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McAllister (2) recently offered an explanation for the subsequent superior performance on the Star Discrimeter of Ss given relevant-S-R pretraining over Ss given relevant-S pretraining. She further proposed that because of previous learning, different relevant-S-R pretraining would lead to differential facilitation.

This differential facilitation would occur for two reasons. First, verbal responses serve as cues, which, through past learning (plus instructions), elicit responses which furnish information concerning the correct motor responses. Since the past learning would, presumably, be different for various types of verbal responses this variation would lead to differential facilitation. Second, if in previous learning situations response strength had been acquired between the verbal cues and motor responses similar to those required on the criterion task facilitation would be increased.

Results of McAllister's study only partially confirmed this explanation. In her study S learned to associate verbal responses to different colored circles. The color of the circles matched, as nearly as possible, the colors of the stimuli on the subsequent motor task. For one group of Ss the verbal responses consisted of combinations of the directions, right, left, forward, and backward. For another group the verbal responses corresponded to the even-numbered hours on a clock. For a third group the verbal responses were degrees of angular distance. The relevant-S group associated adjectives with the colored circles and an irrelevant group associated two lists of words. Following this pretraining all Ss were given 45 trials on the Star Discrimeter. McAllister predicted that through past learning and through the resulting acquired response strength Ss given the directions pretraining would show the most facilitation, followed by the Ss having the clock and Ss having the degree pretraining. Results indicated that facilitation was in the predicted order but no significant difference was found between Ss given the directions and Ss given the clock pretraining. Both groups were superior to the group given the degree pretraining and to the group given relevant-S pretraining.

The present study is concerned only with that part of the McAllister explanation which suggests that past learning of S might differ for the different concepts used in her study. If S is more familiar with the directions right, left, etc. than with hours or degrees, then it would seem that a faster movement would be elicit-

ed by stimulus words such as right, left, than by stimulus words consisting of hours (twelve, two, etc.) or degrees (0, 60, etc.). fewer errors in the McAllister study and to faster reaction times in the present study.

Apparatus

A response board, 18″ square, was constructed which formed the top of a wooden box 6″ high. The surface of the board was painted flat black. Seven circular brass buttons were countersunk into the board and flush with its surface. The Center button had a diameter of ¾″, the six peripheral buttons of 2″. The six larger buttons were placed so that they lay tangentially to the circumference of a circle of 6″ radius from the center of the center button. The buttons were located at the 0, 60, 120, 180, 240 and 300 degree points on the circumference, the point of origin being directly opposite the position of S. A red light was mounted on a 2″ x 3″ metal plate perpendicular to the surface of the response unit and opposite S. A red, plastic, 4″ stylus was held and moved by S to break the timing circuit. The circuit was designed so that the red light came on when S placed the tip of the stylus on the center button. This served as a ready signal. E could press a switch which activated a clock and a buzzer. The buzzer and clock were stopped when S touched the correct peripheral button. The correct button was activated by E before the stimulus word was spoken. The clock and buzzer were started by E simultaneously with the pronunciation of the last syllable of the stimulus word.

Design and Procedure

75 students from the introductory course in psychology participated in the experiment. Since reaction time was, obviously, a relevant variable, Ss were divided into three levels on the basis of their total response time to 40 choice-reaction time trials on the SAM Discrimination Reaction Time apparatus. Using the 'counting-off' method described by Lindquist (1), 45 male students were assigned to three levels of 15 Ss each. The Ss in each level were randomly assigned to three treatment groups. 30 female Ss were assigned to three levels and two treatment groups by the same procedure. Thus, two treatment by levels designs were formed. The reason for this breakdown will be explained later.

Except for appropriate changes in the instructions and stimulus words the experimental procedure was constant for all groups. The locations of the buttons were pointed out for each S. The manner in which the buttons could be identified was explained by E. Ss were instructed to turn off the buzzer as quickly as possible by hitting the correct peripheral button, the correct button to be determined by the stimulus word spoken by E. Stimuli were pre-

sented approximately 2½ sec. after S had stopped the buzzer from the previous presentation.

A block of trials consisted of 36 stimulus presentations with each of the six stimuli being presented six times in a predetermined order. Four such blocks were given. The score for each S was based consequently on 144 responses. A 2-min. rest outside the experimental room was given following each block of trials. Conditions and instructions for the different experimental groups were as follows.

Groups I and IV. Stimulus words were the number of degrees on the circle corresponding to the locations of the buttons—0, 60, 120, 180, 240, and 300. During the instructions E explained that the buttons represented points on the circumference of a circle and were spaced 60 degrees apart. The 0 and 60 degree buttons were then named and pointed out by E.

Groups II and V. Stimulus words were the even-numbered hours on the face of a clock corresponding to the locations of the buttons —12, 2, 4, 6, 8, and 10. During the instructions E explained that the buttons represented hours on a clock and were spaced two hours apart. The 12 and 2 o'clock buttons were named and pointed out by E.

Group III. Stimulus words were directions and combinations of directions away from the center button corresponding to the locations of the buttons—forward, right-forward, right backward, backward, left-backward, and left-forward. During the instructions E explained that the buttons represented directions away from the center button. The forward and right-forward buttons were named and pointed out by E.

Results

As previously noted two separate analyses of the data were made. This was necessary since the results of the DRT trials indicated that male Ss were faster than female Ss. It was not plausible to confound sex with levels since no information was available concerning a possible sex by treatment interaction effect.

Since the X^2 obtained with a Bartlett test for homogeneity of variance was not significant at the .05 level, the analysis of variance technique was applied to the data obtained from the male Ss. Results, as shown in Table 1, indicated that the treatment ms was significantly different from the within cells ms. The obtained F value of 5.92, with 2 and 36 df, was significant at the .05 level. Neither the levels ms nor the interaction ms gave significant F values when tested against the error term.

A Bartlett test was also applied to the data obtained from the female Ss. The obtained X^2 of 2.04 with 5 df *was not significant* at the .05 level. A treatment by levels analysis was also made of these data. The results are shown in Table 2. The treatments ms

gave an F value of 5.45 with 1 and 24 df when tested against the within cells ms. This value also was significant at the .05 level. Again, neither the levels ms nor the interaction ms was significant at the .05 level.

Discussion

Results of the study tend to support McAllister's inference concerning the familiarity, of Ss with the concepts used in the two studies. Greater familiarity, as measured by speed of response, would, presumably, be due to past learning. This would provide a basis for the first part of McAllister's explanation.

Table 1

Results of the analysis of variance of the data obtained from male Ss, groups I, II, and III

Source	SS	df	MS	F
Treatments	943.81	2	471.91	5.92
Levels	34.03	2	17.02	.....
T x L	344.40	4	86.10	1.08
Within Cells	2870.36	36	79.73	.....
Total	4192.60	44		

Table 2

Analysis of variance of the data obtained from female Ss, groups IV and V

Source	SS	df	MS	F
Treatments	342.06	1	342.06	5.45
Levels	266.34	2	133.17	2.12
T x L	191.69	2	95.85	1.53
Within Cells	1505.82	24	62.74	.....
Total	2305.91	29		

An interesting similarity in the results of the two studies can be shown by comparing the individual group means. Male Ss responding to direction stimuli were significantly faster than male Ss responding to degree stimulus words, the 't' value of 3.71 with 36 df being significant at the .05 level. The other means did not differ significantly. The results of the analysis of the female data, of course, showed that clock stimuli led to faster responses than degree stimuli. In the McAllister study both the directions and clock pretraining groups performed significantly better than the group given degree pretraining; however, they did not differ significantly from each other. This is shown in Table 3.

Table 3

Mean sum of response items of the 144 responses

Group	I	II	III	IV	V
Mean	76.62	71.11	65.40	80.99	74.24

Table 3 also shows that male Ss performed somewhat better than female Ss in this study. A comparison of groups I and IV, both of which responded to degree words, shows that the males of group I were faster. Similarly, of the two groups responding to clock words the males of group II were faster than the female Ss of group V. However, the female Ss of group V outperformed the male Ss of group I, indicating that clock words yield faster responses despite the apparent superiority of the male Ss.

Summary

Seventy-five Ss (45 male, 30 female) participated in what was essentially a reaction time experiment. Male Ss were divided into three levels on the basis of their toal reaction time to 40 DRT trials Ss within each level were randomly assigned to three treatment groups (I, II, and III). Similarly, the female Ss were divided into three levels and two treatment groups (IV and V). On the criterion tast all Ss turned off a buzzer by moving a stylus from a center button to one of six peripheral buttons upon hearing a stimulus word spoken by E. For groups I and IV the stimulus words were degrees of angular distance. For groups II and V the words were even-numbered hours on a clock. For group III the stimulus words were directions away from the center button. The stimulus words were analogous in that 'twelve o'clock','o degrees', and 'forward' all referred to the same peripheral button. This was also true of the other stimuli for each group.

Results indicated that stimulus words composed of directions elicited faster responses than did degree stimuli for male Ss and clock stimuli elicited faster responses than degree words for the female Ss. The results support McAllister's explanation for the differential facilitation of different types of relevant-S-R pretraining.

References

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