Differential conditioning in the planarian

H. D. Kimmel and Virginia L. Harrell
UNIVERSITY OF FLORIDA

Abstract

Differential reinforcement of visual and vibratory CSs with a shock UCS showed that a difference in the planarian's rate of responding to the 2 CSs could be established only when the vibratory CS was positive and the visual CS was negative. In the opposite condition an increase in response rate to both stimuli occurred, but no difference between them was observed. The results appeared to add further support to the proposition that classical conditioning is possible in this organism, but suggested that sensitization and generalization may play a more prominent role in this process than is the case typically.

Problem

Since the original demonstration of classical conditioning in the planarian (Thompson & McConnell, 1955), some doubt has persisted regarding whether the increased rate of responding typically observed represents "true" conditioning or is a manifestation of some kind of "quasi-conditioning" (Kimmel, 1964). Thus, for example, Halas, James, & Stone (1961) reported that the conventional visual CS may, itself, be a mild UCS. In a similar vein, Baxter & Kimmel (1963), while showing that planaria given a paired CS-UCS procedure outperformed an unpaired control group, found that the difference between the 2 groups reversed within only about 10 extinction trials.

In the present study the possibility that "true" conditioning can be achieved in this organism was explored further in a differential reinforcement situation. Two Ss had a visual CS paired with shock

and a vibratory CS presented without shock, while 2 others had the CS-shock relationship reversed. The question was whether differential reinforcement would result in differential responding to the 2 CSs.

Method

Four planaria (*Dugesia tigrina*), obtained from a local pond and kept in individual dishes in water from the same pond, received a randomized sequence of 30 presentations of the positive CS paired with shock and 30 unpaired presentations of the negative CS each day for 5 consecutive days. On the first day 30 paired presentations of the positive CS and shock preceded the regular daily 60 trials. The duration of each CS was 3 sec. and, for paired presentations, the shock shared the last 1 sec. of the CS's duration. The intertrial interval was always at least 15 sec. and a trial was run only when the S was swimming in the longitudinal plane of the trough.

The visual CS was positive and the vibratory CS was negative for 2 of the Ss, while the reverse was true for the other 2 Ss. A 7-w bulb, 3 in above the trough was the visual CS and a telephone buzzer (bell removed) attached to the trough was the vibratory CS. The equipment was otherwise the same as described by Baxter & Kimmel (1963).

Results

A CR was defined as a cephalic turning, curling, or contraction that occurred during the first 2 sec. of either CS. Figure 1 shows the number of CRs made on each day separately for the 4 Ss.

Fig. 1. Individual records of No. of CRs on each day of training.

It is clear in Fig. 1 that the Ss for which the vibratory CS was positive showed substantial differential responding as training progressed. For these Ss, the negative CS's response rate showed no increase over the 5 days. For the Ss that had reinforcement paired with the visual CS an increase in responding was associated with both CSs, but no difference between them appeared. Analysis of variance of these data indicated that the Reinforcement x Conditions interaction was significant, $F(1/18) = 19.45$, reflecting the fact that differential responding occurred only in the vibration positive-light negative condition. A significant effect of Days, $F(4/18) = 4.99$, resulted from the fact that all Ss showed an increase in total responding. Error variance for these tests was 17.0 (pooled within error).

Discussion

Assuming that the vibratory CS was more similar to the shock UCS than was the visual CS, the results of this study suggest that differential responding to the 2 CSs in the vibrator-reinforced group may have been the consequence of generalization of excitation from the shock to the vibrator with which it was paired. Yet, when the visual CS was positive, some tendency for an increase in its response production was observed, albeit no greater than occurred for the negative vibratory CS. Oddly enough, the increase in response production associated with the visual CS when it was

positive may be the best "evidence" that a genuine associative phenomenon occurred, even though differential responding appropriate to the differential reinforcement occurred only in the other condition, when the vibratory CS was positive.

What appears to be needed is a study involving 2 CSs whose unconditioned response producing properties are more equivalent than existed in this study. It is likely that the present light was "weaker" than the vibrator, since its intensity was deliberately selected to minimize unconditioned responding known to occur to visual stimuli. Thus, while the differential responding that was found adds some support to the argument that conditioning *does* occur in the planarian, the possibility that sensitization and/or generalization were significantly involved cannot be ruled out.

References

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Abstract

WILLIAMSEN, J. A., JOHNSON, H. J., & ERIKSEN, C. W. (U. Illinois). Some characteristics of posthypnotic amnesia. *J. abnorm. Psychol.*, in press.—Ss were 60 females, 30 who scored high on hypnotic susceptibility (HS) and 30 who scored low (LS). 10 high and 10 low scoring Ss were assigned to each of 3 treatments. Ss in hypnosis treatment were presented 6 words while under hypnosis and given suggestions for posthypnotic amnesia. Ss in simulation treatment pretended they had been hypnotized and given these words with instructions for posthypnotic amnesia. Control Ss were given the words with instructions only to remember them. In the second immediately-following session a second E (who was unaware of the treatment S had received) administered recall, recognition, and associative tests.

Relative to the controls the hypnotized HS group recalled and recognized significantly less. They differed from the simulating Ss in that the simulators overplayed their amnesic role. Even the LS hypnotized group showed impairment on the recall measure. The suggested amnesia had no effect upon the availability of the words as associative responses in either hypnotized group. However, simulating Ss relative to controls showed impaired performance on the associative tests. There was no difference in recall of hypnotized Ss after the posthypnotic amnesia was removed. A second experiment ruled out an explanation in terms of differences in original learning between the hypnotized and control groups. (Pre-publication copies available from the authors).