Factors affecting intersession facilitation of avoidance learning in guinea-pigs¹

C. D. WEBSTER, C. J. BRIMER AND I. EVONIC
DALHOUSIE UNIVERSITY

Abstract

Two experiments were carried out to investigate shuttle-box avoidance learning in the guinea-pig. In Experiment 1, shock intensity and intertrial interval (ITI) were varied according to a 2 by 2 factorial design. Neither factor was found to affect first-session avoidance performance. However, Ss initially trained with the long ITI showed a significant increase in avoidance performance when retested 48 hr. later. In Experiment 2, there were four groups of Ss who initially received either, 10, 20, 50, or 100 training trials. All animals were then given five further training sessions with an interval of 48 hr. intervening between each session. Although avoidance responding was low in all groups during the original training session, there was a marked improvement in subsequent sessions. This improvement occurred earlier with the 50 and 100 trial animals than with the 10 and 20 trial Ss.

Problem

Guinea-pigs tend to make very few avoidance responses during an original learning session in a standard two-way shuttle-box. If, however, the animals are given a second session, after an intersession interval (ISI) of 48 hr., they show a striking improvement in performance (Webster & Rabedeau, 1964).

Experiment 1 was designed to explore the effects of shock intensity and length of intertrial interval (ITI) upon first-session avoidance performance. Animals were retested without the UCS after an ISI of 48 hr. in order to assess the effect of first-session shock intensity and ITI on second-session performance. Experiment 2 was conducted to find out the extent to which the "48-hour" effect depends upon number of original learning trials.

Experiment 1

Method

The Ss were 32 young guinea-pigs ranging in weight from 350 to 590 gm at the start of the experiment. The apparatus was a fully automated two-way shuttle-box 30 in long, 7 in wide and 6 in high. The floors of the box consisted of stainless steel rods. The shuttle-box was housed in a sound-deadened freezer chest and programming and recording equipment was located in an adjacent room. The CS was an 82 db white noise (ambient noise level 72 db) and the UCS was unscrambled shock supplied to the grid floor of either compartment by a Grason-Stadler Model E6070B Shock Generator.

Shock intensities were either 0.4 ma (Low) or 2.0 ma (High). Intertrial intervals were either 30 sec.

(Short) or 120 sec. (Long). Combining shock intensity and ITI in a factorial design gives rise to four experimental conditions. Eight Ss were randomly assigned to each of the four groups and given 50 original delayed avoidance conditioning trials. The CS-UCS interval was 10 sec. for all groups. The S could escape the shock (and simultaneously terminate the CS) by crossing the center-line of the shuttle-box. When the animal crossed during the 10 sec. CS-UCS interval the CS was terminated and shock was not delivered. If the animal failed to escape within 15 sec. of shock onset, the UCS was automatically switched off. Upon completion of the first session, Ss were returned to their living cages for 48 hr. With the exceptions that no UCS was employed, and that half the animals were retested under the ITI condition opposite to that under which they were trained, the same conditions were used in the retest as had been employed in the original learning session.

Results

The results are shown in Fig. 1 in terms of percentage avoidance responses in blocks of trials. Since both the two main effects and their interaction were not significant at the 5% level, the four individual first-session curves have been combined. It is clear that not only is the overall level of avoidance responding very low but there is little or no improvement over blocks of original learning trials.

Analysis of variance on second-session avoidance scores revealed that the first-session shock intensity factor and the interaction between first-session shock intensity and first-session ITI were not significant. However, the first-session ITI effect was reliable ($F = 6.60$; $df = 1, 28$; $p < .05$). In Fig. 1 the curves of the

Fig. 1. Mean percentage of avoidance responses in blocks of 10 trials (first session) and 5 trials (second session).

two first-session short ITI groups have been combined, as have those of the two first-session long ITI groups. Animals originally trained with a short ITI made no improvement in avoidance responding in the second session, in marked contrast to the improvement shown by the Ss in the groups originally trained with a long ITI. Since, in the second session, an extinction procedure was used, the decrement in avoidance behavior over the second-session trials can presumably be attributed to the absence of UCS.

Experiment 2

Method

The Ss were 32 young guinea-pigs ranging in weight from 250 to 355 gm at the start of the experiment. The experiment was completed by using two replications with 16 Ss in each replication. Two shuttle-boxes were employed. Eight Ss were randomly assigned to each of four experimental groups which were given either 10, 20, 50, or 100 original training trials. Following original training, all animals received a further five test sessions, each consisting of 10 trials, with intervals of 48 hr. between each session. In all sessions the CS-UCS interval was 10 sec., the ITI was 60 sec., and the UCS intensity was 1.0 ma.

Results

The overall avoidance response level of Ss in the second replication was higher than that of Ss in the first replication. Since, however, the main finding of the experiment was statistically reliable when either replication was considered separately, the data from both replications were combined in the analyses outlined below.

The principal results are shown in Fig. 2. The curves on the left represent the original-learning avoidance performance of the four groups. Although animals in the 50 trial group made more avoidance responses than did Ss in the 100 trial group during their first 50 trials, the difference between these scores was not significant ($F=1.06$; $df=1,14$; $p>.05$). When the first-session performance of the 10, 20, and 50 trial groups are compared with that of the 100 trial group, it seems that any rise in level of avoidance responding over the first few blocks of 10 trials tends to level off with continued training. An analysis of variance of the four groups over the five test sessions showed that the Group and Test Session effects were significant (Groups - $F=11.34$, $df=3,28$, $p<.005$; Test

Sessions - $F=28.85$, $df=4,112$, $p<.005$). The Group by Test Sessions interaction was also reliable ($F=2.10$, $df=12,112$, $p<.05$).

Discussion

The present study provides additional information about the phenomenon reported by Webster & Rabedeanu (1964). First, original-session avoidance performance was not found to be affected by either shock intensity or duration of ITI (Experiment 1). It is clear, however, that additional values of both parameters need to be examined. Second, despite the absence of shock in the retest, Ss trained with a long ITI showed an improvement in performance after an ISI of 48 hr, whereas Ss trained with a short ITI made no improvement (Experiment 1). Third, little or no improvement in avoidance performance was initially observed after 10 or 20 original learning trials and an ISI of 48 hr. (Experiment 2). It appears that the marked improvement in avoidance performance following a 48 hr. ISI does not occur unless a relatively large number of trials are given in the original learning session.

Fig. 2. Mean number of avoidance responses during original and test sessions.

References

Webster, C. D., & Rabedeanu, R. G. The effect of intersession interval in shuttle-box conditioning of the guinea-pig. *Psychon. Sci.*, 1964, 1, 73-74.

Note

1. This research was supported by Research Grant APA-105 to C. J. Brimer from the Associate Committee on Experimental Psychology, National Research Council of Canada.