

Is a stimulus associated with the escape from shock a positive or negative reinforcer?: Study II

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Abstract:

Evidence collected in an earlier study indicated a neutral box was preferred to a box associated with escape from shock. The present study repeated this finding using a free access preference test before and after escape training. In general, the neutral box was preferred to the safe box, animals which showed an apparent preference for the safe box following training actually never exceeded initial preferences. The need for determining initial preferences in the study of secondary reinforcement was emphasized.

Article:

Wahlsten, Cole, & Fantino (1967) reported that rats ran faster to leave than to enter a safe box associated with escape from shock. These results were interpreted as evidence that the safe box had actually become aversive. Although one group receiving low shock during training ran slightly faster to enter the safe box during a testing-only phase, that group also showed a preference for the safe box during a test prior to training. Unfortunately, direct evaluation of the significance of initial preferences could not be made because the initial test involved free access to the two boxes for 30 min while the running test occurred following confinement in one box. Consequently, it was decided to repeat the experiment using the same test procedure before and after training.

The unrestricted running test presumably measures the relative attraction or aversion between two available sets of stimuli. Spending more time in one location could be due either to positive qualities of that locus or to negative qualities of the alternative locus. These considerations cast doubt on the interpretation of results such as those of Montgomery & Galton (1956), since they compared escape and shock compartments, the shock compartment certainly being highly aversive. A better procedure would be to allow free running between the escape box and a supposedly neutral box. Although finding a preference for the escape box would not preclude the possibility that the neutral box had become aversive, it would seem unlikely since the neutral box was never subjected to training trials as was the escape box. Its absolute properties ought to undergo far less change than those of the escape box.

Another important consideration is that the attraction-aversion relations which obtain during the free access test are the same as those which occur during tests where S chooses between one of two compartments. In this case the relation between goal and start boxes is critical. Goodson & Brownstein (1955) found the escape box to be preferred to either the shock box or a neutral box. However, they also discarded in testing the animals which twice in succession did not leave the start box in 5 min; this amounted to fully 50 of the 103 Ss. Such findings imply that the discarded animals actually preferred the start box to any other box.

The present experiment sought to measure preferences between escape and neutral boxes using the free access test after training as in the Wahlsten et al experiment. Preferences were also evaluated after two levels of training aversiveness. In view of the Wahlsten et al experiment it was expected that more time would be spent in the neutral box and that this preference would be greater for the high shock group.

Method

The Ss were 10 male Sprague-Dawley albino rats, 350 to 500 g, which had been used in a probability learning study with food reward.

The apparatus, consisting of shock, safe, and neutral boxes, was as described previously (Wahlsten et al, 1967).

The two training procedures given to independent Groups H (high aversiveness) and L (low aversiveness) were identical to those used in the previous study.

The testing procedure allowed S to run freely between the safe and neutral boxes for 30 min; the total time spent in each chamber was recorded. The test was administered one day prior to the first training day as an initial preference test. It was also given immediately following a day's training trials on each of four days and then alone for each of three testing-only days. The box in which an S began the test was balanced across Ss within each group.

Results and Discussion

For Groups H and L the basic data were preference ratios, given by (time in safe)/(total time). Since these data were proportions, they were transformed by $X' = 2 \arcsin \sqrt{X}$ (Winer, 1962) to get proper distributions for analysis of variance. Figure 1 shows the transformed preference scores across days for Groups H and L. The analysis of variance was done on a 3 by 2 by 2 design for Days, training Condition, and training Aversiveness. The results are very similar to those for the running time data in the Wahlsten et al experiment, Preferences for the safe box were higher for Group L ($F = 7.13$, $df = 1/8$, $p < .05$). Preferences were also much higher during the testing-only Condition ($F = 34.51$, $df = 1/8$, $p < .01$). Finally, the change across Days was significant ($F = 3.70$, $df = 2/16$, $p < .05$), and it interacted slightly with training Aversiveness ($F = 3.58$, $df = 2/16$, $p < .10$). These effects are in complete agreement with those found for running scores in the Wahlsten et al study.

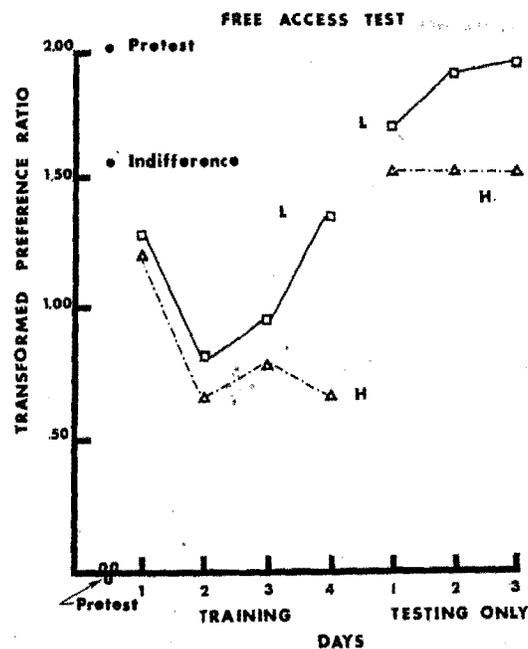


Fig. 1. Transformed preference scores for Groups H (high aversiveness) and L (low aversiveness) during free access tests.

Another similarity can be seen by comparing the preference scores to the indifference ratio of .5, which means equal time was spent in each chamber. In Fig. 1., this indifference ratio is shown using the transformed scores calculated using $2 \arcsin \sqrt{.5} = 1.17$. As found in the Wahlsten et al bar press test, only the Ss in the low-aversiveness group during the testing-only phase showed a preference for the safe chamber. However, an important finding was that the mean preference during testing never exceeded the score obtained on the initial test given prior to training. Since the mean preferences were highest on the last day of testing, comparisons

were made between these scores and the initial preference scores using a t test on differences. For Group H, the final preference was lower than the initial scores ($t=8.07$, $df=4$, $p<.005$), while there was no significant difference for Group L ($t<1$, $df=4$).

This finding points to the misinterpretation which can result if secondary reinforcing effects are inferred from preferences following training when a pre-test is not administered. These results provide no evidence to support the hypothesis that a stimulus associated with escape from shock is positively reinforcing; on the contrary, the preference ratios indicate that the neutral box is preferred to the safe box, implying that the latter had acquired aversive properties.

The importance of including a pre-test for Ss' preferences among presumably neutral stimuli is clearly illustrated by the present data. Without the pre-test one might have concluded that a preference for the safe box had been demonstrated in one of our groups.

References

- Goodson, F. E. & Brownstein, A. Secondary reinforcing and motivating properties of stimuli contiguous with shock or termination. *J. comp. physiol. Psychol.*, 1955, 48, 386.
- Montgomery, K. C. & Galton, B. B. A test of the drive-reduction explanation of learned fear. Cited by R. L. Solomon and E.S. Brush in Experimentally derived conceptions of anxiety and aversion. In M. R. Jones (Ed.), *Nebraska symposium on motivation*. Lincoln: University of Nebraska Press, 1956.
- Wahlsten, D., Cole, M., & Fantino, E. Is a stimulus associated with escape from shock a positive or negative reinforcer? Study I. *Psychon. Sci.*, 1967, 8, 283-284.
- Winer, B. J. *Statistical principles in experimental design*. York: McGraw-Hill, 1962.