A human analogue of discrimination contrast: S- contrast as a function of magnitude of S+

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In the present study, two groups of human Ss received differential reward conditioning for accurately tracing red or blue star patterns. A control group received only small reward in both discriminanda. The present study replicated the findings of previous animal and human studies in that a significant negative S- contrast effect was found. In addition, it was shown that this effect increased as a function of the magnitude of reward in the S+ discriminandum. The latter finding has been obtained previously with infrahuman Ss but evidently not with human Ss; hence, the generality of negative discriminative contrast effects have been extended significantly.

Previous alley studies (e.g., Bower, 1961; Ludvigson & Gay, 1966) have shown that performance of rats to the negative discriminandum (S-) in differential conditioning is influenced by the reinforcement contingencies associated with the positive discriminandum (S+). Generally, these studies demonstrate that the S- performance of differentially reinforced (discrimination) groups is depressed relative to that of nondiscrimination control groups receiving small reinforcement in both "S+" and "S-" (negative S- contrast effect).

Since little information was available concerning how human Ss respond to stimuli associated with contrasting magnitude of reward, Calef et al (1971) attempted to investigate discrimination contrast effects in humans. In the study, one group of human Ss received differential reward conditioning for accurately tracing numbered-nonnumbered star patterns. Two control groups received only small or only large reward (grade points) in both discriminanda. One important aspect of the study was that the results replicated the findings of previous animal contrast studies in that a significant negative S- contrast effect was found.

An additional finding in animal contrast studies is that the S- contrast effect increases as a function of the magnitude of reward in the S+ discriminandum. For example, Ludvigson & Gay (1966) found that rats receiving 19 pellets in S+ and 1 pellet in S- showed a greater negative S- contrast effect than rats receiving 10 pellets in S+ and 1 pellet in S-. One purpose of the present study was to investigate whether an S- contrast effect would increase in conjunction with an increase in the magnitude of reward in the S+ discriminandum for human Ss. Also, the present study

attempted to replicate some of the findings of Calef et al (1971), using a different reinforcement (money rather than grades), discriminandum (color rather than numbered-nonnumbered patterns), and time criterion (10 rather than 15 sec).

METHOD

The Ss were 12 male and 12 female undergraduate students enrolled in the physiological and introductory psychology courses at West Virginia Wesleyan College. The Ss were assigned randomly to three equal groups.

The materials consisted of 160 star patterns. Each S was required to trace 10 star patterns (10 trials) with his less-preferred hand. The S was given only 10 sec to complete as many 1-in. segments of each star (20 segments to a star) as he could without touching the borderline. The intertrial interval was 2 min. One of the discrimination groups (LD) received a large amount of money (6 c) in the presence of a particular discriminandum (S+) and a small amount of money (1 c) in the presence of another discriminandum (S-) for completing a segment of a star without touching the borders. Following each trial, the Ss were informed in writing as to whether they had received large or small amounts of money. For half the Ss, large (L) reward (6 c) was correlated with a red star (S+) and small (S) reward (1 c) was correlated with a blue star (S-). For the other half of the Ss, contingencies were reversed. Hence, each S in Group LD traced five S+ and five S- stars. Each S was assigned randomly to one of eight different schedules of reward (e.g., LSSLLSSLSL). The other discrimination group (MD) received a medium amount of money (3 c) in the S+ discriminandum and a small amount of money (1 c) in the S-

discriminanda. The Ss in the control group were informed of the magnitudes of their rewards in the same manner as Ss in the discrimination groups. To control for trial position, eight different schedules of "S+" and "S-" were assigned randomly to control Ss regardless of the fact that they did not receive differential reward. The performance of Ss was determined by assigning +10 points for each completed segment of a star if the border was not touched and -10 points for completed and uncompleted segments, the borders of which were touched.

RESULTS AND DISCUSSION

Group mean scores for Groups LD, MD, and SC are plotted as a function of stages in training in Fig. 1. The early stage of training consists of the first two S+ and S- star patterns, whereas the late stage of training consists of the last two S+ and S- trials. For Group SC, scores on S+ and S- are plotted separately. As may be seen in Fig. 1, Groups LD and MD performed better on S+ than on S- trials during the late stage, whereas Group SC did not differentially respond to S+ as compared with S-. Within-group t tests of the data for Groups LD and MD during the late stage yielded a significant difference between the S+ and S- scores ($t = 3.96$, $df = 7$, $p < .005$, and $t = 2.21$, $df = 7$, $p < .05$, respectively). Further inspection of Fig. 1 shows that during the late stage, the S- scores of Groups LD and MD were highly depressed

Fig. 1. Group mean performance to S- as a function of S+ magnitude for Groups LD, MD, and SC.

relative to those of Group SC. Also, the S- scores of Group LD were more depressed than those of Group MD. A one-way analysis of variance of the S- data for Groups LD, MD, and SC over the late stage yielded significance ($F = 8.73$, $df = 3, 21$, $p < .01$). Subsequent t tests of the S- scores over the late stage showed Group LD to perform significantly more poorly than Group SC ($t = 3.25$, $df = 14$, $p < .005$), Group MD to perform significantly more poorly than Group SC ($t = 2.91$, $df = 14$, $p < .01$), and Group LD to perform significantly more poorly than Group MD ($t = 2.13$, $df = 14$, $p < .05$).

The present data indicate that performance in the presence of one discriminandum is influenced by the reward received in the presence of the

other discriminandum for human Ss. The present finding, that a negative S- contrast effect occurred, supported the results of several previous animal studies (e.g., Bower, 1961; Ludvigson & Gay, 1966) and a human study (e.g., Calef et al, 1971). Also, the fact that the present results supported Calef et al (1971) indicate that, at least for human Ss, a negative S- contrast effect is not a phenomenon associated with a particular reinforcement, discriminandum, or time criterion. Further research should be conducted to investigate whether a human negative S- contrast effect is peculiar to the motor tasks employed in the present study.

Of particular interest, however, was the present finding that the negative S- contrast effect increases with an

increase in the magnitude of reward in the S+ discriminandum for human Ss. This latter finding supported the animal research of Ludvigson & Gay (1966) and suggests that variables affect human and animal discrimination contrast effects in a similar fashion.

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