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ABSTRACT

To examine the effects of locus of control (the extent to which an individual feels he has control over his own behavior) and cognitive style variables on learning deficits among mentally handicapped children, 80 mentally retarded boys (IQ 50 to 83, age 160 to 196 months) were administered a battery of tests. Analyses of student performance indicated that subjects with internal locus of control and analytic cognitive style gave more correct responses in the initial acquisitions phase than did externally controlled and global children. No difference was observed in the final acquisition block; however, when composite correct responses were analyzed, the analytic children were found superior to global children. Indiscriminate use of verbal support appeared to depress retardates' performance on a concept learning task. Implications concerning potency of social reinforcers and reevaluation of performance deficit in terms of non-intellective factors were noted. (RD)

EFFECTS OF SOCIAL REINFORCEMENT, LOCUS OF CONTROL, AND COGNITIVE STYLE ON CONCEPT LEARNING AMONG RETARDED CHILDREN*

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EFFECTS OF SOCIAL REINFORCEMENT, LOCUS OF CONTROL, AND COGNITIVE - STYLE ON CONCEPT LEARNING AMONG RETARDED CHILDREN

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The purpose of this study was to find how locus of control, and cognitive-style variables contribute to learning deficits among retarded children under varying conditions of social reinforcement. Ss with internal locus of control and analytic cognitive-style gave more correct responses in the initial acquisition phase than did externally controlled and global children. No difference was observed in the final acquisition block. However, when composite correct responses were analyzed the analytic children were found superior to global children. Indiscriminate use of verbal support appeared to depress retardates' performance on a concept learning task. The findings raise issues concerning potency of social reinforcers and suggest reevaluation of performance deficit in terms of non-intellective factors.

Individual difference variables in concept learning research have received relatively scant attention compared to stimulus and procedural variables. Further, in research on mental retardation comparisons are frequently made between normal children living at home and insitiutionalized retardates. The underlying assumption is that all variables except intelligence which are capable of influencing the performance of children, are randomly distributed across the two populations. Such an assumption is unwarrented. In fact, cognitive factors as measured by intelligence tests, have seldom accounted for more than 50 percent of variance in learning and achievement (Nunally, 1959). A careful review of the literature suggested that many of the behavioral differences between the familial retardates and normal children of the same MA are a product of a variety of differences in the motivational systems of these two types of children rather than a result of any immutable effects associated with mental retardation per se. Very seldom attempts have been made to understand the interactive effects of personality, cognitive style and situational variables in the learning of mentally retarded children.

One of the personality constructs which seems likely to influence learning is "locus of control." It refers to the extent to which an individual feels that he has control over his behavior and its consequences. "Internals" (ILC) feel that the outcomes or reinforcements are the result of one's own behavior. "Externals" (ELC), on the other hand, believe that outcomes are independent of one's behavior and are the results of chance, fate, or powerful others.

Data from a number of studies (Bartel, 1968, 1970; Crandall, Katkovsky, and Preston, 1962; Crandall, Katkovsky, and Crandall, 1965; Coleman et. al., 1966; MeGhee and Crandall, 1968; Seid, 1970; Wolfe, 1970) concerned with locus of control suggest that locus of control is an important predictor of academic achievement. ILC S score higher than ELC Ss on academic achievement tests. Experiments conducted in laboratory settings further demonstrate the validity of I-E construct and its effects on learning. Strickland (1965), for example, using a verbal conditioning task found that ILC Ss failed to condition when they feel that they are manipulated. Similar findings have been obtained in studies of story construction under experimentally induced sets (Gore, 1962), on need to control using competitive games (Julian and Katz, 1968; Julian, Lichtman, and Ryckman, 1968), and risk-taking behavior (liverant and Scodel, 1960). These studies indicated that ILC Ss self regulate their judgments and ELC Ss need outer direction. A few more recent studies have been reported in the literature dealing with locus of control in relation to reinforcement variations. While Baron (1968) and McConnell (1965) failed to show explicitly the relationship between these two variables, Cornell (1967) and Waldrip (1967) found that performance of ILC Ss increase under self-determined rewards.

Since success in most concept learning tasks would depend on the capacity of Ss to process information, it was necessary to examine some studies that have shown this characteristic of the Ss categorized on the I-E dimension. Using two-choice probability learning task with EMRs Nielson (1968), and with normals, Brown and Gordon (1970) found that ELC Ss operate more on a chance or random basis compared to ILC Ss. ILC Ss perform better under situations demanding more skill (Davis and Phares, 1967; Watson and Baumal, 1967). The information seeking nature of ILC Ss, which is obviously more relevant to their performance on a concept learning task, has been reported in a series of studies. Phares (1968) and Lefcourt (1967) indicated that superior performance of ILC Ss on a learning task can be related to their information processing ability. Pines and Julian (1969) found evidences contrary to this generalization. On the other hand, Gibson (1968) and Lefcourt, Lewis, and Silverman (1968) did not find any difference between ILC Ss and ELC Ss on this behavior. Even working in the same laboratory and using both decision time and accuracy of scores as criterion measures conflicting results have been reported. For example, Lance (1969) found that ILC Ss took longer to solve Duncker type problems than ELC Ss. This finding was contradictory to the superior performance of ILC Ss reported by Brecher, (1969), Reuder (1966), and Waters (1969) on similar tasks.

It seems to this writer that inconsistent findings in these studies may be due to the basis in which ILC and ELC Ss are selected. In most of these studies Ss securing scores 7.5 or 8 have been categorized as "internals" and those whose scores fall above this limit are "externals". When the scale (Rotter's I-E scale) ranges from 0 to 29, it could be that those who score above 7.5 or 8 are not necessarily ELC Ss in the context of the scale. Further, these relatively unequivocal findings could be due to the confounding of the cognitive process variables and information seeking strategies. One of the purposes of the present study was to validate and extend a few of the generalizations emerging from the previous findings with greater methodological sophistication and to determine the validity of such a concept for the cognitive learning among EMRs.

Recent research has shown that people show characteristic, self- consistent ways of functioning in their perceptual and intellectual activities. Emphasis on the role of "cognitive style" in the understanding of human behavior has led to the identification of its various dimensions. At present the concept has acquired three distinct meanings. First, Kagan, Moss, and Sigel (1963) have found that children and adults differ with regard to the stimulus dimensions to which they initially attend and the speed with which they classify the stimuli. Cognitive style according to these authors refers to "stable individual preferences in modes of perceptual organization and conceptual categorization of the external environment" (Kagan, Moss, and Sigel, 1963, p. 74). One particular dimension of cognitive style involves the tendency to analyze or to differentiate the stimulus field rather than a tendency to perceive it on the basis of a stimulus-as-a-whole. The former conceptual style is known as "analytic" or descriptive attitude while the latter is referred to as a relational attitude. The second approach to this problem is the work of Gardner and his colleagues (Gardner, 1961, 1962; Gardner, Jackson, and Messick, 1960), who working within a psychoanalytical framework, emphasized the study of cognitive consistencies in individual's mode of organizing experience. Processes hypothesized by this group include leveling, sharpening, conceptual differentiation in categorizing, extensiveness of scanning and tolerance for unrealistic experience.

The third meaning to "Cognitive style" was given by Witkin, Dyk, Faterson, Goodenough, and Karp (1962). Witkin (1965) elucidated the concept as follows:

> In a field-dependent mode of perceiving, perception is strongly dominated by the overall organization of the field, and parts of the field are experienced as "fused". In a field-independent mode of perceiving, parts of the field are experienced as discrete from organized background. There is now considerable evidence that a tendency toward one or the other ways of perceiving is a consistent, pervasive characteristic of an individual's perception (p. 318).

All of these approaches to cognitive style have involved the assumption that such style variables are stable modes of cognitive functioning. A number of research studies has shown that a person's "cognitive style" influences his performance on a variety of learning tasks. (See reviews of studies in Davis and Klausmeier, 1970).

Empirical validation of the cognitive style dimension in concept formation tasks have been reported by Davis (1968). Davis found that persons with analytic ability performed significantly better than non-analytic Ss. Similar findings were obtained in studies on concept foremation and cognitive style (Baggaley, 1955; Dickstein, 1968; Elkind, Koegler, and Go, 1963; Frederick, 1968; Huber, 1970; Kirschenbaum, 1968). In the area of mental retardation there is currently a greater need to evaluate and identify performance deficits in terms of non-intellective factors rather than the conventially used explanation of IQ deficit of the retarded. As it appears from these studies that analytic-global dimension of cognitive style may offer a better explanation of the performance deficit of the retarded. However, no experimental attempt seems to have been made in this direction so far. Further hardly a significant study has been reported on the differential performance of Ss categorized on "cognitive style" dimension in relation to learning under reinforcement variations. In the present study attention has been focused on the relationship of cognitive style and reinforcement conditions in relation to their influence on the performance of EMR on a concept learning task.

Research and theory in the area of social reinforcement offer widely divergent explanations of reinforcement effectiveness. (Panda, 1970a, 1970b; Stevenson, 1965; Wodtke and Brown, 1967). Apparently social reinforcer effectiveness has remained a controversial issue. Bijou and Baer (1963) have contended that research in this area has been inconclusive and contradictory because of failure to include individual difference variables. They believed that the effect of a particular reinforcer may vary from child to child. They stated:

> Social reinforcers tend to be different stimuli for different children--approval is a positive reinforcer for one child and negative reinforcer for a second, indistinguishable from any form of attention for a third, and a neutral stimulus for a fourth. The second child may respond to disapproval as a positive reinforcer; the third child may respond to attention--approval, affection, disapproval, anger, or reflection of feeling as equally effective positive reinforcers; the fourth child may respond to no social stimuli as functional (pp. 211-212).

Previous reviews of literature (Panda, 1970a, 1970b; Stevenson, 1965; Wodtke and Brown, 1967) suggest the following generalizations. (1) Social reinforcers control behavior of the Ss in simple learning situations; (2) Feedback in the form of "right--wrong" improves performance of the Ss; (3) Effectiveness of social reinforcers depend on its informational properties; and (4) Responsiveness to social reinforcement is related to certain individual difference characteristics of Ss.

In the light of these generalizations the question arises as to what extent reinforcer effectiveness may a function of other dispositional variables. In other words, do children with different dispositions respond to informative feedback and social comments in the same way, or depanding upon their capacity to process information, feeling of control reinforcement, etc., do they vary in their response to a reinforcing stimulus?

It is reasoned here that retarded children face failure more often than success, and frequently encounter rejection and ridicule more than the normals. Hence, in a learning situation being "correct" is probably more reinforcing for the performance of normal than for the retarded children, who may value interaction with, and attention of the experimenter much more than the satisfaction derived from performing the task more correctly. "Verbal support" will not only help them to keep trying out the task but would help them derive more meaning from the informative feedback they receive.

The present study focused its attention on the role of the three variables already discussed on the concept learning of the educable mentally retarded children. Extensive reviews of research on concept learning in general (Bourne, 1968; Byers, 1968; Klausmeier and Harris, 1966) and with reference to mental retardation (Blount, 1968, Panda, 1970b) have been reported. While most concept learning experiments have been concerned with investigating the effect of pretraining, variations of relevant or irrelevant cues, manipulation of stimulus dimensions, method of stimulus presentations and transfer, very little attempt has been made to understand individual difference variables in concept acquisition and/or usage. Jensen (1966) in another review, stated:

> Finally, as I previously indicated, the subject of IDs in concept learning, indeed in any kind of learning, is virgin territory waiting to be explored by researchers with ingenuity and fortitude. At first, the going will be rough and the initial hard-won advances may seem inelegant and meager, but this is inevitable pioneering. And since there are bound to be mishaps, and casualities along the way, I think it important that many investigators commit their research efforts to this field if we are to see any substantial progress (p. 153).

It is apparent from the review of research presented by Blount (1968) and Panda (1970b) that concept learning research in the retarded has been confined to the conventional CA and MA matching and in both cases performance difference has been explained with reference to the intellectual deficit hypothesis. It seems only natural that the relationship between intelligence and ability to solve conceptual problems should be strongly related but the findings on this topic are equivocal and fail to offer a clear-cut conclusion. The relatively low relationship between concept learning and intelligence suggests a few possibilities. It seems likely that some particular aspect of intelligence rather than general intelligence may be related to performance on a concept learning task. On the other hand, within a restricted range of intelligence certain personality and cognitive style variables might better explain individual differences in concept acquisition. The present study is based on the latter assumption.

The general question examined in this study is whether in a complex cognitive learning and social situation giving a correct response is a function of the retarded child's (1) cognitive style, (2) his feeling of control over the situation, and (3) the reinforcing condition under which he works.

Theoritical formulations suggest that an analytic child should be right more often because of his ability to identify the relevant elements among distractors, and thus would oftentimes get the reward. This getting of a reward strengthens his style of perceiving the task and his responding to it on a subsequent occasion. Naturally, therefore, the learning score of such a child will be high compared to the child whose perception of the task is more global. Another variable which would contribute to the strengthening of the response-reward connection is the extent to which an individual child feels that such a connection is causally related. In other words, a child, no matter whether he has an analytic or a global perceptual style, will respond to the task more correctly if he can establish a causal connection between his own behavior and its consequences (which in this case is the reinforcement he receives). Failure to establish such a causal connection will lead to random alteration of responses which would ultimately determine an inferior performance. Locus of control is a basic personality variable that would differentiate persons in this dimension, These two variables, i.e., cognitive style and locus of control should have similar effects on the child's behavior, but for different theoritical reasons.

The following schematization of the interrelationships between these variables would help to extend the above line of reasoning a little further and will make it more clear. Let us suppose that a behavior sequence is represented in a line "S" to "G".

S (stimulus) → R (response) → G (Reinforcement)

Cognitive style → ← Locus of control

In this case, a R (after the first trial) may be a function of the consistent style of responding that precedes it or due to the perception of causal relationship between a R and the G that follows it. Repetition or reoccurrence of a particular R may as well be a joint function of the two factors. It is apparent from this conceptualization that learning of the child will be best under an analytic attitude combined with a feeling of internal control.

Further, in order that learning will occur some form of reinforcement is necessary. Previous research has already established the role of certain individual difference variables in responsiveness to reinforcement. In the present situation an examination of characteristics of children with a particular stylistic or personality would show that not all children will learn equally well under all reinforcement conditions. This position, thus, would extend the social learning explanation of behavior potential by adding a cognitive style dimension to Rotter's behavioral equation which consists of expectancy of reinforcement and the value of such reinforcement. It is the feeling of the present writer that omission of the cognitive style variable has resulted in the equivocality of the findings on locus of control research with reference to simple as well as cognitive learning.

In addition to these theoritical questions, the present study included all the three variables because of their direct relevance to our knowledge regarding the performance deficit of the retardates. It became a further interest to see if reinforcer effectiveness (Right-Wrong) can be enhanced by addition of noncontingent verbal support which would presumably reduce negative affect from the informative feedback for the retarded children.

Hence, based on the theoritical constructs and empirical findings from the works of Cairns (1963), Rotter (1954), Witkin et al (1962), Zigler (1966a, 1966b); concept learning research in the retarded (Blount, 1968), and the theoritical rationale presented earlier the following hypothesis were formulated.

Internality and analytic cognitive style, singly and jointly, will influence the children's activity in the direction of superior performance (i.e., greater number of correct response and quicker response time) on the concept learning task. Externality and global cognitive style combined together will determine the worst performance. However, their performance under conditions of informative and supportive (Right-Wrong plus Verbal support) condition will be better than that under informative condition alone (Right-Wrong). Quite opposite predictions were held for the internal-analytic Ss. The effect the dispositional variables will be more influential in earlier trials during acquisition than at the final acquisition phase. It was further predicted that for superior performance verbal support would be necessary, especially when the Ss are mentally retarded as a supplement to the informative feedback. It is believed that such support will help them to derive more cues from the informative feedback just by reducing its negative affect and would therefore improve learning. Finally, learning will systematically progress with increased practice.

It is believed that this study by taking care of several conceptual and methodological problems inherrent in some of the previous studies would extend the validity of the variables included in this study to more cognitive learning of the retarded, and to their interactive effect on learning which is even now a neglected area of research.

Method of Study

Design

The experiment consisted of a 2x2x2x4 factorial design with repeated measure on the last factor, i.e., trials. The three other independent variables were: social reinforcement (informative feedback with and without verbal support), locus of control (internal and external), and field articulation (analytic and global). Ss within each subgroup were randomly assigned to the two reinforcement conditions. Each S was given a fixed number of 64 trials. The dependent measure was number of correct responses for the concept of color and time taken to complete the task.

Subjects

The Ss were 80 mentally retarded boys without organic defects--aged from 160 months to 196 months ($\bar{X}$=174.7) and with IQ between 50 and 83 ($\bar{X}$=69.79). These Ss were selected from a pool of 264 children spread over 21 special education classes in two midwestern innercity junior high schools, on the basis of extreme scores on the revised locus of control scale and a median split on the children's embedded-figure test.

Locus of Control Scale. The original Intellectual Achievement Responsibility (IAR) questionnaire (Crandall, Katkovsky, and Crandall, 1965) used with normal children beyond third grade was simplified and adapted for use with retarded children in the course of the present investigation, as none of the existing scales (Bialer, 1961; Gozali and Bialer, 1968) was considered suitable because of their high relationship with MA. The IAR test requires the S to listen to a statement concerning a situation to represent his feeling of control by answering one of the two alternative answers. The test is scored in the internal direction. A S's score on this test varies from 0 to 34 based on his answers to 34 items. Based on a N of 55 (Intermediate EMRs), the internal consistency reliability of the total scale calculated by Spearman-Brown formula was .66.

In the present study, this scale was administered orally by a female graduate student to 264 children in 21 EMR classes in the spring of 1970. Answer sheets of 15 children were eliminated from the analysis because of failure to follow instructions (N=9) and IQ scores too high to be included in the EMR category (N=6), as shown by their recent IQ test results. A further check on the internal consistency reliability revealed a coefficient (Spearman-Brown) of .67 for boys (N=157) and .76 for girls (N=92). Ninety-two Ss, half internal (scores 25-34) and half external (scores 11-20) were randomly selected from the upper and lower 35 percent of the distribution of male scores respectively.

Children's Embedded-Figure Test. A measure of cognitive style of the selected children was obtained using the "Children's Embedded-Figure Test" (CEFT) developed by Karp and Konstadt (1963). This test consisting of 25 complex figures, has been standardized for measuring analytic-global perceptual style in children between five and twelve years. The reported internal consistency reliability of the test ranges from .85 to .90. Its validity coefficient corrected for attenuation ranges from .80 to .85 for nine or twelve year olds with Witkin's EFT as the criterion measure.

"CEFT" was considered more appropriate for use with retarded children compared to a few existing measures of analytic-global cognitive style using Embedded-figures for two reasons: (a) the MA of 13 to 16 year old EMR children are fairly comparable to the MA of 9 to 12 year old normal children, and (b) while "CHEF" (Goodenough and Eagle, 1963), "CEFT" (Karp and Konstadt, 1963), and "EFT" (Witkin, 1950) are almost equally reliable and valid, "CEFT" is easier to administer. Hence, CEFT was administered individually, by four trained female graduate students, to those children who had been selected on the locus of control measure.

A few changes in the standard procedure was made: (a) a criterion of one correct discrimination out of six choices was set for the discrimination figures; (b) to reduce the memory load for retarded children each time the simple cut-out figure was shown for 10 seconds prior to the exposure of the complex figure; and (c) a maximum two-minute time limit was set for each complex figure within which the child was to respond. The score of the child in this test was the number of correct discriminations on the test figures. A high score indicated analytic style and a low score indicated global cognitive style. Children with scores 15 or above were categorized as analytic, and children with scores 14 or below were categorized as global using the medium split.

Materials

The Wisconsin Card Sorting task (WCST) was used as the concept learning task in the present study. The materials consist of 64 response cards (3"x3") and four stimulus cards (3"x3"). Each response card presents from one to four identical figures of a single color printed on a white card. There were four kinds of figures: stars, triangles, circles, and crosses. The four different colors were: red, yellow, blue, and green.

Four stimulus cards were affixed to the response board. The board itself is a rectangular piece of heavy cardborad (12"x18") with four double compartments spaced equally across its width. The stimulus cards were placed in the upper halves of the compartment, moving from the S's left to to his right. The four stimulus cards were: two green stars, four blue circles, one red triangle, and three yellow crosses. The lower half of the board was empty.

Similar card sorting tasks have been used successfully to demonstrate concept learning among normal children (Bourne, Guy, and Wadsworth, 1967; Cairns, 1967; Suppes and Rosenthal-Hill, 1968) and among retarded children (Blount, 1968; Cairns and Paris, 1970). In addition, this test provides four response alternatives which would, therefore, produce maximum uncertainty (Wilson and Kaufman, 1968) and success in this task would be self-reinforcing by reducing uncertainty (Lanzetta, 1969). As each response and stimulus card varied in more than one dimension, the correct response of the S to a concept category (e.g., color, form, or number) in each trial would depend on his analytic ability.

Experimenter

Since the special classes are usually taught by women teachers, and disadvantaged children perform best under female experimenters (Unikel, Strain, and Adams, 1969), two female students who had experience in working with retarded children were chosen to serve as the Es for this study. They were conversant with the experimental task and procedures but were unaware of the specific hypotheses and the characteristics of individual children they tested. Each of the Es tested half of the children randomly assigned within each experimental group.

Procedure

The E remained in the experimental room. Each S was brought from the classroom to the experimental room by a coordinator. The coordinator indicated to the E the number of data recording sheet to be used for the particular child so as to determine the reinforcement schedule. The E then asked the S to sit in front of the response board kept on the table while she was sitting acorss from the S's seat. After asking the child his name, etc., the E introduced the S to the experiment by giving him the following instructions.

"Hi, this is a card game. Now let me tell you what you will be working on. See, there are four cards on this board (point to the cards on the response board). Under each card there is a box (point to the open compartments). You are to take each of these cards and put it under any one of the open compartments below the four cards. Put the cards where you think they belong. When you hear me say "right," you will know that you have put the card where it belongs. When you hear me say "wrong," you will know that you have put a card where it does not belong."

For each S the E said, "Do you have any questions?" (pause). "You can begin now." E then gave the S one response card at a time. E said "right" after each correct response, e.g., when the response card sorted by the S matched with the color of the stimulus card. The response card was then removed by the E. Following an incorrect response choice, e.g., when the response card sorted did not match with the color of the stimulus card, the E said "wrong" and then removed the response card. This right-wrong system of feedback has been found most effective in influencing learning and performance (Bourne, Guy, and Wadsworth, 1967; Buchwald, 1969; Spence, 1966).

All the Ss were informed whether they were right or wrong after they emitted the response. In addition, Ss in the verbal support condition received supportive statements after each block of four trials following the non-contingent procedure.

The eight supportive statements used in this study were: "You are doing well; very good; you are doing fine; that's good; that's fine; you will make it; that's ok." These statements were printed in the response recording sheet, Form II after each four trial blocks in a predetermined random order for all Ss, each statement occurring twice. Following Grant and Berg, (1948) each response card was numbered a priori to indicate the order and position in which they were to be presented to all the Ss.

The E on no occasion mentioned the criterial attribute of cards during the instructions and experimental trials, e.g., color, form, or number. S's response was recorded in Form I for the informative feedback condition without verbal support. For the informative feedback condition with verbal support, S's responses were recorded in Form II.

The response time was recorded for each block of 16 trials. All the Ss received 64 trials. Questions from the Ss during the testing were dealt by the E repeating a part or all of the instructions. Within this limit care was taken to ensure that the Ss understood the instructions and task requirement. Es test the Ss assigned to each of them in separate experimental rooms. After testing was over, S was brought back to the classroom.

Correct Response

The mean number of correct responses for the eight experimental groups is given in Table 1. Each mean is derived from 10 Ss and is based on 16 trials. The scores of each S in each of the four acquisition trial blocks provided the basic raw score for the 2x2x2x4 analysis of variance.

In this analysis the main effect for social reinforcement condition was significant ($F=5.382$, $df=1/72$, $p<.05$). However, the result was opposite to the predicted direction. Under informative feedback without verbal support children made correct responses on an average of 12.86 times in 16 trials whereas for the informative-supportive condition the mean was 10.71. The main effect for the cognitive style variable approached significance ($F=3.717$, $df=1/72$, $p<.10$). As predicted, the analytic children made more correct responses ($\bar{X}=12.67$) than those who were global in their perceptual style ($\bar{X}=10.91$). The trial variable was highly significant ($F=72.372$, $df=3/216$, $p<.001$). With an increase in number of trials, there was an increase in the number of correct responses made by Ss. The only other effect which approached significance was the Trials x Cognitive style interaction ($F=3.349$, $df=3/216$, $p<.10$). Analytic children made significantly higher correct responses in the earlier trials compared to the global children. The remaining main and interaction effects were not significant.

The reversal of the results in case of the reinforcement conditions was thought to be due to an overlap between the initial dominant strategy of shape and the criterion strategy of color. Responses of the Ss to the first trial were analyzed. Analysis of trial one choices showed that a shape strategy was initially preferred by 44 of the 80 Ss (55 percent). Of them, 18 were from the pool of 40 Ss in the informative feedback without support condition and 26 were from the informative supportive condition. Further, on 16 of 64 acquisition trials, the two response strategies overlapped. For example, the response cards had green stars, blue circles, red triangles and yellow crosses. Subjects who persisted in sorting according to shape were, therefore, credited with having made a correct color choice. This would be likely to happen in 2, 4, 4, and 6 trials of blocks 1 through 4 respectively. The apparent sharp improvement of the informative-alone condition over the informative-support condition might have been due to strategy overlap, since the color and shape strategies coincided an unusually large proportion of trials (.38) in the last acquisition trial block as compared to the first block (.15).

In order to eliminate the possible confounding effect due to shape and color strategy overlap, the following procedures were adopted: (a) the trials in which color and shape strategies overlapped were removed from the analysis; and (b) a proportion of color strategy responses in the remaining trials of the block were calculated for each S. The mean proportion of correct responses are shown in Table 2. The summary of the analysis of variance of the corrected acquisition scores yielded essentially the same findings. For the main effects the variation in the magnitude of F ratios did not alter their significance levels.

An analysis of co-variance was computed in order to partial out the possible effect of IQ on correct responses. For this analysis, the composite proportion of correct responses after removal of the overlapping trials were used as the criterion measure. IQ scores were used as the covariate. The results obtained were consistent with the findings obtained using ANOVA.

Additional analysis were made with respect to the trend of the overall trial means and of the differences in the trends of trial means for the separate experimental groups. The sum of squares for trials and interactions with trials were partitioned into a sum of squares for linear regression, the sum of square for curvature,&the cubic component (Edwards, 1963; Grant, 1956).

The trend analysis on trials yields both a significant linear trend (F=167.435, df=1/216, $p < .001$) and a significant effect for the quadratic component (F=28.885, df=1/216, $p < .001$). The linear effect accounts for 84.63 percent of variation due to the main effect for trials. This means that proportion of correct responses increase from trial to trial in a predominantly straight line fashion. For the Reinforcement x Trials interaction, the F for the linear trend is significant (F=4.662, df=1/216, $p < .05$). The percentage of variance accounted for by the linear component is 99.19. It clearly implies that the trial curve for the "informative-alone" group is significantly steeper and reached at a higher assymptotic level than that of the "informative-supportive" group. A close examination of the means in Table 2 would show this. Analysis of the trend for Cognitive style x Trials interaction shows that the linear trend is significant (F=4.268, df=1/216, $p < .05$). This linear trend accounts for 55.36 percent of the total variation due to the interaction effect. An examination of the learning curve shows that there is little curvature in the slope of the curves. The F for the quadratic trend approached significance (F=2.753, df=1/216, $p < .10$). This accounts for 35.71 percent of variance due to the interaction effect.

It, thus, seems that the learning curve for global children is significantly steeper in the earlier trials than that of analytic children. From the second trial block the slopes of both curves became gradual although the learning curve for analytic children was always at a higher level than that of the global children. Trends for the remaining interaction effects were not significant.

It was earlier hypothesized that effects of social reinforcement, locus of control, and cognitive style will be more prominent in the first block of 16 trials than at the last trial block. For this purpose, proportion of correct responses were analyzed separately for the first and last trial block using a 2x2x2 analysis of variance.

As predicted, the main effect for locus of control is significant in the first trial block (F=5.019, df=1/72, $p<.05$). Children with internal locus of control scored significantly higher ($\bar{X}$=.54) than children with external locus of control ($\bar{X}$=.39) on the concept learning task. No such difference was obtained in the last trial block.

It is interesting to note that children with analytic cognitive style gave more correct responses ($\bar{X}$=.57) than the global children ($\bar{X}$=.36). The main effect for this variable is highly significant (F=9.450, df=1/72, $p<.01$). This effect did not approach the significance level in the last trial block. No significant effect was obtained for the reinforcement conditions or any of the interactions in the first trial block. However, the main effect for reinforcement condition in the last trial block was highly significant (F=9.788, df=1/72, $p<.01$). Children under nonsupport condition did better than the children under support condition, which means that information about the performance alone improved the performance of Ss. Although this effect was opposite to the predicted direction, it was consistently observed in trial blocks 1 through 4 (F_1=1.817 n.s., df=1/72, F_2=3.319, df=1/72, $p<.10$; F_3=5.356, df=1/72, $p<.05$, and F_4=9.788, df=1/72, $p<.01$). It is interesting to note that the effects of locus of control and cognitive style decreased over trial blocks from the first trial block where both effects were significant. Analysis of covariance, with IQ as the covariate, yield essentially the same results.

Response Time

Table 3 presents the mean response time in seconds for the eight experimental groups by trial blocks. Each cell mean is based on 10 Ss. The results were analyzed with a 2x2x2x4 analysis of variance. Results of the ANOVA showed that the main effect for reinforcement conditions is significant (F=6.716, df=1/72, $p<.05$). For the second time the result was opposite to the prediction. Children took more time under the support condition ($\bar{X}$=125.76) compared to the nonsupport condition ($\bar{X}$=98.98). However, this reversal in response latency is consistent and would reasonably be expected in view of the earlier reversal of results for the trial variable was highly significant (F=99.805, df=3/216, $p<.001$). Examination of the trial means indicate decrease in mean response time over trials. The effect of locus of control approached the significance level (F=3.168, df=1/72, $p<.10$). There is, thus, a trend for the internals to respond quickly ($\bar{X}$=103.18) compared to the externals ($\bar{X}$=121.57). In addition to these findings a significant interaction effect was found between cognitive style and trial blocks (F=2.998, df=3/216, $p<.05$). In the initial learning block analytic children had quicker response time ($\bar{X}$=144.25) than that of global children ($\bar{X}$=170.63). None of the main and interaction effects was significant.

An analysis of covariance was computed to partial out the effect of IQ from the composite response time. This resulted in washing out the barely approaching significant effect previously attributed to locus of control.

Further analyses were made with regard to the trend of the overall trial means and the effect to reinforcement conditions. The linear component of the variation due to the main effects of trials is significant. (F=258.600, df=1/216, p<.001). The quadratic component (F=36.788, df=1/216, p<.001) and the cubic component (F=4.025, df=1/216, p<.05) are also significant. It is noted that the linear component accounts for 86.37 percent of the total variance attributed to the main effect. This means that the decrease in response time is predominantly a straight line function of trials. A significant linear trend is also found for the Cognitive style x Trials interaction (F=5.824, df=1/216, p<.05). This accounted for 64.76 percent of the variance attributed to the interaction effect. The quadratic component approached significance (F=2.849, df=1/216, p<.10). The greater response time of global children at the initial acquisition block has mostly contributed to its interaction effect.

To test further the effects of the three independent variables--social reinforcement. locus of control, and cognitive style, analysis of response time was done for each trial block. Analysis of variance results show that the main effect for social reinforcement (F=5.526) and cognitive style (F=4.528) are significant at 5 percent level at the first trial block. Ss from informative-alone group took less time ($\bar{X}$=145.13) to respond than the Ss under informative-supportive condition ($\bar{X}$=169.75). Analytic children took less time (144.25) than the global children ($\bar{X}$=170.63). While none of the interactions were significant, the effect of locus of control approached significance (F=3.549, df=1/72, p<.10). On the last trial block no main effect was obtained either for locus of control or for cognitive style. The Ss under the two reinforcement conditions in the last trial block still maintained the relationship observed in the first trial block. To ensure that the effects attributed to these variables were genuine and not confounded with intelligence, analysis covariance was calculated. The results of ANCOVA shows that the only variable that has significant effect on the response time is the reinforcement conditions. In the first trial block this effect approached the significance level (p<.10) and at the last trial block the difference in response time between the two reinforcement conditions was significant at .01 level (F=8.835, df=1/72).

Discussion

Social Reinforcement

The results of the present study regarding the effect of verbal support in enhancing learning are not in agreement with the previous findings. The effect of support appears to be inhibitory. Verbal support was found to have decreased the efficacy of informative feedback that was given to the Ss, which implies a relatively poor performance on the part of those Ss who received such additional support. Further, support also brought a significantly lower level of learning across all trial blocks.

It is obviously puzzling to find that support should at all lead to poor performance, especially on the part of the retarded children who, according to Butterfield and Zigler (1965), Gordon, O'Connor, and Tizard (1954) O'Connor and Claridge (1958), Zigler (1966a, 1966b), and Zigler and Unell (1962) need primarily some form of support, not only to keep staying in the task but to perform well. Some explanation seems to be in order. Let us suppose that learning proceeds best when the S is given complete knowledge of results or informative feedback. Knowledge of results, for one, would do this since it serves both as an incentive and a direcrive. Hence, something should be done to convery this knowledge to S that would increase his correct response probability. In a few experiments (Buchwald, 1969; Cairns, 1967, 1970) telling the S whether he is right or wrong at the end of every trial reliably improved his performance. From these experiments it is clear that feedback or reinforcement, in order to be effective in executing its incentive, energizing, and directive role, must be made reliable, nonredundant, and contingent on the performance. Only in such cases would information concerning the performance increase the performance level on a subsequent occasion. Anything that comes in the way of conveying information in a meaningful way should reduce the informational properties of reinforcement and hence would deter performance. In earlier studies Das and Panda (1963), and Spence and Segner (1967) demonstrated how candy acted as too great a distractor in two choice probability learning situation and reduced the effectiveness of information in predicting the often occurring event.

Quite recently Cairns (1970) found that information conveyed in a random and unreliable fashion has inhibitory effect on accuaracy of performance. In a concept learning task same as that of the present study structuring of information led to improvement in performance compared to unstructured information (Cairns, 1967). Merryman, Kaufman, Brown, and Dames (1968) reported a study on noncontingent reinforcement on concept learning. Four groups of 32 female Ss each were compared on a two-category concept identification task with sex stimulus dimensions. At the beginning of the task, one group received six trials on which E said "right" regardless of S's responses; one group received six "wrongs"; and another group received six trials on which they said nothing. Another group received no prior trials. The group which received six "rights" was significantly inferior to the other three groups in terms of trial of last error and learning rate parameters. The other three groups did not differ significantly. The study, thus, revealed that noncontingent "rights" contribute maximally to random reinforcement effects. A recent experiment (Brown and Merryman, 1970) using the same material and procedure confirmed these findings.

The results of this study appears quite consistent with this information theory framework. Ss under informative feedback performed well because it conveyed to them quite reliably the information regarding how well they were doing in the task, whether and when they are right or wrong. This helped them to imporve their performance since right-wrong was made contingent upon their performance. In the support condition, the meaning conveyed by informative feedback proveded discrepant information to the child regarding the nature of his performance, as this information was accompanied by indiscriminate and noncontingent verbal support, which conveyed to him that he was always doing well. Because of this mismatch between information conveyed through contingent informative feedback and noncontingent verbal support, the performance of the Ss in this condition was significantly inferior. Thus, the results of the study demonstrated that indiscriminate and noncontingent use of verbal support reduces the informational properties of social reinforcement and, thus, retards the performance of Ss in a cognitive learning task where accuracy of response is the criterion measure. This debilititive effect of random support was found increasingly as trials progressed.

Previous studies that have shown the enhancing effect of verbal support differ in methodology, procedure, and tasks compared to that of the present study. In previous studies verbal support increased rate of response or persistence on simple repetitive tasks (e.g., marble drop, pin hole, letter concellations). The results of this study are strikingly different from those because of (a) the task used here is a cognitive task and (b) the dependent measure is accuracy of response and response latency.

The results of response time, though opposite to the prediction, are quite consistent in terms of the formulation of information theory of social reinforcement. It was earlier predicted that because of cognitive nature of the task Ss will take less time to respond when they are encouraged and given verbal support compared to a situation where such motivational arousal is absent, although in both conditions they would be given informative feedback. Mere information will not be generally reinforcing and, hence, the response latency will be longer for Ss receiving only informative feedback. This prediction was made in contrast to the greater persistence of children in simple monotonous tasks under conditions of support found by Zigler and his associates (1966a, 1966b). The results of this study were contrary to this prediction. However, the consistency of these results with the correct response suggests a clear explanation. Ss in the informative feedback condition took less time to respond to the stimulus situation because they could easily process the information that was communicated to them in the most reliable and nonredundant fashion. Ss in the informative-supportive condition possibly failed to abstract and process the reliable cues from the informative feedback due to effect of verbal support which conveyed at times a discrepant information because of its noncontingent occurrence on the response. It is, therefore, obvious that because of this discrepancy or lack of informational clarity Ss took more time to process information, act upon it, and finally respond to it.

In summary, the effect of noncontingent verbal support has a debilitative effect on performance of Ss on cognitive tasks, which was clearly and consistently manifested on the criterion measures of response accuracy and response latency.

Locus of Control

The children with internal and external locus of control did not differ unequivocally in their performance on the concept learning task. But the tendency of ILC Ss to make more correct responses are consistent with the previous research studies on learning and achievement (Bartel, 1968, 1970; Coleman et al., 1966; McGhee and Crandall, 1968; Seid, 1970; wolfe, 1970). Consistently the mean correct responses of ILC Ss are higher than those of the ELC Ss acorss all trial blocks. It may be suspected that the difference between the groups is merely a sample difference coincidental with IQ differences. Analysis of covariance failed to attribute significant contributory effect of IQ to this result.

The difference noticed on the initial acquisition trial block is an indication of the differential learning of the two groups. This result was anticipated that a child's feeling of control would cause significant difference in learning during earlier learning trials. In view of this fact, the difference due to the I-E variable cannot be ignored.

Previous studies (Brown and Gordon, 1970; Liverant and Scodel, 1960; Julian and Katz, 1968; Julian, Lichtman, and Ryckman, 1968; Miller, 1961) have shown the overall superiority of ILC Ss to ELC Ss in learning. In the present study the ILC Ss did not differ from ELC Ss in their overall performance. This discrepency in results may be attributed to the differences in tasks and procedures. The previous studies analyzed the guessing behaviors of Ss using a two choice probability learning task, a level of aspiration board, and a dart throwing game, and related the differences in performance to I-E dimension. In contrast, the present study measured Ss' correct response on a concept learning task. It is possible that lack of differences between the two groups in their overall performance is due to insensitiveness of this variable to cognitive learning or ceiling effects. It could also be that the cummulative inhibitory effect of noncontingent verbal support is more for ILC Ss and less for ELC Ss, thus averaging out the group differences in performance.

Cognitive Style

The results show that analytic-global cognitive style is related to performance on a concept learning task. As predicted analytic children made more correct responses than did global children in the initial acquisition trial block. When results for the overall correct responses were analyzed this effect approached significance. The direction of difference was same as that of the initial trial block. The results of the present study are in agreement with studies on cognitive style and concept attainment reported in the literature (Davis, 1968; Dickstein, 1968; Frederick, 1968; Huber, 1970; Kirschenbaum, 1969). These findings, thus, give general support to Witkin's conceptualization of the analytic dimension and also extends the generalizations obtained from empirical investigations on concept learning among normal Ss to children with low IQ.

Response latency was used as another criterion measure in the present study. No significant difference between the groups occurred on this measure. There is, however, a tendency for analytic children to take less time to complete task than global children which is true across all trials. The prediction that analytic children will take significantly less time than global children was made on the basis of Ss' performance on the embedded-figure test (Witkin, 1950) and the characteristics of analytic attitude. But whether response time could be an appropriate performance index to reflect relationships between cognitive style and concept acquisition needs to be investigated by future researchers.

Concept Learning

Common observations indicate that most human activity involves learning about and dealing with categories or groups of things. In other words, an individual learns to make a single response to any of a class of distinguishable objects. A careful review of literature has shown that how very little attempt has been made to explicate the relationships between individual difference variables and such complex behavior as concept acquisition.

The results of the present study show that educable mentally retarded children learned to identify the concept in a quite consistent fashion. The linear trends for correct responses and response latencies were highly significant. The average assymptotic performance of Ss is .84 from an initial start of .47 for correct responses. For response latency it was 86.46 seconds form 157.44 seconds, thus indicating a significant increase in speed of response as a function of learning trials. The findings of this study, thus, supported the contention of Blount (1968) that retardates' in spite of their IQ deficits do learn concepts.

In this study, certain predic tions were made regarding the interactive effects of social reinforcement, locus of control, and cognitive style in relation to concept learning performance of retardates. None of the interactions among these variables was significant. This suggests that most probably these variables function in an additive fashion. However, analysis of acquisition scores by trial blocks produced a few significant interactions. While performance of Ss at the initial acquisition phase contributed to the significant Cognitive x Trial blocks interaction for both measures, performance of Ss at the final acquisition trial block contributed mostly to the significant Reinforcement x Trial blocks interaction for correct responses.

Implications for Practice and Research

For the present, the results of this study casts serious doubt over the general belief and practice with regard to the effects of verbal support on performance of children. It is commonly held that praising or encouraging a child would increase his performance in a learning or instructional situation. The results of this study consistently showed that use of praise statements or remarks in an indiscriminate way have a general inhibitory effect on cognitive learning. In fact, children's performance on the same task becomes better when they are simply told how bad or how good they are doing on it. Since classroom learning demands accuracy of a response than a rate of responding (how fast or how slow) these findings naturally cause concern for a teacher to dispense verbal support in a loosely defined way. Whether verbal support is a necessary and/or sufficient condition for cognitive learning needs further investigation. It also seems necessary for future researchers to find what makes verbal support debilitative for cognitive learning in retarded children. Is it the frequency with which supportive statements are used, or is it the congruity or incongruity of such remarks with actual performance? Future research should not afford to neglect the study these dimensions of social reinforcer effectiveness.

In view of most educators children perform poorly because by nature they do not attribute responsibility to themselves. Rotter, Seeman, and Liverant (1962) have discussed that a feeling of internal responsibility is a major variable in learning process. A part of this theoretical notion and common belief may still be true. There are evidences in the literature which show the relevance of this factor in relation to simple behaviors. Whether this would still be relevant with reference to conceptual behavior is still not clear in the present study. What is needed now is a series of experimental studies (not correlational) to examine the validity of this personality factor in relation to conceptual learning as well as various subject matter areas of school learning.

Using the results of this study on cognitive style as a reference it seems that the effects of this variable is quite relevant for conceptual learning of retarded children. Further research possibilities could include investigations of this dimension in relation to achievement in various content areas of school learning, memory processes, and other classroom behaviors. Attempts to modify cognitive style may constitute another direction. Further, it would be interesting to see how teacher's cognitive style and pupil's cognitive style interact with each other and influence pupil performance.

It is suggested that future research should validate the customary ideas and practices of encouraging pupils in schools, especially the retarded and the disadvantaged. More reliable information regarding the relationships between learning processes and children's characteristics would offer promise for the education of the retarded.

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Table 1

Mean Number of Correct Responses in the Four Acquisition Trial Blocks for the Eight Experimental Groups

Trial Blocks	Informative Feedback Without Verbal Support				Informative Feedback With Verbal Support				Total
	Internal Locus of Control		External Locus of Control		Internal Locus of Control		External Locus of Control		
	Analytic	Global	Analytic	Global	Analytic	Global	Analytic	Global	
1	10.90	8.50	9.80	6.40	10.90	6.60	7.80	4.40	8.16
2	14.30	11.50	13.20	13.30	14.00	11.40	9.40	10.10	12.15
3	15.00	12.90	14.90	14.70	14.70	11.20	10.40	11.10	13.11
4	15.80	13.70	15.80	15.10	14.80	12.60	11.00	11.00	13.73
Total	14.00	11.65	13.43	12.38	13.60	10.45	9.65	9.15	11.79

N in each cell was 10

Table 2

Mean Proportion of Correct Responses in the Four Acquisition Trial Blocks After Removal of the Overlapping Trials for the Eight Experimental Groups

Trial Blocks	Informative Feedback Without Verbal Support				Informative Feedback With Verbal Support				Total
	Internal Locus of Control		External Locus of Control		Internal Locus of Control		External Locus of Control		
	Analytic	Global	Analytic	Global	Analytic	Global	Analytic	Global	
1	.65	.50	.56	.35	.65	.38	.44	.22	.47
2	.87	.68	.79	.81	.85	.66	.53	.57	.78
3	.94	.78	.92	.92	.91	.68	.63	.67	.81
4	.98	.89	.99	.92	.91	.74	.63	.62	.84
Total	.86	.71	.81	.75	.83	.61	.56	.52	.71

N in each cell was 10

Table 3

Mean Response Time (in seconds) in the Four Acquisition Trial Blocks for the Eight Experimental Groups

Trial Blocks	Informative Feedback Without Verbal Support				Informative Feedback With Verbal Support				Total
	Internal Locus of Control		External Locus of Control		Internal Locus of Control		External Locus of Control		
	Analytic	Global	Analytic	Global	Analytic	Global	Analytic	Global	
1	136.10	145.00	133.70	165.70	136.90	171.90	170.30	200.30	157.44
2	86.60	94.90	95.00	100.40	98.80	103.30	147.80	152.40	109.90
3	75.80	91.20	90.20	78.80	91.40	97.30	118.00	122.80	95.69
4	65.80	82.70	72.00	69.80	82.80	90.90	116.60	111.10	86.46
Total	91.08	103.45	97.73	103.68	102.48	115.70	138.18	146.70	112.37

N in each cell was 10