Escape and avoidance responses to a fear eliciting situation

ROBERT J. BLANCHARD and D. CAROLINE BLANCHARD.
Department of Psychology, University of Hawaii, Honolulu,
Hawaii 96822

Seven days after receiving unavoidable shock, rats were placed in the shock chamber, or in an adjacent chamber. Free access between the chambers was permitted, and latency to cross was measured. Latency to cross into the shocked chamber was an increasing function of shock intensity, while latency to escape the shock chamber was not related to the intensity of prior shock. The results were interpreted as supporting the hypothesis that situations associated with shock produce competing tendencies in the rat to escape and to remain immobile.

Blanchard & Blanchard (1968) have suggested that performance in passive avoidance situations is a function of the interaction of pre-experimentally acquired responses to stimuli associated with pain. They further suggested that these responses include: failure to approach distant fearful stimuli; escape from present fearful stimuli when escape is readily apparent; and immobility when escape is not apparent.

Apparent availability of escape, which is postulated to determine whether escape or immobility is produced in the presence of fearful stimuli, implies a continuum involving the discriminability of the stimuli associated with shock. Most passive avoidance situations, especially those in which no specific CS is given, might be expected to elicit both immobility and escape tendencies. However, immobility and escape responses are not compatible, while immobility and avoidance responses are quite compatible. This analysis indicates that rats might be expected to differ in their tendencies to avoid, or to escape, situational stimuli previously associated with shock.

That is, if shock has been associated with a set of situational stimulus cues, then the escape performance of a rat in the presence of such cues is a function of competing tendencies to escape and to remain immobile. However, if the rat is placed outside the same stimulus situation and permitted to enter, avoidance performance should be enhanced by any immobility tendencies elicited by the shock situation.

Passive avoidance performance should therefore be an increasing function of shock intensity, even on the first test trial. Since successful escape from the shock situation might be expected to alter the apparent availability of escape, continued training should result in better escape performance for Ss receiving higher shock intensities. However, on the initial test trial, the interaction of escape and immobility tendencies should result in minimal intensity differences in escape performance.

The present experiment therefore compared the latency of the initial escape and avoidance responses to the same shock situation for rats receiving 0, .4, .8, and 3.0 mA shock.

SUBJECTS

The Ss were 40 naive female albino rats, from 125-160 days of age, from the colony maintained by the University of Hawaii Department of Psychology.

APPARATUS

The avoidance situation was that used by Blanchard & Blanchard (1968). Briefly, it consisted of two chambers, connected by a guillotine door. The larger (20 x 20 x 10 in.) chamber was painted black, and had grid flooring connected to a Grason-Stadler E1064 GS scrambled shock source. The smaller (9 x 5 x 6 in.) chamber was white, with wooden floors.

PROCEDURE

The 40 Ss were randomly divided into four groups with 10 Ss each. Each S was placed in the larger chamber, with the guillotine door closed, and given 10 min of 0, .4, .8, or 3.0 mA shock, which began 2 sec after the S was placed in the box. The Ss were then replaced in their home cages. Seven days later, each S was replaced in the avoidance apparatus, with five Ss of each of the intensity groups being placed in the shock side (escape groups), and five

in the nonshocked side (avoidance groups), with the guillotine door open. For each S, latency to cross into the adjoining compartment was measured. Also, total time spent in the nonshocked chamber was recorded, as was the total number of crossings from one chamber to the next. The single test session was 10 min in duration.

RESULTS AND DISCUSSION

Figure 1 presents mean scores on each of the three response measures for the eight groups. Latency of the first crossing, a measure of avoidance for the groups placed in the nonshocked box and a measure of escape for the Ss placed in the shocked box, greatly increased with shock for the Ss tested in the nonshocked chamber. Escape latencies, however, did not consistently change for the shocked Ss or as a function of shock intensity. Since the latency distributions were markedly skewed, a Kruskal-Wallis one-way analysis of variance was used to test the significance of latency differences. For the Ss placed in the nonshocked chamber, the Kruskal-Wallis test indicated significant avoidance differences among the groups ($H = 7.96$, $df = 3$, $p < .05$). For the groups placed in the shock chamber, latency differences were not significant ($H = 3.63$, $df = 3$, $p > .05$).

The proportion of time spent in the nonshocked chamber showed a similar trend, with the avoidance groups spending more time in this chamber as an increasing function of shock intensity, while the escape groups each tended to remain in the shock chamber for similar durations. Since the latency of first crossing for the avoidance groups may have contributed to differences on the nonshocked chamber preference measure, percentage time in the nonshocked chamber was also computed for each S from the time when that S first entered the shock compartment. This removed all differences attributable to variations in the latency of first crossing for the avoidance groups. The corrected preference proportions were 56.09%, 52.44%, 65.53%, and 70.67%, for the 0, .4, .8, and 3.0 groups, respectively.

The total number of crossings was a decreasing function of shock intensity for the avoidance groups. The escape groups, however, tended to make fewer and then more, crossings with increasing shock intensities.

Since the corrected nonshocked chamber proportions were independent of the latency of the first cross, it was possible to compute the correlation of these measures for the shocked groups. For the shocked groups placed in the nonshocked chamber, the correlation (Spearman's Rho) between proportion of time spent in the nonshocked chamber after the first crossing and latency of the first cross was +.80, which was significant ($t = 4.81$, $df = 13$,

Fig. 1. Mean scores on the three response measures for groups receiving 0, .4, .8, or 3.0 mA shock.

$p < .001$). However, for the shocked groups placed in the shock chamber, preference of the nonshocked chamber and latency of the first crossing were unrelated ($\rho = -.18$, $t = .66$, $df = 13$, $p > .05$). This pattern—a strong relationship of the response measures for the shocked Ss placed in the nonshocked compartment, and a lack of relationship for the same measures on shocked Ss placed in the shocked compartment—was also obtained with the number of crossings measure. The number of crossings was significantly correlated with both latency of the first cross ($\rho = -.56$, $t = 2.44$, $df = 13$, $p < .05$) and with proportion of time in the nonshocked box ($\rho = -.82$, $t = 5.17$, $df = 13$, $p < .001$). Neither of these correlations ($\rho = -.10$, and $\rho = -.26$, respectively) was significant for the groups placed in the shocked box.

Both the initial latency results and the response measure correlation results are congruent with the hypothesis that fear elicits specific responses depending on the characteristics of the stimuli which have elicited fear. These results are also congruent with the hypothesis that the shocked Ss placed in the nonshocked

chamber had acquired a fear response to the stimuli of the shock chamber, while the shocked Ss placed in the shocked chamber had not. However, since these groups of Ss had received identical training prior to the single test trial, this hypothesis appears extremely unlikely.

Thus the results of the present study indicate that escape from stimuli associated with shock is not acquired after training sufficient to produce clear shock stimulus avoidance. In view of the Blanchard & Blanchard (in press) finding that stimuli previously associated with shock elicit immobility, it appears very likely that the present lack of escape differences for shocked and nonshocked Ss was due to the competition of immobility and escape tendencies in the shock situation.

REFERENCES

- BLANCHARD, R. J., & BLANCHARD, D. C. Passive avoidance: A variety of fear conditioning? *Psychonomic Science*, 1968, 13, 17-18.
 BLANCHARD, R. J., & BLANCHARD, D. C. Crouching as an index of fear. *Journal of Comparative & Physiological Psychology*, in press.