Bulletin of the Psychonomic Society
1991, 29 (4), 292-294

Blocking latent inhibition

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Nonreinforced exposure to a visual stimulus retards subsequent conditioning to that stimulus. If the stimulus is presented in nonreinforced compound with a second, nontarget, visual stimulus, this retardation of conditioning is abolished. If the nontarget stimulus component of the compound has itself been exposed, nonreinforced, prior to presentation of the compound, then conditioning to the target stimulus is stronger than it is if the stimuli are only exposed in compound prior to conditioning.

Nonreinforced exposure to a stimulus (CS) retards subsequent acquisition of conditioned responding when that CS is paired with reinforcement (US); this phenomenon is called *latent inhibition* (LI; see, e.g., Lubow, 1989, for a review). Recently, a number of attempts have been made to establish whether the development of LI can be "blocked" or "overshadowed" (e.g., Honey & Hall, 1988).

Although in several reports it has been noted that compound preexposure to a CS and a second stimulus does result in attenuated LI—that is, conditioning to the CS following preexposure proceeds relatively quickly following a putative overshadowing of LI procedure (e.g., Honey & Hall, 1988)—in a number of studies, researchers have failed to note a complementary blocking effect (e.g., Honey & Hall, 1988; Reed, Clark, & Rawlins, 1991). Exposure to the nontarget element of the compound prior to compound exposure has not reliably been found to produce better conditioning to the target than has an overshadowing of LI treatment.

The establishment of blocking in LI is of some theoretical importance, because various theories of stimulus preexposure make opposite predictions regarding its occurrence. Conditioned attention theory (Lubow, 1989) and associative interference theories (Hall, Kaye, & Pearce, 1985) suggest that blocking should occur. In contrast, the SOP model (see, e.g., Wagner, 1981) suggests that blocking should not occur (see Honey & Hall, 1988; Reed et al., 1991, for further discussion).

METHOD

Subjects

Thirty-two experimentally naive, male Sprague-Dawley rats were used. The subjects were 6-8 months old, had a free-feeding body weight of 435-590 g, and were maintained at 80% of this weight.

Thanks are due Todd R. Schachtman and Lisa A. Osborne for their support. This manuscript was prepared with the help of the Birmingham University School of Psychology. Requests for reprints should be addressed to Phil Reed, Department of Psychology, School of Social Sciences, University of Sussex, Falmer, Brighton, BN1 9QN, U.K.

Apparatus

Four identical operant conditioning chambers were used, from which the levers had been retracted. Reinforcement consisted of three 45-mg food pellets delivered at a rate of one pellet/100 msec to a centrally located food tray. The stimuli were two jewel lights. One (the target) was located centrally on the chamber wall above the food tray. The other light (the nontarget stimulus) was located centrally on the ceiling of the chamber. Other than the two visual stimuli, the chamber was not illuminated during the experiment.

Procedure

The subjects were divided into four equal groups (n = 8). Phase 1 lasted for four 35-min sessions. During each of these sessions, Group Block and Group LI were exposed to five 20-sec presentations of the nontarget stimulus. The first stimulus presentation occurred 5 min into the session; thereafter, this stimulus was presented every 5 min. The session ended 5 min after the final stimulus presentation. Group Overshad and Group Cond were placed in the chamber with no programmed events. Phase 2 consisted of four 35-min sessions. Groups Block and Overshad received five 20-sec presentations of a simultaneous compound stimulus of the target and nontarget stimuli. Group LI received five 20-sec presentations of the target stimulus alone. Stimulus presentations were distributed across the session as described in Phase 1. Group Cond were placed in the chamber with no programmed events. Following Phase 2, all subjects were magazine-trained in one 30-min session, during which food was delivered according to a variable 60-sec schedule. During the four conditioning sessions, all groups received five 20-sec presentations of the target stimulus, which were followed, immediately after offset, by reinforcement. Stimuli (followed by food presentation) were distributed across the session as described for Phase 1.

RESULTS

In Figure 1, the group-mean elevation ratio is averaged over each session (i.e., five trial blocks) of the conditioning phase of the study. The elevation ratio was calculated by measuring the number of magazine entries made during the CS period, and by dividing this number by the sum of magazine entries made during the CS period and in the 20 sec prior to CS onset. If a subject failed to respond during the CS period or the pre-CS period, a score of 0.5 was recorded; if the subject responded during the pre-CS period but not during the CS period, a score of 0 was given; if the subject responded during the CS period but not the pre-CS period, a score of 1.0 was given for that trial.

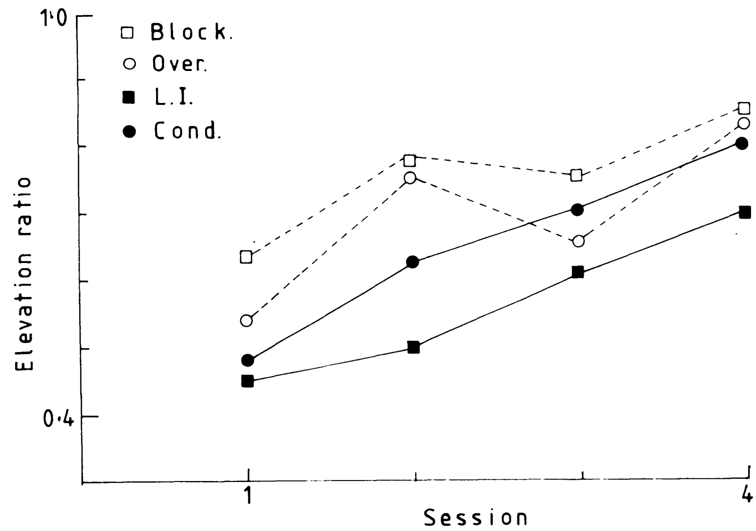

Figure 1. Group-mean elevation ratios in five-trial blocks for each session. Group Cond received no preexposure. Group LI received exposure to the nontarget stimulus prior to the target. Group Overshad received compound exposure to target and nontarget stimuli. Group Block received exposure to the nontarget stimuli prior to compound preexposure.

The group mean scores on the first trial were: 0.44 for Group Block; 0.44 for Group Overshad; 0.60 for Group LI; and 0.59 for Group Cond. An analysis of variance (ANOVA) conducted on these scores revealed no difference between the groups ($p > .20$).

All groups acquired the magazine entry response over the course of training, but they did so at different rates. Group Block commenced training at a higher rate than did Group Overshad, which in turn had a higher elevation ratio than did Groups Cond and LI. After two sessions, Groups Block, Overshad, and Cond all had higher elevation ratios than did Group LI. By the end of training, all the three former groups had similar elevation ratios, and all were higher than that for Group LI.

These data were analyzed with a two-factor ANOVA (group × session), which revealed a significant effect of group [$F(3,28) = 4.09, p < .05$] and session [$F(3,28) = 6.29, p < .05$], and an interaction between these factors [$F(3,84) = 5.62, p < .05$]. Analysis of the simple main effects of group on each session revealed significant differences for Sessions 1, 2, and 3 [minimum $F(3,84) = 4.72$, all ps $< .05$]. These differences were further investigated with Tukey's honestly significant difference tests. A rejection level of $p > .05$ was adopted for these tests. In Session 1, Group Block differed from each of the other groups. Group Overshad differed from Group LI. In Session 2, Groups Block and Overshad each differed from Group LI. In Session 3, Group Block differed from Group LI. In Session 4, Groups Block, Overshad, and Cond each differed from Group LI.

DISCUSSION

The present results confirmed that exposure to a target stimulus will retard conditioning to that stimulus in appetitive design. In addition, if the target is preexposed in a simultaneous compound, this latent inhibition is abolished (see also, Honey & Hall, 1988; Reed et al., 1991).

The finding of critical importance, however, was that the subjects in Group Block became conditioned relatively quickly, which is not itself novel (see Rudy, Krauter, & Gaffuri, 1976). The novel finding is that subjects exposed to a latent inhibition blocking design became conditioned faster than a group exposed only to a target/nontarget compound stimulus (see Honey & Hall, 1988, for criticisms of previous demonstrations of the effect, as in Rudy et al., 1976).

The finding that the development of latent inhibition can be blocked supports an associative interference (Hall et al., 1985) or conditioned attention (Lubow, 1989) view of stimulus preexposure, but it is at odds with the SOP model proposed by Wagner (1981). It should be noted, however, that other researchers have noted the opposite effect of a blocking design—that is, enhanced latent inhibition (Reed et al., 1991). These findings, taken together, pose problems for all existent theories of stimulus preexposure, and they prompt examination of the circumstances that lead to enhanced or attenuated latent inhibition with a blocking design.

It seems clear from a comparison of the present study with those of Honey and Hall (1988) and Reed et al. (1991) that if relatively few nontarget-alone presentations are given in Phase 1 of a blocking design, the attenuation of latent inhibition will be the likely result. If this exposure is increased, so that many more nontarget-alone as opposed to compound stimulus exposures are given, then this attention of latent inhibition is abolished or even reversed.

In the present study, few nontarget-alone presentations were given, but not only was the latent inhibition effect abolished, the blocking condition produced better conditioning than did an LI overshadowing treatment. Consideration of a number of reports suggests that this is the likely result if the locations of the CS and US are spatially distinct. For example, blocking was obtained by Rudy et al. (1976) and in the present study, in both of which cases such a spatial separation existed. Blocking was not obtained by Reed et al. (1991) or Honey and Hall (1988), in whose studies the CS and the US were presented in the same place, nor has it been obtained in cases in which such a distinction is difficult to apply (e.g., flavor aversion). The reasons why such an effect may occur are far from clear, but this effect may be related to the effects of attentional (orienting) responses being directed to a location spatially distinct from the location to which conditioned (or goal-tracking) responses are directed.

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(Manuscript received November 17, 1990.)