Response contingent shock and avoidance conditioning¹

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Hooded rats were trained on an avoidance conditioning task with varying amounts of response contingent shock (RCS) for the first 20 trials. RCS was either manipulated (withheld or added) or not manipulated when S began to respond during the CS-UCS interval. Ss were tested in 30 additional trials. RCS increased freezing and individual differences, and decreased mean avoidances. It is suggested that withholding shock has a combined effect of reducing freezing and of behavior shaping.

In recent years considerable attention has been directed toward the analysis of individual differences in the acquisition of an avoidance response. The individual differences are most striking when comparisons are made across tasks which, at least superficially, appear similar. Thus, the difficulty of conditioning a discriminated lever-press avoidance response is considerable compared with conditioning a running response in a shuttlebox (Meyer, Cho, & Wesemann, 1960). However, even within a single task, performance often ranges from response acquisition in several trials to failure to avoid in several hundred trials (Bindra, 1961).

The variability typically encountered in conditioning a discriminated avoidance response suggests that test procedures, while alike for all groups, may not be alike for all individuals within all groups. Accordingly, the present study investigated shock response contingencies as a procedural variation contributing to individual differences in avoidance conditioning. This contingency has been examined indirectly by Sheffield (1948) in his analysis of the Brogden, Lipman, & Culler (1938) study, wherein it was observed that the response to the CS was a function of previous behavior to the UCS, and that the poor performance with unavoidable shock could be attributed to the fact that presenting shock during the anticipatory run to the CS often stopped running behavior rather than furthering it. Similarly in standard avoidance conditioning procedures, if the onset of the shock occurs while the animal is running, the animal is punished for making the correct response. The present experiment was designed to compare performance of Ss trained on an avoidance conditioning task with varying amounts of response contingent shock.

Method

Thirty-six Long-Evans rats, 75 to 150 days of age, selected from the colony maintained at West Virginia University Animal Behavior Laboratory served as Ss. Three groups of 12 Ss matched according to age and sex were given three daily 10-min. handling and pre-

experimental adaptation periods which involved placing the animal in the shuttlebox and desensitizing S to the light CS.

The Ss were tested in four identical Miller-Mowrer type shuttle-boxes 30 in. long, 10-1/2 in. wide, and 6 in. high. A scrambled shock source was adjusted to produce a dependable running response without inducing disruptive responding. A light source, producing a 10 ft.-c. change in illumination at the grid, projected through two flashed opal panels of glass in the ceiling at the ends of the boxes served as the CS.

The experiment was conducted in three phases: Twenty treatment acquisition trials followed by 30 test acquisition trials and 50 extinction trials. For the control group, a standard conditioning group, response contingent shock was not manipulated in the treatment trials. For a second group (shock-withheld) the shock was withheld if the S began to respond. For both groups the CS-UCS interval was 6 sec. In the third group (shock added) rather than withholding shock if the S began to respond within 6 sec. shock was presented; otherwise the CS-UCS was 6 sec. In all cases, the trial terminated when S crossed the midline of the shuttlebox. At the end of the 20 treatment trials all Ss were given the 30 test acquisition followed by 50 extinction trials.

The CS-UCS interval for all acquisition trials was 6 sec. with an intertrial interval of 2 min., ± 20 sec. During extinction, the CS was terminated either when S crossed the midline or after 8 sec., whichever was first.

The number of freezings (rigid posture rather than the more relaxed orienting response to the CS) and the number of response contingent shocks (RCS) during the treatment trials, the number of avoidances for the test trials, and the responses terminating CS during

Table 1. Summary of Results

Comparison	Experimental Condition		
	Control	Shock Withheld	Shock Added
Mean RCS			
Trials 1-20	.92	.00	8.8
Mean Avoidance			
Trials 21-50	23.3	27.1	19.3
Standard Deviation	8.6	2.4	9.1
Mean Extinction			
Responses	39.6	44.1	38.0
Standard Deviation	18.3	6.6	20.9

extinction were recorded.

Results and Discussion

The results are summarized in Table 1. A mean of 8.8 RCSs was recorded for the shock-added group during the treatment trials. In the control group, in which shock contingency was not controlled, eight Ss received one RCS, one S received three, and the remaining three received no RCSs. Of course, no Ss received RCSs in the shock-withheld group. The behavior of the Ss during treatment acquisition trials was markedly different for the three groups. The shock-withheld group showed significantly less freezing behavior ($p < .005$) than the shock added group and the control group ($p < .05$). The fact that the incidence of freezing behavior in the shock-added group did not differ from the control group suggests that freezing behavior is induced with minimal RCS.

During the test acquisition trials (21-50) the shock-withheld group made significantly more avoidance responses than the shock-added group ($t = 2.85, p < .02$). Considering that adding or withholding RCS did not affect acquisition compared with the standard conditioning group suggests an effect in addition to that which might result from reduced freezing behavior. If we consider a successful avoidance response as a form of behavioral shaping then the addition of shock during trials 1-20 for Ss in the shock-added group prevented the correct response from being shaped while withholding shock for the Ss in the shock-withheld group reinforced successive approximations of the correct response and assured a maximum number of shaping trials. In the standard conditioning group, wherein there was no control of the response-shock contingency, the number of avoidance responses during the treatment trials would be expected to fall between the other

two groups. The mean number of avoidance responses during trials 1-20 for the three groups were: Control 9.9; shock-withheld, 13.0; and shock added, 0.

Bartlett's test indicated significant heterogeneity of variance ($p < .005$) and inspection of the variances reveals that this was due to the reduced variability in the shock-withheld group. The addition of the response contingent shock in the shock-added group did not increase the variability over that of the control group.

In extinction the mean number of responses to the CS was not statistically significant among the three groups, the data again showed significant heterogeneity of variance in the same pattern as during test acquisition trials. That the extinction means were equal while the variances were not reflects the fact that different processes were operating during extinction. It was observed that the shock-added and control Ss, on many trials, froze with the onset of the CS whereas the shock-withheld Ss moved freely about the compartment.

References

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Note

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