The effects of age and CS complexity on the acquisition of an avoidance response in rats

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Two groups of 25 day old and two groups of 95-105 day old rats were used to investigate the effects of age and CS complexity on the acquisition of a one way avoidance response. A group at each age was trained using the opening of a guillotine door as the CS, and a group at each age was trained using the opening of a guillotine door and onset of a buzzer as the CS. Ss trained with the buzzer and opening of the guillotine door CS met the learning criterion in significantly fewer trials than Ss trained using only the opening of the guillotine door as the CS. There was no significant effect of age or interaction of age with CS complexity on trials to criterion.

Recent studies of the effects of age on acquisition of shock motivated behavior in rats have reported conflicting results. Campbell & Campbell (1962), using extinction of a conditioned fear response as their measure of acquisition, reported no differences between 25 and 100 day old rats. Kirby (1963) using a straight alley escape and avoidance task also reported no differences in acquisition between 25 and 100 day old rats. However, Thompson, Koenigsberg, & Tennison (1965), using a one way avoidance task, found 25 day old rats inferior to 100 day old rats. They attributed the differences between their results and those of Campbell & Campbell and Kirby to differences in task difficulty. Thompson & Hjelle (1965) have found that CS complexity significantly affects acquisition of a one way avoidance response. They found a CS of opening a guillotine door resulted in slower acquisition of a one way avoidance response than a CS of opening a guillotine door and the onset of a buzzer. The present experiment investigated the effects of CS complexity on the acquisition of an avoidance response by 25 and 100 day old rats.

Method

The Ss were 80 male albino Sprague-Dawley rats; 40 were 25 days old and 40 were 95-105 days old at the time of testing. The Ss were maintained on ad lib food and water throughout the experiment.

The apparatus was a 35 x 14 x 4-1/2 in. shuttle box painted flat black except for a 1 in. wide observation window which ran the width of the box. A 3 in. wide guillotine door divided the box into two equal compartments. The grid floor was of 1/8 in. brass rods, 1/2 in. center to center. The grid could be charged with 1.1 mA dc current from a C. J. Applegate stimulator (Model 228) through a Grason-Statler

grid scrambler. An 81 dB buzzer rested on a table approximately 6 in. behind the shuttle box. Background noise was 71 dB. The raising of the guillotine door and buzzer onset were hand operated. The CS-US interval and shock onset were controlled by Hunter timers. A Standard Electric clock that started with a CS onset and stopped with a CS termination measured response latency. The intertrial interval was timed with a stop watch.

Twenty of each age group were trained in a one way avoidance response with the raising of the guillotine door (GD) as the CS. The remaining 20 of each age group were trained using raising the guillotine door and buzzer onset (GDB) as the CS. All Ss were trained to a criterion of nine avoidance responses in 10 trials. The S was placed in the apparatus with the GD closed for 5 min of habituation. A trial began with buzzer onset and/or GD opening. If S had not crossed into the other compartment within 5 sec, the shock came on and stayed on until S crossed into the other compartment. Both CS and US were response terminated. The S remained in the nonshock compartment for 90 sec and then was returned to the shock compartment. The CS onset to CS onset interval was 115 sec. The S could terminate the CS and avoid the shock by responding during the 5 sec CS-US interval. Latency of response was recorded for each trial.

Results and Discussion

The mean trials to criterion and standard deviation for each group are presented in Table 1. These data were analyzed by analysis of variance, which indicated a significant task difference ($F=17.5$, $df=1/76$, $p<.001$). The Ss trained using the GD only required more trials to meet criterion than the Ss trained with GD and buzzer. Although the differences between age groups were suggestive ($F=2.57$, $df=1/76$, $p<.20$), they were not significant. The expected interaction also did not reach significance ($F<1.0$).

The finding of task differences is consistent with the data of Thompson & Hjelle (1965) using the same

Table 1. Mean Trials to Criterion and Standard Deviations For All Tasks and Age Groups

	Age: 100		Age: 25	
	X	S	X	S
CS				
GDB	12.40	1.36	13.45	2.78
GD	15.40	2.89	16.75	5.24

task; the more components in the CS, the faster the acquisition. The failure to find a significant difference between the two age groups in acquisition is consistent with the data of Campbell & Campbell (1962) and Kirby (1963) in their findings of no differences in the acquisition of shock motivated behavior as a function of age. The data of the present experiment are not consistent with those of Thompson, Koenigsberg, & Tennison (1965), who found that 25 day old rats were significantly inferior to 100 day old rats in acquisition of a one way avoidance response. Thompson et al attributed their significant age effect to the use of a more difficult task than that of either Campbell & Campbell or Kirby. However, in this experiment in which task difficulty was varied, no interaction of task difficulty with age was obtained.

Although the task used in this experiment was similar to that of Thompson et al, there were some differences. The apparatus in this experiment was the same size for both age groups, whereas in the Thompson et al experiment the apparatus size was proportional to S size. The apparatus in this experi-

ment was all black, whereas in the other experiment it was half black and half white. Finally, this experiment used a criterion of nine avoidance responses in 10 trials, whereas Thompson et al used 10 consecutive avoidance responses as the learning criterion. Some one or combination of these factors must have made the Thompson et al task more difficult for their young rats. On the basis of this experiment and those of Kirby and Campbell & Campbell, it must be concluded that there is no effect of age on the acquisition of a simple one way avoidance task.

References

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