trainable sample was diagnosed as being retarded for unknown reasons (i.e. no structural reaction manifest) and about a third were diagnosed as having some degree of organic disturbance. Only two were assessed as familial retardates. Thus, in order to make an educable-trainable comparison it was necessary to bias the trainable sample with organic retardates, a consideration which has definite implications for perceptual learning, since organic retardates have been shown to have a significantly larger short term memory deficit than cultural familial retardates (Hawkins, 1966). Buschke, in his review of research concerning the interaction of short term and long term memory systems (1968) suggests that, in congruence with Atkinson and Sheffrin's (1968) general theory of human memory, a STM deficit slows learning by hindering access to information in long term memory systems for systematic and hierarchical search for relevant information, rather than by blocking acquisition of information. He cites as evidence for this position his (1967) findings that brain damaged Ss display a differential impairment for same order recall over serial order recall on STM tasks. As a theoretical orientation this position would argue that organically retarded children would learn at a slower rate and would show a higher rate of forgetting than would familial retarded children.

Another factor which must be considered is S's valuation of and preference for social rewards. Several investigators have demonstrated that preference for abstract rewards (symbols of achievement over money or candy - Harter, 1967; and social over candy - McGunigle, 1968) is highly and independently correllated with both MA and IQ in comparisons of normal and retarded children. This suggests that social reinforcement, and perhaps presentation of stimuli by a social agent, would be less motivating for trainable than educable Ss.

A final consideration in designing this experiment was the measure to be taken of learning and forgetting. One objective of this study was to compare P and C under these conditions with interspersed test trials eliminated, since Seitz (1969) had shown an improvement in performance under C with interspersed trials eliminated. Consequently error scores on test trials rather than trials to criterion were the learning measures.

The primary object of this research was to determine whether conditions of learning (P or C) and mode of presentation (machine or E), or the interaction of these variables would differentially effect the performance of educable and trainable level Ss in a discrimination learning task. The research cited above led us to expect a higher level of performance from the educable Ss under the experimenter presentation condition, as well as a general educable superiority. We also expected a higher rate of forgetting in the trainable sample.

Method

Subjects. Thirty-two educable (IQ range 50-70) and thirty-two trainable (IQ range 30-50) institutionalized retarded children at the Austin State School and Travis State School served as Ss. Four groups were formed from each of these samples by randomly assigning eight Ss to each group. Duncan's Multiple Range test indicated no significant difference in MA or CA in either the educable groups or the trainable groups. Mean MA of the educable sample was 8.91 years, mean CA was 15.33 years. The mean MA of the trainable sample was 5.23 years, mean CA was 14.35 years. The Weschler Intelligence Scale for Children was used to assess IQ for all Ss. (See Table 1)

Insert Table 1 about here

Stimuli and Apparatus. The MTA SR-400 Scholar, a machine which permits automatic advancement of the stimuli, and flashcards which were presented by the experimenter, were used to administer the stimuli. Stimuli for each trial consisted of three simple geometric response figures (RF), which were unique to each block and as to position within each stimuli configuration (Fig. 1). In the P condition the correct RF was underlined. On all test trials correct RFs were unmarked.

Insert Figure I about here

Procedure. The educable and trainable samples were both randomly divided among four conditions: prompting -

machine presentation (PM); prompting - E presentation (PE); confirmation - machine presentation (CM); and confirmation-E presentation (CE). The task posed each S was to discriminate the correct RF from the stimuli configuration presented on each trial. In each condition the S's task was composed of 15 blocks of eight practice trials, followed by three sets of five blocks of test trials, administered immediately after completion of the practice program, .5 hours after completion of the first test series, and 24 hours after completion of the second test series. Each S was instructed to select (by pointing, or by pressing the proper response panel on the MTA screen) the correct RF. Ss in the P condition's training phase were told that the correct choice was underlined and that they were to remember that figure. Ss in the C condition's training phase were instructed to select one of the alternative RFs until they found the correct RF. All Ss were informed of a correct response both by advancement of the training program to the next trial (mechanically or manually), and verbally by E ("That's right"). In the case of an incorrect response E would wait for the S to select another RF. Ss in each condition received identical test programs. At the beginning of the experimental session each S was shown a nickel and was told that the nickel would be his if he did his very best during the experiment. The nickel was placed on the test table and given to the S at the end of the immediate test series.

Factors held constant were: social reinforcement for correct responses; tangible reward for performance of the task; and the test program.

Independent variables were: level of retardation (educable or trainable); condition of learning (P or C); method of presentation (machine or E); and elapsed time from original learning situation (0, .5, or 24 hours).

The dependent variable was error scores for each test series.

Results

Inspection of the means and standard deviations of error scores for both samples indicated that the assumption of homogeneity of variance had not been met (Table 2). Raw scores were transformed to log (X+1) (Edwards, 1964, p. 130). Separate analyses of variance were performed for the educable and trainable samples. The general level of acceptable significance was set at $p<.05$. No significant treatment effects were found for the educable sample. The analysis of variance for the trainable sample showed significant differences attributable to condition of learning (P or C): type of presentation, (machine or E); and the interaction of these variables. The trainable analysis also showed a significant main effect for tests across time.

For the trainable group of Ss, C produced significantly fewer errors ($F=30.23$, $df=1,7$, $p<.005$) as did the machine method of presentation ($F=11.21$, $df=1,7$, $p<.05$). The interaction showed fewer error scores under P when machine presentation was used and fewer errors under C when E presentation was used ($F=8.02$, $df=1,7$, $p<.05$). The trainable group's main effect for tests showed a significant decrement in performance across time ($F=4.75$, $df=2.14$, $p<.05$).

An t-test comparing total error scores for both samples showed significantly fewer error scores for the educable sample ($t-3.46$, $df=191$, $p<.001$).

Discussion

The breakdown of error scores (Figure 1) indicated that the major source of variance in the trainable sample was the PE condition, and that the remaining conditions were not markedly different in initial performance from the educable sample. The performance in the PE condition also appeared to be the major difference in the effect of our experimental manipulations between educable and trainable Ss. These findings lead us to make a series of ad hoc comparisons. A t-test comparing the educable and trainable Ss' mean error scores in the PE condition alone showed a significant difference ($t=9.47$, $df=47$, $p<.001$), with the educable Ss scoring fewer errors. The PE curves represent the best and worst performance for the educable and trainable groups respectively. However, discounting the PE conditions in both samples, these experimental conditions permitted equivalent performance on the first test of a simple discrimination learning task by children at two widely different MA and IQ levels.

It is not clear to the authors what factors might account for these results. Perhaps the educable Ss who had been used in similar research performed better in the PE conditions because they had come to expect success from previous experience and approached the E with a high positive reaction tendency (Zigler 1969). By contrast the trainable Ss might have been fearful of the E, a stranger to them, and approached the situation with a high negative reaction tendency.

Further research is necessary to explore the nature of the interaction of learning variables with subject variables to discover the reason that the interaction of these variables in the PE condition had a deleterious effect on trainable Ss, while apparently not affecting performance of educable Ss (Figure 1). Another appropriate topic for research is the effect of the variables mentioned above on rate of learning, a factor which may prove central to the question of mental retardation.

While one of the concerns was to attempt to enhance performance under confirmation by elimination of test trials, it is difficult still to come to any conclusions on the research results alone. In an Interim Report submitted to The Office of Education in August 1968, Seitz and Goulding found prompting to be significantly superior to confirmation in a discrimination task involving educable subjects. They found also, however, that when confirmation was used without interspersed test trials, performance improved significantly; it was in fact, no different from that seen under prompting. The same pattern of results again is true for our educable institutionalized subjects. For trainable subjects, however, we find that prompting in a flash-card situation leads to worse performance than do other conditions. Here, however, performance may be affected by an interaction of training method with motivational and perceptual variables inherent in these Ss. The logical follow-up to this study (if the number of necessary subjects were available) would be a parametric study in which both prompting and confirmation were used with and without interspersed test trials by institutionalized and non-institutionalized educables and trainables.

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Table I

Mean MA, IQ, and CA of Institutionalized Educable and Trainable MRs*

Condition		Educable Ss			Trainable Ss		
		MA	IQ	CA	MA	IQ	CA
Prompt Machine	Mean	8.86	63.43	14.43	6.09	43.13	15.13
	SD	1.57	9.93	2.45	3.69	5.30	2.79
Prompt Experimenter	Mean	9.37	62.50	15.62	4.78	38.00	12.75
	SD	2.56	9.94	3.50	2.10	6.48	4.23
Confirm Machine	Mean	9.12	58.00	15.87	5.64	35.13	17.38
	SD	1.64	5.10	2.75	1.58	4.58	6.63
Confirm Experimenter	Mean	8.29	58.62	15.40	4.43	35.88	12.13
	SD	1.25	6.19	3.56	2.05	6.88	5.36

*n=8 per cell

Table II

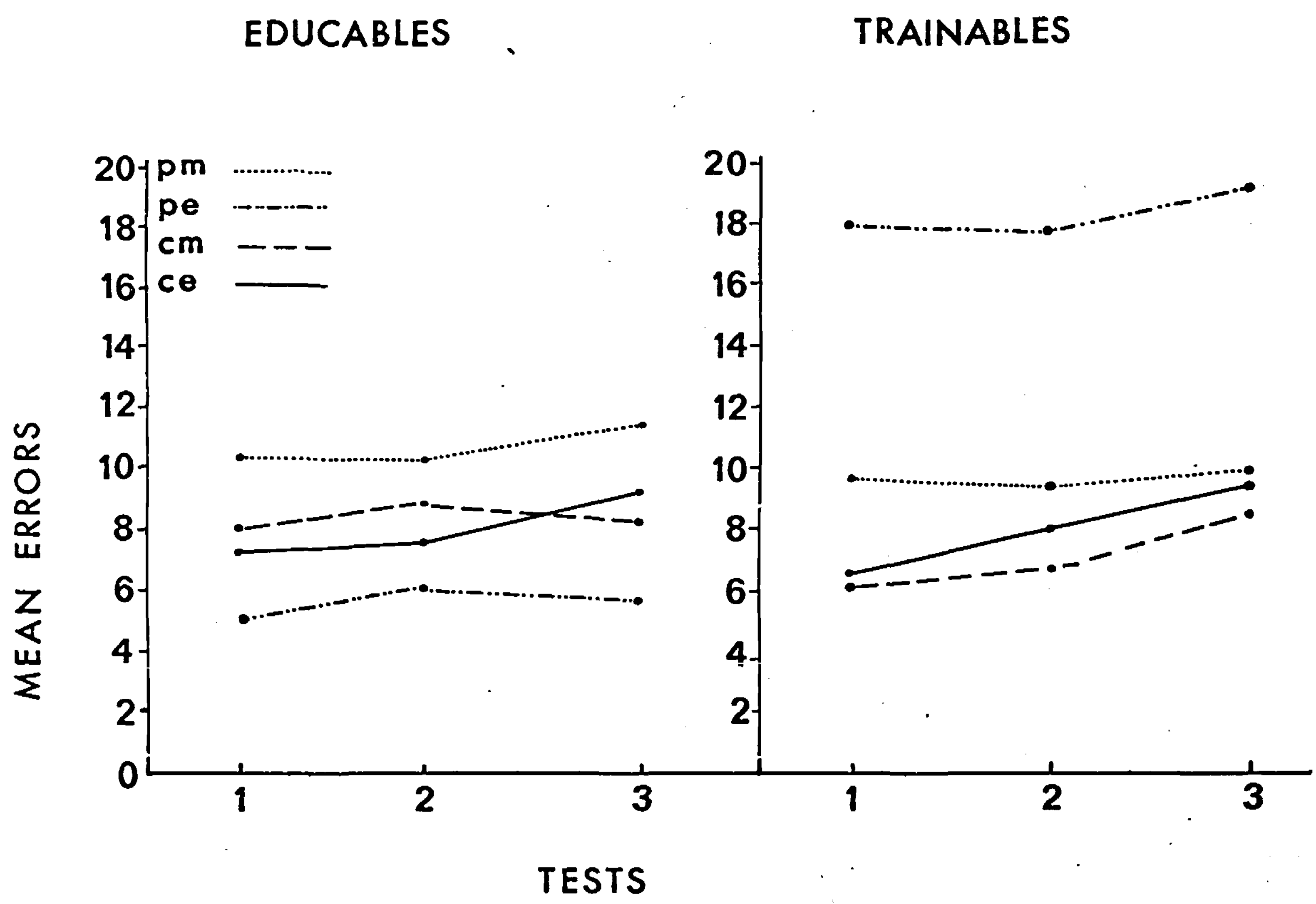
Mean Error Scores on Tests Given Immediately, 30 Minutes and 24 Hours After Practice of a Three-Place Discrimination Learning Task.*

Condition		Educable Ss Test 1	Educable Ss Test 11	Educable Ss Test 111	Trainable Ss Test 1	Trainable Ss Test 11	Trainable Ss Test 111
Prompt Machine	Mean	10.38	10.25	11.5	8.75	9.37	10.00
	SD	9.62	9.49	8.05	7.68	7.91	7.71
Prompt Experimenter	Mean	5.00	6.00	5.75	18.00	17.87	19.25
	SD	1.52	6.05	6.27	6.28	7.61	6.92
Confirm Machine	Mean	8.00	8.88	8.25	6.12	6.87	8.62
	SD	9.44	12.59	9.56	4.45	4.38	6.19
Confirm Experimenter	Mean	7.25	7.37	9.25	6.37	8.00	9.50
	SD	8.64	9.49	9.37	4.47	5.07	5.90

*n=8 per cell

Figure Captions

Fig. I. Mean error scores of four groups of educable and four groups of trainable MRs across three test trials of a discrimination learning task.



EDUCABLES
TRAINABLES
pm
pe
cm
ce
MEAN ERRORS
0
2
4
6
8
10
12
14
16
18
20
1
2
3
TESTS

FIGURE 1