The effect of intersession interval in shuttle-box conditioning of the guinea-pig¹

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Abstract

Sixty guinea-pigs were given 50 avoidance conditioning trials in a shuttle-box and then retested either 0, 1, 24, 48, or 168 hr. later. Little improvement in performance was observed within sessions but animals retested at 48- and 168-hr. intersession intervals were substantially better than all others.

Problem

In a study of shuttle-box avoidance conditioning in guinea-pigs, the authors found that animals made few avoidance responses in 50 or even 150 trials and showed little or no improvement in performance over trials. If the Ss were given a second training session two days later, a striking improvement was noted. One S made only three avoidance responses in the first session of 50 trials (only 1 in the last 20 trials) but made 18 avoidance responses in a 20 trial session two days later. The present study was conducted to confirm these observations and to explore the improvement in performance as a function of the duration of the intersession interval.

Method

The Ss were 60 experimentally naive, young, female guinea-pigs ranging in weight from 320 gm to 515 gm at the start of the experiment. The apparatus was a two compartment shuttle-box 30 in long, 6 in high and 7 in wide. There was no partition between the two halves of the box. The top and front side of the box were made of Plexiglas, the back and ends were unpainted plywood. The floor of each compartment consisted of 30 metal rods set 1/2 in apart. The CS was from a Holtzer Cabot 24-v buzzer suspended 9 1/2 in above the center of the box and from one of two 25-w lights mounted 2 1/2 in above the Plexiglas top at the ends of the box. The light over the compartment occupied by S was made to flash at 1 cycle per sec. A scrambled shock source (Grason-Stadler, Model E6070B) supplied 3 ma at 350 v, 60 cycles, A. C.

The first training session was the same for all Ss. After a 5-min. habituation period in the apparatus, each S was presented with the CS alone until no reaction was made for three consecutive trials. After the Ss had become acclimatized to the CS, 50 delay conditioning trials with a 10-sec. CS-UCS interval and 1-min. intertrial interval were given. Both CS and UCS were terminated when the S crossed the center line of the shuttle-box.

The 60 Ss were randomly assigned to five experimental groups with 12 Ss in each group. Each group received a second training session of 25 trials after an interval of 0, 1, 24, 48, or 168 hr. With the exception

of the 0 interval group, Ss were returned to their living cages for the appropriate interval between sessions. In order to equate handling, Ss in the 0 interval group were taken from the apparatus after the 50 trials of the first session and replaced 30 sec. later.

Results

The results in terms of percentage avoidance responses in blocks of trials are shown in Fig. 1. Since an analysis of variance on total number of avoidance responses for different groups in the first session was not significant, the individual group curves have been combined in Fig. 1.

The relatively high level of performance in the first 10 trials of the first session was probably due to sensitization to the CS after the first few shocks. The upward trend from the second to the last block of trials in the first session was significant ($t = 2.08$; $df = 58$; $P < .05$) indicating a small but reliable improvement in performance.

An analysis of covariance was performed on the total number of avoidance responses for the different groups in the second session using first session totals as the covariate. The result was highly significant ($F = 6.94$; $df = 4, 54$; $P < .005$). Adjusted mean avoidance scores converted to percentages are shown in the right of Fig. 1. Tukey's gap test ($P = .05$) applied to adjusted means indicated that the 48- and 168-hr. groups were reliably different from all other groups. No other gap was significant. There was no evidence for a systematic change in performance within the second session.

Perhaps the most obvious hypothesis to account for the striking increase in performance after a 48-hr.

Fig. 1. Mean percentage of avoidance responses in blocks of 10 trials (first session) and 5 trials (second session). The data points at the far right are mean percentages of avoidance responses adjusted by covarying on the total number of avoidance responses in the first session.

intersession interval is in terms of incubation of fear to the CS, that is, the capacity of the CS to elicit fear grows with time after CS-shock pairings. If avoidance performance is an indicator of the degree of fear elicited by the CS then the improved performance after a long intersession interval in the present study is readily understood. However, in recent studies (McAllister & McAllister, 1963; Saltz & Asdourian, 1963) evidence has been obtained which indicates that the "incubation" effect may be due, not to an increase in fear to the CS, but to increased generalization or spread of fear with time after training. In both studies, it was found that avoidance responding by rats was better 24 hr. after conditioning if original learning and testing were conducted in different boxes. If the same apparatus was used on both occasions, performance was about the same with 0 and 24-hr. intersession intervals. In the present study, both sessions were conducted in the same apparatus under as nearly identical conditions as could be arranged.

An alternative hypothesis is the possibility that

massed shocks elicit emotional reactions which tend to interfere with instrumental responding. An animal's emotional reactivity is assumed to decrease with time so that, in the second session, a higher level of performance is possible. Of course, with improved performance fewer shocks are received and interfering emotional responses tend not to be elicited. The precise nature of the postulated interfering "emotional reactions" is a subject for further study.

References

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Note

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