Conditioned suppression following CS preexposure*

MICHAEL DOMJAN and SHEPARD SIEGEL
McMaster University, Hamilton, Ont., Canada

The present experiment evaluated both unconditioned and conditioned suppression in response to a preexposed CS in order to determine the extent to which these two processes contribute to the observation of "latent inhibition" in the conditioned suppression situation. Independent groups of rats received 0, 2, 5, 10, 25, or 50 CS preexposures prior to conditioned suppression training. Ss receiving more than 2 CS preexposures did not evidence unconditioned suppression in response to the CS, but nevertheless differed in acquisition of the conditioned suppression response, with more extensive preexposure associated with less conditioned suppression.

The presentation of a novel stimulus often disrupts ongoing responding. This unconditioned suppression, or "external inhibition" (Pavlov, 1927), may be readily eliminated by presenting the stimulus a number of times without reinforcement (e.g., Carlton & Vogel, 1965). Repeated presentations of a stimulus, however, also retard the acquisition of conditioned suppression to that stimulus if it is subsequently used as the CS in a conditioned suppression procedure (Anderson, Merrill, Dexter, & Alleman, 1968; Anderson, Wolf, & Sullivan, 1969; Carlton & Vogel, 1967; Leaf, Kayser, Andrews, Adkins, & Leaf, 1968; Lubow & Siebert, 1969; May, Tolman, & Schoenfeldt, 1967; Siegel & Domjan, 1971). The deleterious effects of unreinforced preexposure to the CS on the acquisition of conditioned suppression are similar to the latent inhibition phenomenon originally described by Lubow & Moore (1959) and subsequently demonstrated in a wide variety of conditioning preparations (see reviews by Cantor, 1969; Siegel, 1971).

Preconditioning exposure to the CS thus appears to have two effects in the conditioned suppression situation: it attenuates unconditioned suppression to the CS, and it interferes with the acquisition of conditioned suppression. The deleterious effects of CS preexposure on the acquisition of conditioned suppression may be a result of the fact that CS preexposure reduces unconditioned suppression to the CS. Alternately, it is possible, as some have suggested (Lubow & Siebert, 1969), that the effects of CS preexposure on the acquisition of conditioned suppression are independent of the effects CS preexposure has on unconditioned suppression to the CS.

*This research was supported by Grant APA-0298 from the National Research Council of Canada to Shepard Siegel.

The purpose of the present experiment was to determine the extent to which the latent inhibition effect observed in the conditioned suppression situation is a consequence of attenuated unconditioned suppression to the CS following preexposure.

SUBJECTS AND APPARATUS

The Ss were 47 experimentally naive male albino rats weighing 200-250 g at the start of the experiment. Individual Ss were run in one of four identical Lehigh Valley Skinner boxes (Model 1316), each equipped with two retractable bars. The right bar was retracted throughout the experiment, only the left bar being used. Ss were housed in individual cages, with water freely available in the cages and Skinner boxes. The CS consisted of a 1-min presentation of a 1,400-Hz tone, interrupted 4 times/sec. The cue lights in the Skinner box, located over each bar, pulsed on and off in synchrony with the interrupted tone. The US, a 1.0-mA 0.5-sec scrambled electric shock delivered to the grid floor of the Skinner box, was generated by a Lehigh Valley constant-current shock generator (Model 113-04).

DESIGN

The investigation consisted of three phases: (1) preliminary barpress training, (2) preexposure to the CS, and (3) conditioned suppression training. Ss differed only in their treatment during the preexposure phase of the experiment. Six independent groups received 0, 2, 5, 10, 25, or 50 preconditioning CS-alone presentations. Originally, eight Ss were assigned to each group, but one S in Group 25 died during the course of the investigation.

PROCEDURE

All Ss were gradually reduced to 75% of ad lib weight and were maintained at that weight throughout the investigation. They were shaped to press the bar for .045-g food pellets and were weaned to a VI 1-min

schedule of reinforcement. This preliminary barpress training required five daily 1-h sessions, with the VI 1-min schedule in effect for the last three sessions.

Following this preliminary training, Ss received preexposure to the CS. This preexposure was conducted during two daily 6.5-h sessions. The bar was retracted during preexposure, and no food pellets were delivered. Ss in Group 0 were simply placed in the Skinner box during both days of this phase of the experiment, receiving no CS presentations. Ss in Groups 2, 5, 10, and 25 received no CS presentations on the first preexposure day but received the appropriate number of CS-alone presentations during the second preexposure session. The 1-min CS was presented once every 15 min, these presentations being scheduled so that the last presentation for each group occurred 15 min prior to the end of the preexposure session. Thus, Ss received their last preconditioning CS presentation at the same time but differed in the duration of confinement in the Skinner box prior to the first presentation. Ss in Group 50 received 25 CS-alone presentations on each of the two preexposure days.

Following preexposure, Ss received conditioned suppression training during three daily 1.5-h sessions, with the bar again extended into the Skinner box and the VI 1-min schedule in effect. Three conditioning trials, spaced 30 min apart, were presented during each session. Conditioning trials consisted of the CS presented for 1 min, terminating in 0.5 sec of shock. Both the number of barpress responses occurring during the CS and the number of responses occurring during the 1-min period

Fig. 1. Mean unconditioned suppression (Trial 1) and conditioned suppression (Trials 2-9) ratios for groups given different amounts of CS preexposure.

prior to the CS were recorded for each conditioning trial.

RESULTS

The Ss' performances on each trial of conditioned suppression training was expressed as a "suppression ratio," calculated according to the formula $A/(A + B)$, where A is the number of barpresses during the 1-min period in which the CS was presented and B is the number of barpresses during the 1-min period immediately prior to CS onset. Thus, a suppression ratio of 0.50 indicates that the CS has no effect on responding, and lower ratios indicate increasing degrees of CS-elicited response suppression.

A measure of unconditioned suppression to the CS was available from Ss' performance on the very first acquisition trial, prior to any association of the CS with shock. A measure of conditioned suppression to the CS was provided by computing the mean suppression score for each S for Conditioning Trials 2-9. These two indices of response suppression for each group of Ss are displayed in Fig. 1. A nonparametric Kruskal-Wallis analysis of variance indicated a significant effect of preexposure frequency on both unconditioned suppression to the CS ($H = 12.7$, $p < .05$) and conditioned suppression to the CS ($H = 12.6$, $p < .05$). However, as may be seen in Fig. 1, the effects of CS preexposure on unconditioned suppression did not parallel the effects of CS preexposure on conditioned suppression. No unconditioned suppression to the CS was observed for Groups 5, 10, 25, and 50 on the first conditioning trial.

Nevertheless, these groups showed increasingly deleterious effects of CS preexposure on the acquisition of conditioned suppression as the number of preexposure trials was increased. As indicated in Fig. 1, Groups 25 and 50 evidenced less conditioned suppression than did Groups 5 and 10 (Mann-Whitney $U = 58$, $p < .02$, two-tailed), but did not differ in Trial 1 suppression ($U = 112$, $p > .50$).

DISCUSSION

The finding that only Groups 0 and 2 suppressed responding when presented with the CS on the very first acquisition trial suggests that, in the conditioned suppression situation, unconditioned suppression is elicited only by a relatively novel stimulus or a stimulus with which S has had only minimal experience. As few as five preconditioning presentations of the CS were sufficient to eliminate unconditioned suppression to the stimulus.

Despite the fact that Groups 5, 10, 25, and 50 did not evidence unconditioned suppression to the CS, they differed in acquisition of the conditioned suppression response; Ss which received extensive preexposure to the CS (Groups 25 and 50) did not acquire the conditioned suppression response to the same degree as Ss which received fewer CS preexposures (Groups 5 and 10). Thus, it would appear that the deleterious effects of CS preexposure on the acquisition of conditioned suppression cannot be interpreted simply as due to greater unconditioned suppression evidenced by non-preexposed Ss to the relatively novel CS.

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