Inhibitory effects of post trial stimulation on classical eyelid conditioning under partial reinforcement¹

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Abstract

Four groups were given 50 reinforced and 50 non-reinforced eyelid conditioning trials on each of two days. One group received a tone immediately following each reinforced trial; one group received the tone following each non-reinforced trial; one group received the tone following every trial and one group received no tones. When the tone appeared following a non-reinforced trial, performance was lowered irrespective of whether or not it appeared on reinforced trials. Performance differences on the second day were small and non-significant.

Problem

In a previous study (Runquist, Sidowski, & Gormezano, 1962) it was suggested that the amount of inhibition generated by non-reinforcement in classical eyelid conditioning will be greater when the non-reinforcement trials are more clearly differentiated from reinforced trials. Any characteristic which is differentially associated with reinforced and non-reinforced trials can serve to enhance this discrimination. In this experiment, an additional stimulus was presented immediately following either reinforced or non-reinforced trials in a partial reinforcement situation in an attempt to provide an additional source of differentiation between reinforced and non-reinforced trials. Since the CS is identical on both kinds of trials, this stimulus cannot serve as a differential cue to produce differential conditioning but should exhibit the greater general effects of inhibition by lowering overall performance.

Method

Four groups of 20 undergraduates each comprised this study. Each S served for two consecutive days receiving 50 reinforced and 50 non-reinforced (UCS omitted) classical eyelid conditioning trials on each day. The sequence of reinforced and non-reinforced trials was random except for the restriction that each block of 20 trials contained 10 reinforced and 10 non-reinforced trials. The groups differed in the appearance of a tone stimulus coinciding with UCS offset or the time of UCS offset if the latter were not delivered. Group NR received the tone only on non-reinforced trials, Group R received the tone on reinforced trials, while Group R-NR received the tone on both reinforced and non-reinforced trials. Group C was a standard partial reinforcement conditioning having no tone.

The conditioning laboratory and apparatus have been described in detail elsewhere (Runquist & Muir, 1965).

Essentially, two Ss sat in isolated booths each facing a white wall from which protruded a black box containing a 3 by 5 in ground glass face. The CS was an increase in brightness of this glass face to a value of 12.0 as measured with a Gossen-Luna - 6 light meter. Room illumination provided a background level of 14.2 from the white wall. The UCS was a puff of compressed nitrogen of 100 msec. duration and 80 mm (mercury) intensity delivered 50 msec. after CS onset. All stimuli were timed with Hunter timers and programmed with punch tape. The tone was delivered through Telex earphones at an intensity of .05-v and a frequency of 700-cps by a Smith Code Practice Oscillator. It began 600-msec. after CS onset and was .5-sec. in duration. The recording system consisted of the Mechanical-electrical linkage system now in common use. A CR was defined as a 1 mm deflection between 150 - 500 msec. after CS onset.

The Ss were given neutral instructions prior to the first session and told that nothing would change prior to the second session. Trials followed irregularly spaced at 15, 20 or 25-sec.

Results

Performance in terms of per cent CRs over blocks of 20 trials is shown in Fig. 1 for the two sessions. The first session produced diverging curves for the four groups although the Groups C and R did not differ greatly nor did Groups NR and R-NR. No systematic trends were apparent in the second session although groups tended to maintain the same relative position.

Fig. 1. Per cent CR's in blocks of 20 trials for both sessions.

For statistical analysis, performance following reinforced and non-reinforced trials was separated as previous results (Runquist, 1963) have shown that partial reinforcement effects differ on the two kinds of trials. In the first session, two important interactions emerged: Trials by Groups, $F(12, 684) = 2.55$, $p < .01$, and Groups by Reinforcement, $F(3, 684) = 4.20$, $p < .01$. The former reflects the divergence of the curves shown in Fig. 1, while the latter reflects a rather complex relationship whereby performance was lower following non-reinforced trials than following reinforced trials for all groups except Group R where there was no difference. Differences for the other groups were about the same. The per cent CRs were 45% and 35% for Group C; 38% and 29% for Group R-NR; 33% and 29% for Group NR and 38% and 39% for Group R. In the second session, only Trials by Reinforcements was significant. On the initial block of trials, performance was better following non-reinforcement, but the differences reversed then converged by the end of the session. In general, it can be concluded that in the second session there were no significant differences attributable to the tone, although the ordering of the groups was virtually identical to that at the end of the first session.

Discussion

The pattern of results does not appear to be consistent with the hypothesis relating inhibition to differentiation between reinforced and non-reinforced trials. If this were the case, one would expect at the very least that the positions of the R and R-NR groups would be reversed and the difference would be reflected in the difference between performance following reinforced and non-reinforced trials. Indeed, one might even expect that Group R would show the poorest performance since both tone and UCS always occurring together on the same trials should provide the best differentiation. Similarly, Group R-NR might be expected to perform at a higher level than Group C since having the

tone on both reinforced and non-reinforced trials could make these trials more similar. Apparently, then, the differentiation hypothesis is in error at least as far as the present situation is concerned, for the dominant pattern is that performance is lowered when the tone appears on non-reinforced trials irrespective of its inclusion on other trials. It would be tempting to thus conclude that the inhibition generated by non-reinforcement is enhanced when the tone is presented on those trials. Without appropriate continuously reinforced controls where the tone is present, this conclusion is, of course, impossible. These controls are now being run along with a replication of the present study.

Although we are at somewhat of a loss to explain these findings at the present time, it is tempting to speculate on the possible role of the tone as a safety signal. If the tone becomes a signal that the noxious UCS is not forthcoming it could produce a reduction in general drive or the level of responsiveness which is presumably produced by the UCS and carries over from trial to trial (Spence, 1956). If this were to be a valid explanation one might expect the largest inhibiting effect of the tone to occur following a non-reinforced trial, which is true of the present data although the effect is not large. At any rate, further exploration of this hypothesis would seem to be indicated.

References

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Notes

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