Proactive interference in rats¹

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Four groups of rats were taught a visual simultaneous discrimination with a non-correction procedure. Two of the groups had previously been trained to make the reverse discrimination, the other two had no prior training. Two groups were given a relearning test one day after training, while two others were tested 32 days after training. There was no retention loss unless prior interference had been provided. Thus, proactive interference was demonstrated.

The most influential current approach to forgetting is stated in terms of proactive inhibition (Underwood, 1957). According to this view competing habits already present in S's repertoire are extinguished in the course of original learning only to recover spontaneously during the retention interval and thus interfere with the correct response at the time of test. This analysis draws support from the fact that proactive inhibition (PI) increases with increasing retention interval, a point that has been made repeatedly at the level of human verbal learning (e.g., Underwood, 1948; Briggs, 1954). At the animal level attempts to demonstrate the existence of PI, let alone its usual temporal parameters, have, with one exception (Gleitman & Jung, 1963), been unsuccessful (Kehoe, 1963; Rickard, 1965; Crowder, 1966). This state of affairs is rather surprising, since the proposed mechanisms of PI are in terms of processes (extinction and spontaneous recovery) for which there is no dearth of authentication at the animal level.

It has been suggested (Kehoe, 1963) that a critical factor in such studies is the use of correction as opposed to non-correction procedures. The former is typically employed in verbal learning experiments, the latter in animal studies. Kehoe argues that, given the correction method, the correct response is learned rather quickly and gains ascendance over the competing habits before they are completely extinguished. In contrast, the non-correction method assures a more thorough extinction of the inappropriate response by the time criterion has been reached. One might thus expect less PI following training by the non-correction method since the competing responses may have been extinguished below a point from which they can spontaneously recover. Indeed, the one study to date which has yielded clear-cut evidence of PI in animals utilized a correction procedure (Gleitman & Jung, 1963). The present study demonstrates that this factor is not critical, showing sizable PI in rats trained by the non-correction method.

Method

The Ss were 48 male hooded rats maintained on a 23 hr. feeding schedule and at 85% of their ad lib body

weight throughout the entire experiment. They were approximately 100-120 days of age at the start of the experiment. Three standard rat test chambers served as apparatus, each equipped with three response panels 2-1/2 in. wide and 3 in. high. Two of these panels were mounted on the front wall, one on the back wall of each chamber. Stimuli were projected on the response keys by means of In-line projectors.

All Ss were first trained to press the front panels, uniformly illuminated by white light, and yielding reinforcement whichever of them was pressed. At the next stage of pretraining, each trial began with the rear panel illuminated. Pressing the rear panel turned off its light and lit the two front panels. Again, a response to either of these was reinforced.

Following pretraining, the Ss were presented with a simultaneous discrimination. White vertical and horizontal lines on a black background served as the stimuli. As before, each trial started with the rear panel uniformly illuminated. When this was pressed, the stimuli appeared on the front panels, their position determined by a Gellerman order. A response to the wrong panel turned off both stimuli and initiated a 7-sec. intertrial interval. A response to the correct panel turned off the wrong stimulus, and deactivated its panel. A second response to the correct stimulus terminated that stimulus, produced a 45 mg sucrose pellet, and started the 7-sec. intertrial interval. (Requiring two responses to S+ increases S's exposure to that stimulus, thus facilitating acquisition.) For half of the Ss vertical stripes served as S+, for half they served as S-. Ss were run for 40 trials a day.

Ss were run to a criterion of 32 or more correct trials in a session. The Ss were then divided into reversal (R) and nonreversal (NR) groups matched by "days to criterion." Half of the NR Ss, again matched by days to criterion, were tested one day after the criterion day (NR-1) and half were tested 32 days later (NR-32). All Ss in the R groups were trained on the reverse of their original discrimination until they reached the same criterion of 32 of 40 trials a day. Matched by days to criterion on the second discrimination, half of the Ss in the R group were tested one day later (R-1), half were tested 32 days later (R-32). On the test day the Ss were confronted by the last discrimination to which they had been exposed. The test consisted of 40 trials of this discrimination using the identical procedure in force during acquisition.

Results

Not surprisingly, there was considerable negative transfer between the two discriminations learned by the R groups. The mean number of sessions required

Fig. 1. Mean number of errors on last day of acquisition and on test day.

to criterion was 5.79 for the first discrimination and 8.88 for the second discrimination ($t=3.23$, $df=46$, $p<.001$).

Our primary interest concerns the retention test. Figure 1 presents the mean number of errors across 10 trial blocks on the last day of acquisition and on the test day for the last discrimination learned. As can be seen, there was little retention loss unless prior interference was provided. An analysis of variance was conducted using difference scores for errors on test and final training sessions, yielding significant effects of reversal ($F=5.91$, $df=1/44$, $p<.025$), retention interval ($F=13.30$, $df=1/44$, $p<.001$), and the interaction between reversal and retention interval ($F=14.43$, $df=1/44$, $p<.001$). A Duncan Multiple Range Test showed that NR-1 did not differ significantly from NR-32 or from R-1, either across the 40 trials or on any block of 10 trials. On the other hand, R-32

differed significantly from both R-1 and NR-32 ($p<.001$). This difference held throughout all trial blocks ($p<.05$) indicating that the interference effect persisted throughout the entire 40 trial session.

Discussion

PI was demonstrated with rats using a non-correction procedure. Thus, the use of a non-correction method cannot be offered as an explanation for failure to find such interference effects in animals. Under the circumstances, it is still unclear why PI was not obtained in some prior studies. Some possibilities include the employment of rather short retention intervals (Rickard, 1965, and Crowder, 1966, used a maximum retention interval of seven days) and terminal acquisition levels that were too high (most of the previous studies used more stringent criteria than ours).

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Notes

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