Performance of lower- and middle-class children on a discrimination reversal task[1]

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A discrimination reversal learning task, with form the relevant and color the irrelevant dimension, was investigated using a counterbalancing of order of positive form. Although no differences were found in acquisition, children took more trials reversing to squares than to circles. No differences were found between lower- and middle-class white and Negro children in average trials to acquisition or reversal.

The relationship between language and concept learning has been a fundamental issue in theoretical explanations of the development of conceptual behavior. A S-R mediational approach assumes that verbal responses serve as cue producing stimuli which mediate between the external stimulus and the overt response. Kendler & Kendler (1959), hypothesizing that if verbal mediation occurred, performance on a reversal shift would be superior to a nonreversal shift, presented results with kindergarten children which support the hypothesis. O'Connor & Hermelin (1959) have reported results indicating that verbalizing may hinder conceptual learning. Imbeciles (M.A. 4.8 yrs.) learned a discrimination reversal task faster than normal five-year old children except when required to verbalize their choices on the initial task. O'Connor and Hermelin suggest that the use of verbal labels interferes with rather than facilitates reversal since the S must inhibit not only the association between the response and the previously positive stimulus but also between the response and the name of the previously positive stimulus. The study of groups that have been demonstrated to differ in development of verbal behavior is suggested by the conflicting evidence concerning the role of verbal mediators. Socioeconomic class differences are related to language development and usage (e.g., Riessman, 1962). John (1963) and Rosehan (1966) found that in the early years of development class status but not race is related to degree of language difficulty. The present study was conducted to compare the performance of lower- and middle-class children on a discrimination reversal task.

Method. Forty-six children (24 male, 22 female) of ages 79 to 105 months were selected from the first two primary levels of an ungraded elementary school.[3] Socioeconomic class categorization was made on the basis of parental occupation and area of residence. Children whose class membership was questionable were eliminated from the sample. Of the 46 Ss originally tested, five were eliminated for failure to learn the initial discrimination within 100 trials, and three were eliminated for failure to reverse within 100 trials. The final sample consisted of 12 lower-class Negro, five lower-class white, 10 middle-class Negro and 11 middle-class white children.

The stimuli used were four plastic blocks, each 2.75 in. in diameter and 1 in. thick. The areas were: circle 5.94 sq. in., and square 7.56 sq. in. The blocks varied on two binary dimensions: the relevant dimension of form (circle vs square) and the irrelevant dimension of color (red vs green). Ss were randomly assigned so that each form was positive for one-half of the Ss during learning. Position of the positive stimulus was determined by a series developed by Fellows (1967) which controls for possible position effects. For both the initial learning and reversal trials, the criterion chosen was nine out of 10 successive correct responses. All Ss were tested individually. Each S was seated before a plastic turntable, 15.75 in. in diameter, divided in half by a screen 8 in. in height. Before beginning the discrimination task, Ss were tested for color blindness. Each S was instructed that E would hide a piece of candy (M & M) under one of the blocks and S was to choose one of the blocks on each trial with the aim of finding the candy every time he chose. The reversal task was presented immediately after S reached criterion on the initial discrimination. For each group of Ss the formerly negative stimulus was now the rewarded choice. No instructions were given S between the initial and reversal tasks. At the completion of the reversal task, S was asked how he won the game. If he did not respond, he was asked if there was something special about the blocks that helped him to decide which one to pick. Any correct verbalizations of the reinforcement contingency were recorded as positive instances of verbalization.

Results. The mean number of trials to acquisition and reversal for the social status groups by form condition are presented in Table 1. On the initial discrimination, the mean number of trials to criterion did not differ significantly between Ss grouped by socioeconomic status, race, sex, grade, or ability to verbalize the contingency. Also, groups assigned to square and circle conditions did not significantly differ in performance on the initial discrimination task.

On the reversal task, there were no significant differences between socioeconomic status groups in mean number of trials to reversal. Racial groups did not differ significantly in reversal performance. The children found it more difficult to reverse to the square than to the circle ($F = 14.88$, $df = 1/34$, $p < .001$), although there was no significant interaction between class status or race and the form conditions. Performance on the reversal problem for Ss who could verbalize the contingency was not significantly different from those who could not. Primary-level 2 Ss took significantly fewer trials to criterion on reversal that primary-level 1 Ss ($F = 5.41$, $df = 1/34$, $p < .05$). The mean trials to criterion for acquisition and reversal for Ss in primary-levels 1 and 2 are given in Fig. 1. The form order effects ($F = 20.61$, $df = 1/34$, $p < .001$) interacted significantly with grade level ($F = 8.14$, $df = 1/34$, $p < .01$). Comparison of mean trials to reversal for each grade level indicated that reversing to the square was more difficult than reversing to the circle for both levels, but that the children in Level 2 found this reversal less difficult than children in Level 1. In addition, boys took significantly fewer trials to reverse than did girls ($F = 9.09$, $df = 1/34$, $p < .01$). The difference in form conditions for Ss grouped by sex was again significant ($F = 19.98$, $df = 1/34$, $p < .001$), but the interaction between sex and form order was not.

An additional measure suggested by Steinmetz & Turnage (1966), percentage of trials correct to and including criterion trials, revealed no significant difference on acquisition of the initial discrimination for the socioeconomic groups. However, on reversal, the lower-class group, while not differing in average trials to criterion, did respond correctly on a higher percentage of trials than the middle-class group ($F = 4.28$, $df = 1/34$, $p < .05$). A lower percentage of trials correct in reversal was found for Ss transferring to the square than to the circle ($F = 23.24$, $df = 1/34$, $p < .001$), but again there was no significant interaction between socioeconomic status and form condition.

Discussion. The only socioeconomic class difference found was that the lower-class children were responding correctly on a higher percentage of reversal trials even though the two class groups did not differ on average number of trials to criterion.

Verbalization, as defined by ability to verbalize the contingency after the completion of the reversal task, did not differentiate faster or slower learning groups. In all, no lower-class Level 1 and only four Level 2 children (23.5% of the lower-class children) could verbalize the contingency as opposed to 11 Level 1 and Level 2 middle-class children (52%). Since the predicted effects of class status did not occur, either the present categorization into lower- vs middle-class, or the large effect due to the order of form reversal may have minimized whatever differences might be related to verbal mediations due to class. Although the differences in sex might be related to mediation

Table 1
Mean Number of Trials to Criterion on Initial Discrimination and Reversal by Socioeconomic Class and Form Condition

Class	Initial (S+)	Rev (C+)	Initial (C+)	Rev (S+)
Lower	26.75	16.63	28.44	38.78
Middle	35.55	15.18	41.70	45.10
Total	31.84	15.79	35.42	42.11

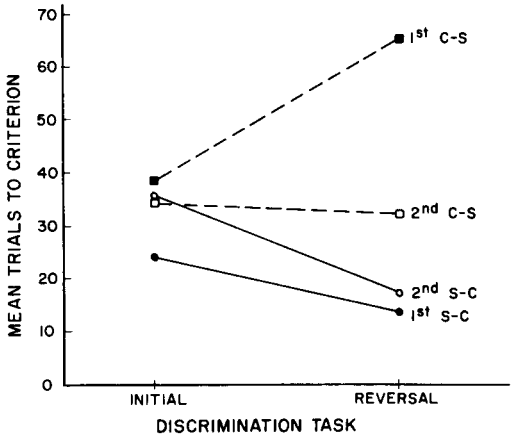

Fig. 1. Mean number of trials on initial discrimination and reversal for 1st- and 2nd-grade Ss for each order of positive form.

hypotheses, because of the small number of Ss, the present data would need replication before any conclusion could be reached.

The results of the present investigation indicate that order of presentation of positive stimuli within a dimension is an important variable in reversal tasks. The significant interaction between grade level and order of presentation of the positive form value would seem to indicate a developmental problem, perhaps involving effects of stimulus preferences or the complexity of the entire stimulus situation. However, one would have expected that preferences or complexity would also have effected original learning and form differences were found only in the reversal data. Kendler & Kendler (1959) and Kendler, Kendler, & Wells (1960) using dimensions of size and brightness in counterbalanced designs tested for order effects between dimensions, and reported no significant differences. Kendler & D'Amato (1955) using form and color reported significant differences in learning between dimensions for adults. The present results showed differences within the dimension of form.

According to Steinmetz & Turnage (1966) reversal learning should be related to degree of acquisition training as given by the ratio of rewarded trials to total number of trials in acquisition (r_e). Here with no differences in acquisition, r_e would predict approximately equal ease of reversal after initial training on squares (r_e = .69) and circles (r_e = .70), whereas distinct performance differences were found. However a correlation between per cent correct responses in acquisition and trials to reversal for all Ss was found to be significant at the .05 level (r = -0.346).

Thus, the ease of reversal is affected by differences between dimensions, differences in acquisition level and differences within a dimension. All these data indicate that careful investigation of order effects should be conducted.

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NOTES

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