Irrelevant stimuli in S-R discontiguity¹

RAYMOND HADLEY AND GILBERT FRENCH

UNIVERSITY OF CALIFORNIA, BERKELEY

Effects of irrelevant stimuli on visual discriminations involving S-R spatial separations were investigated in monkeys. Such stimuli interfered when they were identical to discriminanda but not when they were different from discriminanda.

Small separations between discriminanda and manipulanda can impair discriminative performance (e.g., McCleary & Harlow, 1954). This discontiguity may afford more opportunities for irrelevant stimuli to control behavior. If this notion is correct, interference by irrelevant stimuli should vary with degree of separation. Studies reported here demonstrate the effect of adding irrelevant stimuli to manipulanda. The first concerns the interaction between amount of separation and presence of irrelevant stimuli. The second compares irrelevant stimuli which are like the discriminanda with those which are different.

EXPERIMENT 1

Method

Four male rhesus monkeys were tested in a WGTA outfitted with a stimulus display unit similar to McCleary & Harlow's (1954, Fig. 1). This was an upright wooden panel with two vertical slots. Each slot contained a paired discriminandum and manipulandum. The black and white plaque discriminanda were located above the manipulanda, which were blocks that could be pushed to uncover food wells.

The lateral position of the positive white plaque was varied from trial to trial in a random sequence (Gellermann, 1933). In one condition of irrelevancy, the manipulanda were identical gray blocks. In the second condition, one response block was white and the other black. Positions of the white manipulandum were determined by an independent random sequence which was subject to the constraints that the block appear beneath the white discriminandum on half the trials and no more than three times in succession. Thus, manipulandum color was uncorrelated with location of reward. Four experimental conditions were obtained by orthogonal pairing of two degrees of discriminandum-manipulandum separation, 0-in. and 2-in., with the two kinds of irrelevancy.

On each of 16 days, testing was divided into eight, 8-trial modules, two under each condition, for a total of 64 trials per day.

Results and Discussion

As shown in Fig. 1, more correct responses occurred throughout under the 0-in. than under the 2-in. separation ($t=14.72$, $df=3$, $p<.001$). While under the 0-in. separation there was no significant difference between manipulandum conditions, under the 2-in. separation

Fig. 1. Percentage of correct responses as a function of training under the 4 conditions of Experiment 1.

more correct responses occurred with the gray manipulanda than with the black and white manipulanda ($t=12.91$, $df=3$; $p<.001$).

The left panel in Fig. 2 shows for each degree of separation the excess number of responses to the white as opposed to the black manipulandum by all Ss over training. If Ss ignore manipulandum color, this preference score should approximate 0. With minimal separation, the value decreases rapidly and approaches 0 closely by the end of the experiment. With 2-in. separation, the value remains high. By the binomial test, scores exceeding 13.5 are significant at the .05 level.

This experiment again confirms that lack of S-R contiguity impairs discrimination and demonstrates that irrelevant stimuli like the discriminanda impair performance when the discriminanda and manipulanda

Fig. 2. Preferences for differentially colored manipulanda under the 2 separation conditions of Experiment 1 (left panel) and under the 2 conditions of similarity to discriminanda in Experiment 2 (right panel).

are more than minimally separated. To perform well, Ss must ignore the color of the manipulandum. In the 0-in. condition, all Ss touched the lower edge of the discriminandum just before pushing a response block. Under the 2-in. separation, only the most accurate S touched the discriminandum. In the absence of such double responding, which has been noted by Polidora & Fletcher (1964) and Polidora & Thompson (1965), Ss base their responses upon manipulandum color with a bias toward matching it with that of the positive discriminandum.

EXPERIMENT 2

Purpose

This study was designed to test the hypothesis that the interference seen under the 2-in. separation was due specifically to the manipulanda being the same color as the discriminanda rather than simply to the presence of differential manipulandum color uncorrelated with reward. If the hypothesis were supported, the interference might be interpreted as an extinction effect attributable to the fact that an S sometimes pushes a white response block (same color as the positive discriminandum) and obtains no reward and sometimes pushes a black response block (same color as the negative discriminandum) and obtains reward.

Method

Apparatus and Ss were the same as in Experiment 1. On all trials, the positive discriminandum was orange and the negative yellow; and there was a 1-in. separation between discriminanda and manipulanda. In Condition I-U the manipulanda were identical (both purple) and unlike the color of the discriminanda. In Condition D-U the manipulanda were different from one another (one green and the other blue) and unlike the discriminanda. In Condition D-L the manipulanda were different from one another (one orange and the other yellow) and like the discriminandum in color. Locations of discriminanda and manipulanda were determined as in Experiment 1. For 12 days, testing was divided into six, 8-trial modules, two under each condition.

Results and Discussion

Over all days the percentage of correct responses

for all Ss was 70.7 for Condition I-U, 68.7 for Condition D-U, and 63.4 for Condition D-L. The difference between Conditions I-U and D-U was not significant ($t=0.24$, $df=3$; $p>.10$); but performance under Condition D-L was reliably less efficient than under Condition D-U ($t=3.09$, $df=3$; $p=.0585$).

The right panel of Fig. 2 shows a stronger tendency to prefer one manipulandum under Condition D-L than under Condition D-U. In Condition D-L the Ss' preferences were clearly for the orange manipulandum, identical in color to the positive discriminandum. In Condition D-U, there was no general tendency to prefer either manipulandum. In both conditions, preferences decreased over practice.

As in Experiment 1, discrimination is impaired with S-R separation if the colors of the manipulanda are different from one another, uncorrelated with reward, and identical to the discriminanda. Interference is primarily attributable to similarity of manipulanda and discriminanda rather than to differential manipulandum color being uncorrelated with reward. Irrelevant manipulandum color is apparently easier to ignore if it is different from the color of the discriminanda than if it is the same. The results of this experiment are compatible with the concept that interference in this situation is an extinction effect.

References

- Gellermann, L. W. Chance orders of alternating stimuli in visual discrimination experiments. *J. genet. Psychol.*, 1933, 42, 206-207.
- McCleary, G. E., & Harlow, H. F. The effect of spatial contiguity on discrimination learning by rhesus monkeys. *J. comp. physiol. Psychol.*, 1954, 47, 391-394.
- Polidora, V. J., & Fletcher, H. J. An analysis of the importance of S-R spatial contiguity for proficient primate discrimination performance. *J. comp. physiol. Psychol.*, 1964, 57, 224-230.
- Polidora, V. J., & Thompson, W. J. Orienting behavior and the S-R discontiguity effect in monkeys. *J. comp. physiol. Psychol.*, 1965, 59, 240-245.

Note

1. Supported in part by grant MH 08473 from the National Institute of Mental Health.