Proximity of manipulandum and foodcup as a determinant of the generalized S^D effect¹

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Abstract

An experiment was performed to determine if the discriminative control exerted by an S^D and S^Δ over an unrelated response might be due to the fact that the S^D elicits foodcup approach behavior which has the effect of bringing S nearer to the manipulandum, thereby increasing the probability of a response in S^D . This hypothesis was disconfirmed in that (a) the generalized S^D effect was obtained even under conditions where S^D -elicited foodcup approach would keep S as far away as possible from the manipulandum, and (b) during testing the S^D and S^Δ did not lead to differential numbers of foodcup approach responses.

Problem

Several studies (Bower & Kaufman, 1963; Estes, 1943, 1948; Morse & Skinner, 1958; Walker, 1942) have shown that after one stimulus (S^D) has been paired with reinforcement (S^R) and another (S^Δ) has been paired with nonreinforcement, these stimuli will exert discriminative control over a response which has never before occurred in the presence of these stimuli. This generalized S^D effect has been shown upon test responses learned prior to as well as subsequent to the establishment of S^D and S^Δ and upon responses learned with a different reinforcer from that paired with S^D (Bower & Kaufman, 1963) as well as responses learned with the same reinforcer.

Aside from these facts, however, essentially nothing more is known about the nature of this effect. The purpose of the present study is to investigate the dependence of the generalized S^D effect upon the physical relationship between the test response and the behavior involved in obtaining reinforcement.

In all previous studies of this phenomenon (except Walker, 1942) the same test chamber was used for (a) the S^D - S^R pairings, (b) conditioning the test response, and (c) testing the effect of S^D and S on the test response. Moreover, all of these chambers have been constructed with the manipulandum defining the test response and the foodcup or water dipper located on the same wall of the chamber and in very close physical proximity. Bower & Kaufman (1963) have suggested that the generalized S^D effect may be specific to this physical arrangement and may be accounted for in the following way. During the S^D - S^R pairings the S^D would become a discriminative stimulus for foodcup-approach behavior. Then, during the test for the effect of S^D on the test response, the S^D would elicit feeder approach responses, the result of which would necessarily be to put S in close physical proximity to the manipulandum. Thus, the increase in responding during

S^D might be due simply to the fact that S is more likely to be near the manipulandum.

This reasoning would lead one to expect that a response whose manipulandum is quite distant from the foodcup would certainly not be more likely during S^D , and actually might be less likely. The purpose of this study was to evaluate this hypothesis.

Method

Fourteen naive male albino rats ca. 120 days old served as Ss. The apparatus consisted of two identical operant conditioning chambers 15 in square and 15 in high. Each chamber was enclosed in a sound-shielded housing and was controlled by programming equipment located in an adjoining room. Each chamber was equipped with a microswitch-type response lever that could be moved to any position around the chamber, and a foodcup permanently fixed to one wall and into which .045 gm food pellets could be automatically delivered. This foodcup was constructed so that S had to nose open a light aluminum door to obtain the food pellets; a very light action microswitch attached to this door permitted foodcup responses to be recorded. A small loud speaker behind the foodcup wall permitted tone and clicker stimuli to be presented.

Ss were maintained throughout at 80% of their adult body weight. After two 25-min. adaptation sessions in their assigned chamber, all Ss received 15 daily 25-min. sessions (bar removed from the chamber) in which the tone and clicker were alternately present for 30-sec. periods. For half the Ss two pellets were delivered during each tone presentation, one after 10 sec., the other after 20 sec.; no pellets were delivered during the clicker presentations. For the other half of the Ss the role of the tone and clicker were reversed. Each pellet delivery was accompanied by the sound of the feeder operating and by a brief termination of the houselight.

Next, the bars were introduced into the chambers. For half the Ss (Proximate Group, Group P) the bar was on the same wall as and centered 4.5 in to one side of the foodcup; for the other half (Nonproximate Group, Group N) the bar was located at the opposite end of the box, 15 in away from the foodcup. With neither tone nor clicker present, Ss received 50 continuous reinforcements for bar pressing followed by five daily sessions of 30 reinforcements each of variable interval 1-min. reinforcement for bar pressing.

The final phase of the study consisted of two 30-min. sessions on successive days in which bar pressing was extinguished in the presence of the alternating tone

Table 1
Mean Bar Presses Emitted in S^D and S^Δ During Testing and the Proportion (P) of Individual Ss Making More Responses in S^D

	Day 1			Day 2		
	S^D	S^Δ	P	S^D	S^Δ	P
Proximate Group	62.8	51.5	6/7	29.4	26.8	5/7
Nonproximate Group	47.6	38.8	5/7	24.6	19.1	6/7

and clicker. In each of these sessions, S was placed in the box with neither tone nor clicker present, and the first bar press was reinforced. Immediately following that response, the S^Δ was presented for 30 sec. and thereafter the S^D and S^Δ alternated every 30 sec.

Results and Discussion

The mean number of bar presses emitted during S^D and S^Δ on each of the two test days for Group P and Group N is presented in Table 1. The fractions in the columns labeled P refer to the proportion of Ss making more S^D than S^Δ responses. Both groups averaged more S^D responses on both test days, although as would be expected from previous studies, the effect is not particularly large. Nevertheless, an analysis of variance of the data in Table 1 yielded a significant main effect for S^D vs. S^Δ ($p < .005$), and analyses of Group P and Group N separately showed significantly ($p < .01$, $.02$, respectively) more S^D responses in both cases. The interaction between bar placement and S^D - S^Δ yielded $F < 1.00$.

Foodcup responses were also measured during extinction, and an analysis of these revealed no differences even approaching significance. Of particular interest, both the S^D - S^Δ main effect and the interaction between bar placement and S^D - S^Δ yielded $F < 1.00$.

The results of this study, then, offer no support to the hypothesis that the generalized S^D effect depends upon S^D -elicited foodcup approach responses which bring S into closer proximity to the test response manipulandum. First, significantly more S^D bar presses were obtained under conditions where foodcup approach responses would serve to keep Ss as far from the manipulandum as possible. Second, no evidence was found in either group for more foodcup responses in S^D than in S^Δ during testing.

The question now arises as to what other interpretations of the generalized S^D effect might be available.

Certainly it is difficult to conceive of an interpretation in terms of any of the mechanisms of traditional single-stage S-R theory because the test response has never, prior to the demonstration of the effect of S^D and S^Δ upon it, even occurred in the presence of S^D or S^Δ . Some kind of mediational process (of which the hypothesis tested here is a very simple example) seems to be demanded by this phenomenon. However, to try to be more specific about the details of this mediational process would amount to little more than outright speculation. A very large number of logically possible mediating processes, differing both in the nature of the mediating behavior and in the mode of control the mediating behavior exerts upon overt behavior, could be invoked here. Moreover, (as is true with most phenomena that appear to require explanation in terms of mediating processes) since so very little systematic research has been done with the generalized S^D effect, there are no grounds at the present time for deciding among these various theoretical alternatives. The present study has reduced the number of possibilities by one; but it was able to do so only because the nature of this particular mediating process was spelled out so explicitly by Bower & Kaufman (1963). Further narrowing of the field will require that the other theoretical alternatives be spelled out just as clearly so that their implications can be tested, and that much more systematic research be directed to the generalized S^D phenomenon itself.

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