Transfer in oddity problems as a function of type and amount of pretraining[1]

MARVIN L. SCHROTH, *DEPARTMENT OF PSYCHOLOGY, SANTA CLARA UNIVERSITY, Santa Clara, Calif. 95053*

The present study was designed to investigate whether different degrees of acquisition of pre-experimentally acquired discriminative responses (prior habit arousal) would prove a significantly more effective means of facilitating the subsequent learning of the oddity problem than corresponding amounts of activation of warm-up (receptor-orientating responses). Ss were 156 second grade children assigned to seven groups, including six treatment conditions, and matched for sex. Three groups had different amounts of experiences in seeing-and-discriminating among the stimuli and three groups had parallel amounts of pretraining in seeing (warm-up) experiences. All pretraining groups learned the oddity problem in fewer trials than the control group with the prior habit arousal groups being superior to the warm-up groups. Amount of pretraining and interaction effects were not statistically significant.

Stimulus predifferentiation pretraining as a variable facilitating transfer has been extensively investigated in learning tasks involving the use of motor-skills or discrimination problems as the transfer task. One general method of pretraining that has been demonstrated to aid in the learning of these types of tasks is the directed-attention or relevant stimulus-no response situation (Goss, 1953; Goss & Greenfeld, 1958). More recently, Schroth (1968) examined the function of directed attention pretraining using oddity problems as the transfer task. Findings indicated that the "directed attention" group's performance was superior to that of the other stimulus predifferentiation groups on the oddity problem.

The apparent facilitative effects of this method of pretraining has been explained as the result of two different processes (Goss, 1953). One of these processes, identified by Goss, is acquired distinctiveness based upon the pretraining activation of pre-experimentally acquired discriminative responses (prior habit arousal). The second of these processes is warm-up in the form of postural adjustments and/or receptor-orienting responses occasioned by exposure to the stimuli during pretraining.

The purpose of the present study is to explore further the effects of stimulus predifferentiation, involving the above processes, as it relates to problem-solving by investigating the role of different types and amounts of directed-attention pretraining. An experimental design was employed, using oddity problems (Harlow, 1942) as the transfer task, which called for two kinds of pretraining and three degrees of prior habit arousal and warm-up experiences.

METHOD

Subjects

Ss were 156 second grade children. They were assigned to seven groups and matched for sex so that each group consisted of 10 boys and 8 girls.

Stimuli

Stimuli consisted of "metric" shapes which were constructed by a technique developed by Fitts, Weinstein, Rappaport, Anderson & Leonard (1956). The metric forms were sketched in black ink on a dozen 6½ x 14 in. pieces of cardboard. Two of the three figures on any card were identical in shape with the remaining figure being different (odd). In order to make the oddity problem more difficult all three figures were of dissimilar size. A more complete description of the stimuli may be found in Schroth (1965).

Apparatus

To aid in presentation of the stimulus cards, a wooden stand measuring 14 x 3 in. was constructed. A small groove just large enough to slip the cards into was sawed along the length of the stand approximately ½ in. from the front.

Feedback or knowledge of results was provided on each trial during the transfer task by a poker chip which was placed immediately behind the correct figure.

Procedure for pretraining experiences. The pretraining phase of the experiment is based upon the procedure used by Goss (1953). The seeing-and-discriminating groups were given instructions designed to activate previously learned responses for designating stimulus differences but without reinforcement of those responses. Specifically, the Ss in Groups 1 (SD-12), 2 (SD-24) and 3 (SD-36) were told they were playing a game in which the purpose was to see how well they could tell differences between pictures and, therefore, that they were to pay close attention to the series of cards to be presented in order to be able to state how they differed either in shape and size or both. Thus instructed, Groups 1 (SD-12), 2 (SD-24) and 3 (SD-36) were given 12, 24, and 36 trials, respectively (the presentation of a card displaying three figures represented a single trial). The set of 12 stimulus cards was presented continuously until the appropriate number of trials was given.

Instructions and conditions for Ss in the seeing groups were designed to arouse postural adjustment and receptor exposure responses. Therefore, Ss were told that they were going to play a game in which the purpose was to study the effects of looking at pictures on some cards and hence that they were to pay close attention to each one of the cards to be presented. The same number of trials was given to Groups 4 (S-12), 5 (S-24) and 6 (S-36) as was administered to SD-12, SD-24, and SD-36, respectively.

Procedure for transfer task. Immediately after Ss of these groups had completed their directed attention learning experiences, they were introduced to the oddity problem by means of appropriate instructions. Ss were told they were going to play a new game and they were to point to one of the pictures on a card. They were instructed that a poker chip would always be found behind the correct picture, the object being to guess which was the correct picture each time a card was presented. Group 7(C), the control group which had no prior experiences with the stimulus cards, was administered the same instructions.

All groups were given 48 trials or number of trials required to reach criterion of 9 out of 10 successive correct responses. The correct solution was for the S to select the figure different in shape from the two other figures on a stimulus card.

RESULTS AND DISCUSSION

The mean number of trials required to reach criterion of 9 out of 10 successive correct responses for the seven groups on the oddity problem is summarized in Table 1. All groups with some type of directed attention pretraining performed at a higher level then the control group. One-tailed ts ranging from 1.92 to 5.37, significant at the .05 level for appropriate df, were obtained when Group 7(C) was compared singly with all other groups.

Differences among mean trials to criterion of 9 out of 10 successive correct responses for the six directed attention pretraining groups were tested by means of 2 by 3 factorial analyses of variance. These analyses permitted the rejection of the null hypothesis with respect to differences among means for all six groups ($F = 26.33$) at or beyond the .01 level for appropriate df. Further analysis of the between-groups sum of squares into sources of variation based on types of pretraining experiences, amounts of pretraining experience, and interaction of types and amounts resulted in a significant F (129.72) at the .01 level only for types of pretraining experiences.

To determine which means differed significantly from one another, the Newman-Keuls method for multiple comparisons was employed. Groups 1 (SD-12), 2 (SD-24) and 3 (SD-36) differed significantly from Groups 4 (S-12), 5 (S-24) and 6 (S-36) at the .05 level of confidence. No other comparisons between means were statistically significant.

Table 1
Means and SDs of Trials to Oddity Learning Criterion

	Trials to Criterion	
Group	Mean	SD
1 (SD-12)	23.61	6.28
2 (SD-24)	20.89	5.44
3 (SD-36)	22.72	7.01
4 (S-12)	29.50	4.21
5 (S-24)	28.28	6.02
6 (S-36)	29.17	9.02
7 (C)	35.46	10.74

The results of the present experiment indicate that the activation of pre-experimentally acquired discriminative responses by means of instructions to see-and-discriminate and warm-up, in the form of seeing stimuli, both facilitated learning the oddity problem. These findings support the conclusions of Goss (1953) and Schroth (1968) that directed attention pretraining aids in the learning of new tasks, although the nature of the transfer tasks employed in the two studies was different as previously discussed.

It is further suggested by the data that the seeing-and-discriminating technique of pretraining is more beneficial to problem-solving than warm-up, in the form of seeing, alone; Groups 1 (SD-12), 2 (SD-24) and 3 (SD-36) performed better on the oddity problem than Groups 4 (S-12), 5 (S-24) and 6 (S-36). This particular result, however, is in conflict with the finding of Goss (1953) in which differences between the two types of pretraining are not statistically significant. This disparity would appear to be best explained by the dissimilarities of the two experiments. The current study involved the use of complex stimuli, nonsense shapes, in a problem-solving situation while Goss employed relative "simple" stimuli within a motor learning task. Apparently prior habit arousal has effects beyond those of warm-up which are more beneficial to problem-solving, involving concepts such as oddity, than learning motor tasks in which the stimuli are not so complex.

In addition, the results alluded to regarding the effectiveness of the two types of direct attention pretraining methods have implications for a mediating processes concept. There exists theoretical grounds for supposing that similar mediating processes or general principles are involved in the seeing-and-discriminating condition besides warm-up effects, which are also involved in the transfer task. Both tasks, for example, entail discrimination, comparison and categorizing of the stimuli. In order to render a correct response on a given trial of the oddity problem, it was requisite that Ss possess the capacity to recognize similarities and differences between the stimuli. Thus, the above pretraining condition could be expected to facilitate more transfer in terms of a mediating processes theory than the seeing pretraining situation, alone; the results support this conclusion.

Another major finding in the current study is that number of trials required to reach the criterion did not decrease as a function of amount of pretraining for either type of directed attention experiences. It appears likely that maximum facilitative effects attributable to these processes are reached at or before 12 of these experiences (number of trials ranged from 12 to 36). These results support the finding of Goss (1953), using "seeing-and-discriminating" and "seeing" types of pretraining, specifically, and the conclusions of Arnoult (1957), in general, that effectiveness of stimulus predifferentiation in facilitating transfer does not increase beyond a "small" number of trials.

To summarize, the major results are twofold: (1) directed attention pretraining facilitates transfer in complex problem-solving with the seeing-and-discriminating type proving to be more beneficial than the seeing preparation, and (2) effectiveness of directed attention pretraining does not increase beyond 12 or less trials.

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NOTE

1. The results of this study were reported at the Western Psychological Association meetings at San Diego, March 1968.