Proceedings of the Iowa Academy of Science

Volume 63 | Annual Issue Article 58

1956

The Role of Special Instructions in the Successive Performance of Different Tasks on the Star Discrimeter

Stephanie Pisoni
State University of Iowa

Allan R. Wagner
State University of Iowa

The Role of Special Instructions in the Successive Performance of Different Tasks on the Star Discrimeter

By Stephanie Pisoni and Allan R. Wagner

The problem was to determine the facilitating and/or interfering effects of knowledge concerning the kinds of change that might be made in shifting from a perceptual-motor task that has just been learned to a subsequent interpolated task. The experimental design called for original learning (OL), interpolated learning (IL), and relearning (RL) phases of practice, with the period for informative instructions coming between the OL and IL phases. Task A was used for OL and RL and either Task B or Task J for IL. Familiarity with the principal features of the tasks will help in explaining the problem.

Apparatus and Tasks

The tasks, all self-paced, were provided by the Star Discrimeter (1, 3, 4). Its essential features are shown in the drawing in Figure 1. Six channels, spaced 60 degrees apart, radiate out from a central opening in a horizontal steel plate which constitutes the top of the response unit. A wobble stick protrudes from the central opening and can easily be moved into any of the six channels.

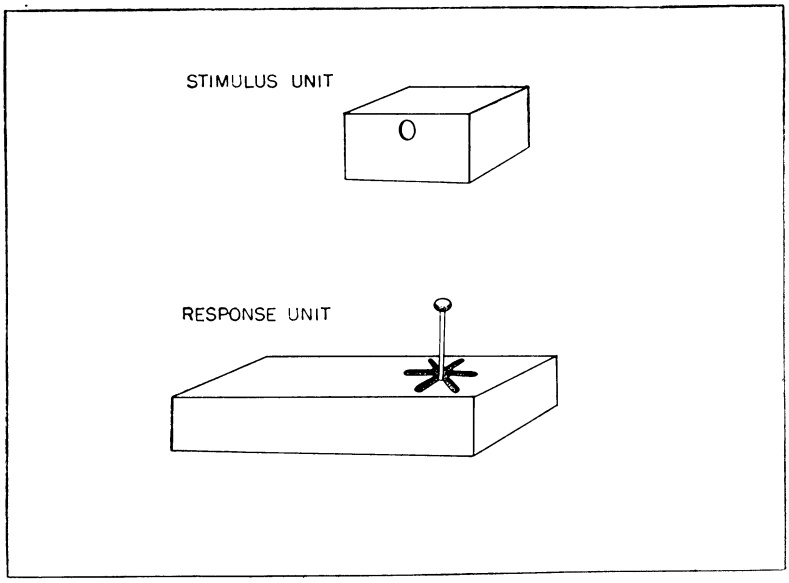

Figure 1. Principal Features of the Star Discrimeter.

The stimulus unit, positioned approximately at eye level, has a circular piece of opal glass in its front surface. Six different colors of lights are projected onto the glass, from behind. The sequence of colors is controlled with a 50-point stepping relay.

For a particular task, each color is connected with one of the six response channels. When a color appears, pushing the wobble stick to the end of the channel associated with it activates the stepping relay to bring up a new color. A subject's task is to learn to associate colors and channels and to move the wobble stick quickly in and out of the correct channels as the lights appear. Correct and incorrect entries are recorded on Veeder-Root counters which are triggered through microswitches placed, respectively, at the ends and along the sides of the channels.

By means of convenient multiple-wafer switches, any light may be connected with any of the six channels so a large number of different light-channel combinations may be obtained. A particular combination, called Task A, was the one used for OL and RL. Two other tasks, B and J, were used for IL. Task B involved a random rearrangement of light - channel interconnections, while Task J involved a systematic rearrangement of interconnections which made the six correct responses exactly opposite (180 degrees from) those that were correct for Task A.

Theoretical Considerations

McAllister (3) has pointed out that skill in performing a complex perceptual-motor task depends on the acquisition of specific overt responses to specific stimuli and also on more generalized responses to the general features of the task situation. Although specific overt responses to particular colors, acquired in the learning of one task, might be inappropriate for the performance of a second task, the generalized responses, often called sets or verbal self-instructions, might be entirely appropriate and thus serve to facilitate performance on the second task. If generalized responses (sets) as well as specific responses are made inappropriate for the second task, some amount of interference would be expected.

It was thought that instructions on the kinds of changes that might be made in the task could serve to alter the sets of the subject and affect the amount of facilitation and/or interference.

McFann (4) had already shown that relevant instructions, consisting of information on the change actually to be made in the second task, was highly facilitative of IL performance. It is easy to see how subjects given such specific instructions could utilize the information during IL as well as during later RL. The question was whether or not subjects could utilize, not information on the particular changes to be made, but general knowledge concerning several changes that might be made.

Procedures

One hundred and two female subjects, all volunteers from courses in elementary psychology, after being instructed in the manner of performing on the apparatus, were given five trials on Task A. The number of correct responses and number of errors on these trials were summed for each subject. These sums were used as a basis for keeping four groups of subjects about equally matched in overall ability to perform.

As indicated in Table 1, the groups and conditions for the IL

Table 1.

Essential Differences Between the Conditions for the Four Groups.

Group	N	Special Instructions	IL Task	Change in Task
I	38	Yes	J	180°
II	38	Yes	B	Random
III	13	No	J	180°
IV	13	No	B	Random

phase of practice were as follows: Group I, instructions —180° change; Group II, instructions—random change; Group III, no instructions—180° change; Group IV, no instructions—random change. The number of subjects in each group is indicated in the second column of the table.

After the subjects had been assigned to one of the four groups, they were all given 15 additional OL trials on Task A. These trials, as well as all others, were 20 seconds in length, and were separated by 10-second rest intervals.

At the completion of the OL trials, all subjects were told that they would next practice on a second task with different light-channel relationships. In addition, Groups I and II were given special instructions consisting of information regarding four general kinds of changes that might be made in the color-channel relationships in obtaining the second task. Groups I and III then received 20 trials on Task J (180° change) while Groups II and IV received 20 trials on Task B (random change). There was a one-minute rest period between the 10th and 11th trials.

A two-minute rest period followed the completion of the 20 IL trials. During this time, the subjects were informed that they would again practice on the task with which they had begun; they would relearn the original task. They were given 20 RL trials, with the usual 10-second rests between them and with a one-minute rest between Trials 10 and 11.

Predictions

The predictions were as follows:

1. Group I, given instructions on the kinds of changes that might be made and then shifted to Task J (180° change), would per-

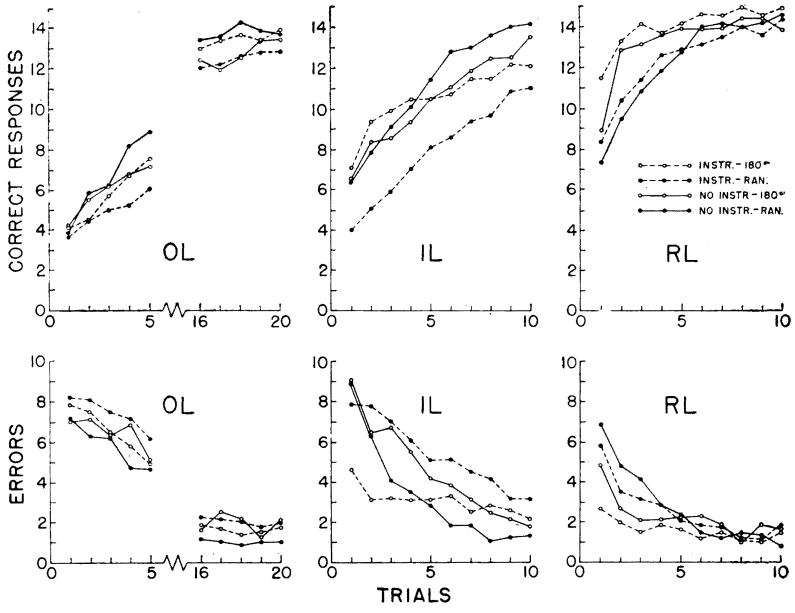

Figure 2. Performance Curves Based on Mean Number of Correct Responses and Mean Number of Errors on Trials 1-5 and 16-20 of OL and Trials 1-10 of IL and RL.

form better than Group II, given instructions and then shifted to Task B (random change).

2. Group II, given instructions and shifted to Task B, would perform less well than Groups III and IV—the groups not receiving special instructions.

Results

The results are summarized in Figure 2. In the three graphs across the top, means of number of correct responses are plotted against trials; in the three across the bottom, means of number of errors against trials. Curves for the four groups may be identified through the legend in the upper right-hand graph.

Performance curves for OL Trials 1-5 and 16-20 are shown in the two graphs at the left. The general levels and slopes of the curves are quite similar, especially over Trials 16-20. A simple analysis of variance, made of the correct responses data for Trials 16-20, indicated that the groups were not significantly different in performance at the end of the OL phase of practice.

The curves for the IL phase are shown in the middle graphs of Figure 2, where it can be seen that the means of correct responses for Group II (instr.-ran.) were consistently below those for the other three groups. There appears to have been no facilitation of

performance in the case of Group II, but facilitation in the case of the other three groups. Groups III and IV, which did not receive special instructions, performed about equally well on the two different IL tasks.

A simple analysis of variance of the data for correct responses on the first IL trial yielded an F ratio significant at the 1% level of confidence. Use of the t test for unrelated measures showed, as expected, that the mean on Trial 1 for Group II was significantly lower than the means on this trial for the other three groups. A trend analysis (2) of the correct responses data for Groups I and II over the first five IL trials revealed that Group I was consistently superior in performance. The error curves for IL, seen in the lower middle graph, provide additional evidence of the superiority of Group I over II.

The curves for the RL phase of practice, in the two curves at the right in Figure 2, show that Group I (instr.-180°) made more correct responses and fewer errors on the initial trials than did any of the other three groups. A simple analysis of variance of the correct responses data for Trial 1 yielded an F ratio of 6.56, significant beyond the 1% level. The F ratio for errors on the first trial was not significant. The differences of importance, as found through the t test for unrelated measures, were between the mean of correct responses for Group I and the means of correct responses for the other three groups. A trend analysis of the correct responses data showed that the overall mean for Group I on RL Trials 1-5 was significantly higher than the overall mean on these trials for Group II.

Discussion

The results were examined in relation to the general hypothesis that amount of proactive and retroactive facilitation and interference in performance on the Star Discrimeter is a function, in part, of a subject's set, and can therefore be influenced by instructions.

On the first trial of IL, the special instructions (on possible changes in task) served to facilitate performance on Task J (180° change) by reducing the number of errors as compared with the errors made by the no-instruction group, whereas the instructions interfered with performance on Task B (random change) by depressing the number of correct responses. This differential effect might be explained in terms of some initial (pre-experimental) tendency of the subjects to respond systematically instead of randomly. However, it seems likely that a more important factor was the degree of appropriateness of the instructions to the two IL tasks.

For Group I, every channel was changed 180°. Each correct response could thus serve to reinforce a set for 180° as well as a

specific overt response. In contrast, for Group II, some of the correct channels were changed 120° the others 60°, so each correct response could serve to reinforce not only a specific overt response but also, at least in early trials, a set to respond to a change of 120° or 60°. Either set would be inappropriate for some of the correct responses and would tend to interfere with the acquisition of the correct pattern of responses.

The view that the special instructions played a unique role in differentiating the performance of the groups is substantiated by the trend of the error curves for IL. Consider the curves for Groups II and IV. Both groups practiced on Task B, with random change. Except on Trial 1, the means of errors for Group II are well above those for Group IV. Interference effects persisted much longer for Group II. The subjects may have been influenced by tendencies, induced by the special instructions, to respond as if the change were one of either 60° ar 120°.

The superiority of the performance of Group I in the RL phase of practice might be attributed entirely to the effectiveness of the special instructions. However, the performance of Group III, which did not receive the special instructions but practiced on Task J, suggests that a shift of 180° was easier to remember than a random shift. Note in this connection that on RL Trial 2, the means of number of correct responses for Groups I and III are about the same. Note also that the RL curves for Groups II and IV display similar trends. This is especially true of the curves for correct responses.

The effects of the special instructions were essentially as predicted for the IL phase of practice. The effects were apparently diminished for the RL phase.

Summary

Four groups of female subjects were used to determine the effects of special instructions on performance during IL and RL phases of practice on the Star Discrimeter. The special instructions, consisting of general information on types of changes that might be made in going from the OL to the IL task, facilitated the performance of the group that was shifted to Task J (180° change) but retarded the performance of the group shifted to Task B (random change). The differential effects were discussed in relation to the probable role of verbally induced sets in the performance of Discrimeter tasks.

(The authors are indebted to Professor Don Lewis for help in planning the study and analyzing the data.)

Bibliography

1. Duncan, C. P., Transfer in motor learning as a function of degree of first-task learning and inter-task similarity, *J. exp. Psychol.*, 1953, *45*, 1-11.

2. Lindquist, E. F., *Design and Analysis of Experiments in Psychology and Education.* Boston: Houghton Mifflin, 1953.
3. McAllister, Dorothy E., The effects of various kinds of relevant verbal pretraining on subsequent motor performance, *J. exp. Psychol.,* 1953, *46,* 329-336.
4. McFann, H., A study of the effects of response alternation and different instructions on proactive and retroactive facilitation and interference, *J. exp. Psychol.,* 1953,*46,* 405-410.

DEPARTMENT OF PSYCHOLOGY
STATE UNIVERSITY OF IOWA
IOWA CITY, IOWA