Response suppression after transfer from shock-escape to thirst-motivated training[1]

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In a 6-ft runway, rats were given 15 shock-escape trials, or none, followed by various transfer conditions. Shock-escape followed by thirst-motivated training resulted in response suppression which was unaffected by a view of water from the runway, was not due to reduced attraction to water, and was not an exclusive function of prior shock experience.

According to Hull (1943), combined drives should produce additive effects. From his position, it would also be expected that a habit based on one drive-incentive combination should profit to some degree from that treatment when transferred to a different drive-incentive combination. Studies by Porter & Miller (1957) and by Bower & Kaufman (1963) have provided supporting evidence. Babb (1963), however, not only failed to obtain additivity, but found a response suppression effect in transferring from shock-escape training to thirst-motivated training.

The purpose of the present study was to attempt to replicate the suppression finding and to determine the influence of several variables that might be responsible for it.

SUBJECTS

The Ss were 44 naive male hooded rats between 100 and 110 days of age on the first day of pretraining. They were obtained from a colony maintained by the Department of Psychology of Hobart and William Smith Colleges.

APPARATUS

The apparatus was a 4-ft runway with 1-ft start box and goal box extensions. It contained a brass grid floor and clear Plexiglas doors and top. Except for the floor, doors, and top, the apparatus was painted a flat medium grey. The goal box contained a 2-in. high barrier which was placed 6 in. in front of the rear wall. A constant-current shock of 0.2 mA, measured at the shock source, was delivered through a scanning device to the floor of the start box and runway. Except for the barrier, which was specific to the present study, the apparatus is more fully described elsewhere (Babb, 1963).

PROCEDURE

Each S was given 3 min of handling each day for five days. They were then put on a 22-h water deprivation schedule for the next 12 days and, on each day, were individually given 3 min access to a metal tray of water which was placed in the middle of a metal table. The table was painted aluminum in color and had a 2-in. high rim around a rectangular top with dimensions of 20 in. x 30 in. All pretraining occurred in a room separate from that in which the experimental sessions were held.

After pretraining, experimental trials were given at a rate of five per day, with intertrial intervals of approximately 8 min. In both acquisition and transfer, the alley door opened on an average of 30 sec after a S had been placed in the start box. The actual time was randomized between 20 and 40 sec but was the same for all Ss on any specific trial. When shock was used, it was delivered to the grid floor of the start box and runway, and shock onset was simultaneous with the opening of the alley door. As a consequence, Ss always received shock in the start box as well as in the runway but never experienced shock within the confines of the goal box. At the end of each run, animals were allowed to remain in the goal box for 30 sec and were then returned to individual retaining boxes to await the next trial.

In the acquisition phase, all groups were continued on water deprivation, now irrelevant, and three of the four groups, Groups BA, ST, and SE, were given 15 shock-escape trials in the runway. Animals in the fourth group, Group OT, were maintained on the same deprivation schedule in their home cages during the period of time in which Ss of other groups were receiving shock-escape training. After the acquisition phase, shock training was discontinued for all groups and two of the groups that had received shock training began to encounter a tray of water in the goal box and were water-reinforced on succeeding trials. One of these groups, Group BA, did not experience a barrier in the goal box. The absence of the barrier enabled a view of the newly-introduced tray of water while Ss were still in the runway. The other group, Group ST, continued to encounter the barrier, as did Groups SE and OT. Group SE was transferred from shock-escape training to conditions of regular extinction but with irrelevant thirst continued, and Group OT, which had not received shock-escape training, was begun on water-reinforced training. All groups were given a total of 40 transfer trials.

RESULTS

Transfer starting and running times were transformed to reciprocals of medians for each five trials. Since predictions concerned sequential relationships between groups, Mann-Whitney U-tests were made between particular groups on specific sets of trials. For running times (see Fig. 1), Group ST (M = 25.73) was inferior to Group SE (M = 40.09, $p < .05$) on the first five trials, indicating that transfer from shock-escape training to extinction conditions (Group SE) resulted in faster running than did transfer from shock-escape to water-reinforced training (Group ST). The previous finding of suppression was also successfully replicated: Group ST (M = 11.00) was inferior to Group OT (M = 18.36) on Trials 11-15, the same trials on which suppression was formerly noted. However, in the present instance, the significance level was $< .05$ using a Kruskal-Wallis two-tailed test but only $< .10$ with a two-tailed Mann-Whitney test. Nevertheless, this level was considered sufficient for establishing the replication.

The performance of Group BA (barrier absent) was compared to that of Group ST (barrier present) on every set of trials, with the expectation that Group ST would evidence as much or more suppression than Group BA. Differences were not significant and were consistent with the prediction for both running and starting time data. Performance curves for Group BA were not included in Figs. 1 or 2 since only the

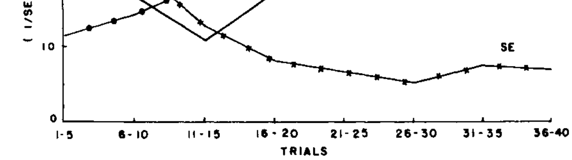

Fig. 1. Running speed as a function of trials in transfer.

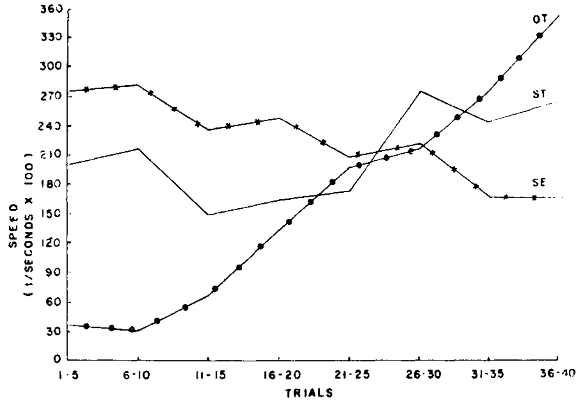

Fig. 2. Starting speed as a function of trials in transfer.

comparison with Group ST performance was relevant. The lack of differences between Groups BA and ST indicates that the suppression effect was not a function of a direct association between fear in the runway and perception from the runway of the newly introduced tray of water in the goal box. Such a possibility was present in the study in which the suppression effect was first obtained (Babb, 1963).

In regard to starting time data, the performance of Group OT (M = 356.00) eventually surpassed that of Group ST (M = 269.91) and differences were significant on Trials 36-40, the last transfer trials ($p < .05$). Suppression of starting times did occur but on later trials than was the case for running times. Differences between Groups ST and SE in starting times were also consistent with running time data, but were not significant.

All Ss receiving water-reinforced trials were manually timed from the moment they entered the goal box until E could note obvious water ripples emanating from the area of muzzle contact with the water. Comparisons were made between groups on the first five trials, the second five trials, and all 10 trials combined. None of the differences between groups approached significance. For the first five transfer trials, mean number of seconds prior to drinking were 12.98, 14.24, and 16.63 for Groups BA, ST, and OT, respectively. For the second five trials, corresponding means were 6.53, 8.98, and 6.14. By the end of the first 10 trials, scores were generally so small that further efforts at manual timing seemed inappropriate. Accordingly, the data seem to indicate no appreciable differences in readiness to drink on the part of Ss that had received prior shock-escape training vs Ss that had received only the later thirst-motivated training.

DISCUSSION

The successful replication of the suppression effect previously obtained (Babb, 1963) helps to confirm the finding that transfer from one relevant drive condition to another can produce negative, as well as positive, transfer effects, even when response requirements are the same under both conditions. The results also indicate that the effect does not seem to be a function of a direct association between fear occurring in the runway and perception of the tray of water in the goal box. Further, the water incentive, or its combination with thirst, seems to play an important role in producing the effect. Even so, the role does not seem to be mediated by a decrease in water consumption, provided the measurement of readiness to drink is an accurate index.

Despite successful replication and some clarification of the suppression effect, a number of different variables remain to be studied and one or more of them may be important in determining the occurrence of suppression. Fear, produced by stimulus change in the form of introducing the tray of water into the goal box and serving as a basis for generalization from the runway, has been suggested previously as a variable of some possible importance (Babb, 1963). Actually, however, cessation of shock in the start box and runway might constitute an even greater source of stimulus change, but a particular directional effect of such change could be debated.

Although response requirements in this study were the same for both acquisition and transfer, it remains possible that the component aspects of the running response were not identical in the two situations. In other words, shock may encourage a type of running which involves the smallest number of floor contacts possible, e.g., a small series of long jumps, and such behavior could be competitive with the type of running learned under the influence of thirst motivation. Alternatively, it is also possible that fractional anticipatory goal responses formed under thirst motivation are incompatible with shock-conditioned or fear-elicited responses produced as a consequence of shock-escape training.

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NOTE

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