The results fail to provide any support for either of the two assumptions of the attention explanation of the O'Neal-Mills results. There is no evidence that in the O'Neal-Mills procedure the Ss paid greater attention to the choice photographs or that increased attention increases the intercorrelation of the rankings. If either of these two effects occurred, they were much too weak to be detectable. It is clear that even if they did occur, their magnitude was far too small in this situation for them to provide an explanation for the higher intercorrelation for the choice photographs. The results indicate that whatever difference there was between attention paid to choice photographs and the control photographs, it was not as great as the difference in attention created by the variation in the instructions under which the photographs were ranked. Yet the difference in the intercorrelation for the photographs ranked under the careful and the quick instructions was smaller than the difference in the intercorrelation for the choice photographs and the control photographs.

By ruling out the attention interpretation as a feasible explanation for the finding that the anticipation of making choices about other persons increases the intercorrelation of traits attributed to those persons, the present study has clarified the interpretation of the O'Neal-Mills finding. The elimination of the attention interpretation leaves the interpretation in terms of a desire for certainty about the prospective choices as the most suitable explanation for the influence of anticipated choice on the halo effect.

REFERENCES

FESTINGER, L. *A theory of cognitive dissonance.* Stanford: Stanford University Press, 1957.

FESTINGER, L. *Conflict, decision, and dissonance.* Stanford: Stanford University Press, 1964.

JONES, E., & GERARD, H. *Foundations of social psychology.* New York: Wiley, 1967.

KENDALL, M. *Rank correlation methods.* London: Griffin, 1948.

MILLS, J. Interest in supporting and discrepant information. In R. Abelson, E. Aronson, W. McGuire, T. Newcomb, M. Rosenberg, and P. Tannenbaum (Eds.), *Theories of cognitive consistency: A source book.* Chicago: Rand McNally, 1968.

O'NEAL, E., & MILLS, J. The influence of anticipated choice on the halo effect. Journal of Experimental Social Psychology, 1969, 5, 347-351.

SIEGEL, S. *Nonparametric statistics.* New York: McGraw-Hill, 1956.

NOTES

1. The halo effect is defined by Jones & Gerard (1967) as, "The tendency for trait ratings to show a higher intercorrelation than would be revealed by more objective measurement [p. 713]."

2. Statistical significance was tested throughout by means of the Wilcoxon matched-pairs signed-ranks test (Siegel, 1956). All p values are two-tailed.

Persistence of responding on a perceptual-motor task following shifts in informative feedback

ROBERT J. MAY, JR. and ROGER W. BLACK
University of South Carolina, Columbia, S.C. 29208

Four groups were trained on a pursuit-rotor task which they continued until they "became bored or tired." After each trial one group was informed that their performance was "good" and a second group that theirs was "poor." A third group was initially rated "good" and then shifted to "poor," while the fourth group was shifted from "poor" to "good." Persistence in responding suggested a "negative contrast effect" following the shift from "good" to "poor," but no corresponding "positive contrast effect" occurred. No effect on accuracy of performance was obtained. These results are analogous to those obtained in conditioning studies.

A recent series of studies in this laboratory has been concerned with the effects of knowledge of results (KR) of time on target (TOT) on an analogue of resistance to extinction (RE) in a pursuit-rotor task (e.g., Mandell, 1969; Slayton, 1969; Black & Black, 1970). The basic procedure in these experiments was to instruct S that his task was to learn to track the target circle during the "test" interval of alternating "test" and "rest" periods and to continue to do so until he "lost interest," "became bored," etc. The response measure of interest was the number of trials S was willing to perform prior to his terminating his participation in the experiment. This measure, designated "trials to termination (TTT)," was considered to be analogous to measures of RE employed in instrumental conditioning.

Reasoning from the widely accepted view that KR in perceptual-motor tasks affects performance in much the same manner as reinforcement in conditioning (e.g., Bilodeau & Bilodeau, 1961), Black & Black (1970) sought to determine if schedule of KR of TOT on the pursuit-rotor affected TTT in a manner similiar to the effect of reinforcement schedule on RE in instrumental conditioning. Two groups of Ss were given an initial series of 20 trials, during which one group (Group CKR) was correctly informed of their TOT following each trial, while the other group (Group PKR) was given TOT following half of the trials. Subsequently, KR of TOT was discontinued for both groups, and TTT was found to be significantly greater for Group PKR than for Group CKR. This result was considered analogous to the partial reinforcement effect in instrumental conditioning and was interpreted as further extending the empirical parallel between the effects of KR and those of reinforcement.

The present study was concerned with the question of whether or not shifts in the "quality" or "reward value" of informative feedback (IF) affects pursuit-rotor performance in the same way that shifts in magnitude of reward affect performance in instrumental conditioning. In a recent review of instrumental and differential conditioning studies in which reward magnitude was shifted, Black (1968) concluded that both incremental and decremental shifts in reward result in rapid corresponding shifts in performance. In addition, downward shifts in reward magnitude appeared to result in a reduction in performance to a level lower than that of control Ss which had always received the smaller reward. On the other hand, incremental shifts appeared to result in an improvement in performance but not to a level beyond that of Ss which had always received the larger reward. Thus, "negative contrast effects (NCE)" but not "positive contrast effects (PCE)" were typically obtained.

In the present study Ss who were trained on the pursuit-rotor received IF, which indicated that their performance was either "good" or "poor" relative to a fictitious criterion. Following an initial series of trials IF was abruptly shifted upward or downward in an attempt to determine if subsequent TTT showed

either PCE or NCE. More specifically, the study sought to determine whether Ss who were shifted from "poor" to "good" IF scores requried more TTT than Ss whose performance was always rated "good" and, conversely, whether Ss who were shifted from "good" to "poor" required fewer TTT than Ss who were consistently rated "good."

METHOD

The Ss were 60 students enrolled in the introductory course in psychology at the University of South Carolina. The apparatus was a Marietta 5-6S pursuit rotor, Model D, which was equipped with automatic timers for both "test" and "rest" intervals and a clock which recorded TOT in .01 sec. The turntable was 12 in. in diam, while the target circle was .75 in. in diam. The turntable revolved at 60 rpm during the "test" intervals. Eleven 15-W light bulbs were enclosed in compartments numbered consecutively from 1 through 11, which formed a rectangular box with a white translucent Plexiglas top, and which was designated the "IF box." When the bulb in one of the compartments was lighted, it illuminated the numeral painted on the inner surface of the Plexiglas top of that compartment, thus making that numeral visible, while the numerals on the remaining compartments were not visible to S. An appropriate switching arrangement allowed E to illuminate any one of the compartments and its associated numeral at the end of each trial. The IF box was placed on a table in front of the pursuit rotor. A wood partition behind the pursuit rotor prevented S from seeing E or the timers, clock, and data sheets.

When S arrived at the experimental room he was asked to hold the stylus and stand in front of the pursuit rotor. He was then read instructions which described his task and which indicated that after each trial, a numeral would be illuminated on the IF box which would provide him with a rating of the accuracy of his tracking performance relative to "the average performance of college students." He was told that a score of 6 indicated "average" performance, while scores below or above 6 indicated progressively "poorer" or "better" performance, respectively. Furthermore, S was informed that, since performance on the task normally improves with practice, the criterion against which his performance would be judged would also change. Finally, S was told that it was his responsibility to terminate participation in the experiment whenever he "lost interest," "became tired," etc. These instructions concluded with the following statement: "Remember, this experiment is over whenever you wish it to be. It will not stop until you say you want it to. However, please continue until you lose interest or are tired."

The Ss were assigned randomly to one of four groups which differed in terms of the IF scores which S received. The Ss in Group P were given "positive" or "good" scores (numerals 8 through 11, randomly selected) after each trial throughout the experiment, while Ss in Group N received "negative" or "poor" scores (numerals between 1 and 4, randomly selected). In Group PN, Ss were assigned "good" scores after each of the first 20 trials but were then shifted to "poor" scores for the remaining trials. Conversely, Ss in Group NP received "poor" or "negative" scores on each of the initial 20 trials but were shifted to "positive" scores for the remaining trials.

Training consisted of an alternating series of 10-sec "test" and 12-sec "rest" periods and continued until S indicated that he wished to stop. The IF numeral indicating S's score on each trial was illuminated during 8 sec of the 12-sec "rest" period following that trial.

RESULTS AND DISCUSSION

Two sets of data were obtained: accuracy of performance (TOT) on each trial and TTT, which was considered a measure of RE. Since Ss remained in the experiment for differing numbers of trials, the TOT data for each S was Vincentized (Vincent, 1912) into five blocks and analyzed as a 4 by 5 factorial design with groups as a between-Ss factor and trial blocks as a within-Ss factor. This analysis indicated that TOT increased with practice ($F = 66.58$, $df = 2/221$, $p < .001$). In terms of TOT in the final Vincentized block of trials, mean TOT for the four groups was as follows: Group P, 3.37 sec vs 3.66 sec for Group NP; Group N, 3.14 sec vs 2.44 sec for Group PN. Thus, there was a slight suggestion of a PCE (Group P vs Group NP) and a stronger suggestion of a NCE (Group N vs Group PN). These effects, however, failed to prove reliable since neither the effect of groups or the Groups by Trial Blocks interaction proved significant ($F = 2.12$, $df = 3/55$, and $F = .61$, $df = 12/221$, respectively).

As with the accuracy data, the comparisons of primary interest for the TTT results were that between Groups P and NP and that between Groups N and PN. The results for TTT for these groups were: Group P, 85.67 trials vs 62.20 trials for Group NP; and Group N, 64.07 trials vs 50.53 trials for Group PN. Thus, an incremental shift in IF for Group NP not only failed to produce a PCE (i.e., superiority to Group P), it even failed to produce a TTT level as great as that for Group P. Furthermore, the greater TTT for the latter Ss proved significant ($t = 2.93$, $df = 28$, $p < .01$). On the other hand, Ss in Group PN which received a decremental shift in IF apparently showed a NCE in that their TTT was lower than that of control Ss in Group N who received "poor" IF scores throughout the experiment. This smaller TTT for Group PN than for Group N also proved significant ($t = 2.12$, $df = 28$, $p < .05$).

The finding of a NCE following a decremental shift in IF is further evidence of the parallel between the effects of KR on perceptual-motor performance and those of reinforcement in instrumental conditioning. Moreover, the finding that an incremental shift in IF failed to produce as great a number of TTT as that for Ss who always received "good" IF scores is also similiar to the results obtained in both instrumental and differential conditioning experiments involving contrasted reward magnitudes (Black, 1968). It is interesting to speculate, however, as to why these effects which appeared reliably in the TTT data failed to do so in terms of the accuracy of performance. A possible explanation might be that the effects of IF and of shifts in IF scores are motivational rather than associative. Certainly such a possibility is recognized in the interpretations of conditioning experiments which attribute the effects of reward magnitude and shifts in reward magnitude to "incentive motivation" rather than to "habit strength." If such an interpretation is placed on the present task, then IF scores and shifts in such scores might well be expected to affect S's willingness to remain in the experiment (i.e., TTT) without at the same time affecting his skill at the task (i.e., TOT).

REFERENCES

BILODEAU, E. A., & BILODEAU, I. M. Motor skills learning. Annual Review of Psychology, 1961, 12, 243-280.

BLACK, P. E., & BLACK, R. W. A "partial reinforcement-extinction effect" in a motor-skills task. Psychonomic Science, 1970, 18, 125-127.

BLACK, R. W. Shifts in magnitude of reward and contrast effects in instrumental and seletive learning. Psychological Review, 1968, 75, 114-126.

MANDELL, E. "Resistance to extinction" of a pursuit-rotor tracking response as a function of prior schedule of knowledge of results. Doctoral dissertation, University of South Carolina, 1969.

SLAYTON, A. J. Effect of secondary reinforcement on extinction employing augmented knowledge of results as reward. Master's thesis, University of South Carolina, 1969.

VINCENT, S. B. The function of the vibrissae in the behavior of the white rat. Behaviour Monographs, 1912, No. 5.