Active avoidance learning in hamsters¹

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Hamsters were found to be very inefficient in acquiring a one-way locomotor avoidance response compared to albino rats, whereas an earlier report showed them to be much more proficient than rats in learning a lever-press avoidance response. Even fewer avoidances were made by hamsters when a visual rather than auditory CS was used. The deficiency in comparison to rats could not involve a general learning deficit since the hamsters showed much improvement in escape latencies. The results emphasize the importance of the required avoidance behavior in determining the relative learning proficiencies of different species.

In a recent paper Pearl (1963) compared the avoidance learning of three different species of rodents, rats, guinea pigs and golden hamsters, using a lever pressing response. The hamsters showed distinctly superior avoidance acquisition over that of rats. The data suggested that the difference in learning might be related to the different lever-pressing propensities of the two species. A question arises, therefore, concerning the generality of the results from that study. In fact, the explanation given suggests that the difference in performance is not related to the basic factors determining avoidance learning, such as fear-drive reduction, but rather to a particular response required, i.e., to the experimental procedure itself. In order to test this possibility the present study has been designed in which hamsters were trained with an active avoidance conditioning apparatus and procedure similar to the shuttle box situation in requiring a running response. This procedure, which differs in that only a one-way movement is possible, has been shown in other work to be effective in eliciting good avoidance learning in rats (Davis, Babbini, & Huneycutt, 1967).

Method

The Ss were 50 male golden hamsters 150-180 days old. They were housed in cages of 10 animals each with food and water available ad lib. The apparatus was a four-compartment box which has been described elsewhere in detail (Davis, Babbini, & Huneycutt, 1967). Briefly, it consists of a square box subdivided into four equal compartments with sliding doors in each of the inner walls. The doors were operated so that the animal could run only in one direction from compartment to compartment in a clockwise succession. In this fashion it is possible to avoid conflict produced upon re-entering the area of a previous shock trial which we feel constitutes a hindrance to shuttle avoidance conditioning in rats.

Two experiments were performed employing a different CS for each. For 30 Ss a white noise of middle

intensity from a buzzer mounted above center of the apparatus was used. The light from a 100 W bulb mounted in the same position was used with the other 20 animals. In the latter case the room in which the apparatus was located was lighted dimly so that the visual CS could be easily discriminated. For both experiments the US was an electric shock administered through the grid floor via a variable resistor and a motor-operated grid scrambler described elsewhere (Huneycutt & Davis, 1967). The intensity of the US was varied slightly between Ss to maintain a consistent behavioral effect.

All hamsters received 90 consecutive trials conducted in a single experimental session. Each S was placed in the apparatus with the doors opened and was allowed to explore the box for 3 min. Then the doors were closed and the S was confined for 1 min before beginning the training. The CS was presented together with the opening of the door for a duration of 5 sec. The US, following immediately the offset of the auditory or visual signal, lasted until the S ran to the other compartment. The door was lowered just after the S had passed through. Subsequent trials were made in the same way with the intertrial interval ranging randomly from 20 to 40 sec and averaging 30. The responses were classified "escapes" if the S ran into the other compartment after the onset of the US and "avoidances" if it ran during the CS. In the latter case the CS terminated as soon as the S had passed through the door. Avoidance and escape responses were tabulated and the latencies of both were recorded by a stopwatch to the nearest .2 sec.

Results and Discussion

The number of avoidance responses by the hamsters was very low in both experiments (Table 1). For the first experiment the percentage of avoidance responses was 9.48%; whereas, for the same number of trials in the same experimental situation, Holtzman albino rats showed 61.57% of conditioned responses (Davis, Babbini, & Huneycutt, 1967). The latencies of the escape responses were averaged for each animal in blocks of 10 trials, and then the averages were ranked. A nonparametric trend analysis of the mean curves of the two experiments was performed using the test of Page (1967).

Table 1 Avoidance responses in 90 trials

	N	MEAN	%	RANGE	FIDUCIAL LIMITS 99%
Experiment 1 (CS: Buzzer)	30	8.53	9.48	0-31	7.98 11.07
Experiment 2 (CS: Light)	20	1.66	1.76	0-6	1.11 2.78

In each case the results were statistically highly significant ($p < .001$), indicating that in both experiments the latency curves of the escape responses were monotonically decreasing functions.

These results were markedly different from the data of Pearl (1963). In fact, not only was the learning of the hamsters much better in that case than this, but also the difference between rats and hamsters was in the opposite direction. Our results cannot be explained in terms of generally poor learning ability because the escape response latencies showed a remarkable improvement in each of our experiments. Rather, they indicate that avoidance learning in hamsters is strictly related to the experimental procedure employed, and that some responses are much more appropriate than others for this species. This has been suggested earlier for rats to account for differences in learning found with different conditioning procedures (Meyer, Cho, & Wesemann, 1960). The higher number of avoidances obtained with the acoustic CS may be related to an effectiveness intrinsic to this kind of stimulus in producing avoidance. This has been shown in rats by Myers (1959) who suggests that the startle

response elicited by the buzzer serves to antagonize the freezing pattern produced by fear.

Why the running avoidance responses should be learned so much better by rats than by hamsters remains uncertain despite the more erratic and awkward locomotion of the hamsters on the grid, noted also by Pearl (1963).

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Note

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