SOME EFFECTS OF VARYING THE DURATION OF AN EXTEROCEPTIVE WARNING STIMULUS ON INTERCURRENT AVOIDANCE AND APPETITIVE RESPONSES¹

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During intercurrent avoidance and appetitive responses in a two-lever apparatus, the strength of partially extinguished avoidance behavior may rebound solely as a result of a change in the duration of the warning conditioned stimulus (CS). No delivery of the original noxious unconditioned stimulus (US) is required for this rebound. In this experiment, the effect occurred in a cat when brief, experimenter-terminated presentations of the CS were replaced by (longer) presentations of the signal that were terminated only by the animal's avoidance response.

METHOD

The subject was a male cat, which had been trained to press a lever for a 1-cubic centimeter milk reward on a 100% reinforcement schedule; upon presentation of a buzzer CS, the *S* deflected a vertical bar suspended as a pendulum in order to avoid electric shock through the grid floor. The appetitive response was established first, in daily 20-minute sessions, after which escape/avoidance was superposed. The animal was required to deflect the pendulum to forestall brief 80-volt shocks which began 1 minute after the onset of the CS, and the pendulum response terminated both the CS and the US. After the initial acquisition, the CS was always presented three times during each daily session—at the 6-, 12- and 18-minute marks, respectively. After stabilization, no shock US was required to maintain behavior for periods of weeks. However, immediately after the initial training of the aversively reinforced response, the appetitive lever-pressing was much suppressed, particularly just after the subject's termination of the CS. With stabilization and deprivation to 67% of normal body weight, this *after-suppression* became shorter and shorter, and the cat eventually returned almost immediately to lever pressing on the food manipulandum after disposing of the CS (top tracing of Fig. 1).

Avoidance was weakened, however, and a subsequent rebound obtained after the above routine was interrupted by blocks of three successive daily sessions in which the CS was presented at the usual times, but was terminated by the experimenter 5 seconds after its

onset—a period too short for the cat to complete the avoidance response. Interpolated between such blocks of sessions with experimenter-terminated CS's were *test* sessions during which the CS was again left on for the cat to terminate or not at will. Test sessions differed from those of acquisition in that no shock US was delivered regardless of whether or not the cat deflected the pendulum. With such sessions, the residual strength of the avoidance response could be determined at various points of the procedure.

RESULTS

The top tracing of Fig. 1 shows the cumulative appetitive record of the cat in the last session of stabilized performance before the sessions with brief, experimenter-terminated CS presentations. After onset of CS (arrow), the cat immediately left its lever pressing for milk and deflected the pendulum (arrow). Having thus avoided and disposed of the CS, it promptly resumed its appetitive lever-pressing. Little or no after-suppression appears in this record.

The bottom tracing shows what happened during the test session following the block of sessions with brief CS which had succeeded in substantially weakening avoidance. The first presentation of the CS revealed that the avoidance response had indeed been weakened: After onset of the signal (arrow), the cat delivered several additional responses on the appetitive lever and consumed the milk obtained. As the CS continued to sound, however, and its duration approached the CS-US interval of acquisition, the cat finally deflected the pendulum. After it had ended the CS, the cat did *not* then return to appetitive lever-pressing. Instead, a period of cringing and vocalizing followed that appears in the record as a long after-suppression. Nevertheless, the cat did resume the appetitive task before the second onset of the CS 6 minutes later. And when that signal was again presented, its onset at once interrupted appetitive lever-pressing and elicited a prompt avoidance response.

DISCUSSION

The observed rebound may be considered a form of reconditioning of a partially extinguished avoidance response, effected without delivery of the US, so that it is reconditioning of the second order. A Type-S interpretation is: The CS actually paired with US was a 1-minute CS. However, conditioning also extended to briefer CS's by generalization. The experimenter-terminated brief presentations that were unreinforced

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Fig. 1. Record of appetitive lever responses.

by US extinguished the brief CS's. On the other hand, a 1-minute CS was not thus extinguished, so that delayed avoidance did take place. Finally, by induction, presentation of the still-potent, 1-minute CS resulted in reactivation of the previously extinguished brief CS's.

Type-R interpretations are possible that treat the appetitive lever as a "superstitious" avoidance device. These explain the sequence of events as successive (operant) extinctions of "alternative" avoidance levers. All such explanations must account for: (1) the after-suppression; (2) the consumption of food following the

lever response in the presence of the CS; and (3) resumption of the appetitive response following after-suppression. A fuller account is found elsewhere (Halasz, 1959).

REFERENCE

- Halasz, Michael F. Extinction of intercurrent avoidance and repetitive responses under chlorpromazine. Unpublished doctoral dissertation, Univer. of Chicago, 1959.

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