Role of docility in avoidance: Gerbils and kangaroo rats in a shuttlebox[1]

ROBERT BOICE AND CAROL BOICE, *OHIO UNIVERSITY*
ARTHUR E. DUNHAM, *UNIVERSITY OF NEW MEXICO*

Reactivity to shock and avoidance responding in a two-way shuttlebox were compared in three species of rodents: M. unquiculates *(gerbils),* D. ordi *(kangaroo rats), and* M. musculus *(laboratory mice). The more reactive mice avoided more than either desert species. Although the gerbils and kangaroo rats were similar in their nonreactivity to the grid shock, the gerbils avoided at a markedly higher level than the kangaroo rats. The kangaroo rat, possibly a truer desert animal than the gerbil, may have found the shuttle response incompatible with its naturally passive response to stress.*

Genetic differences in avoidance learning are frequently attributed to differential reactivity to shock. Thus the finding that wild Norway rats learn shuttlebox avoidance more rapidly than their docile counterparts, laboratory rats (Boice, Denny, & Evans, 1967), could be attributed to the extreme reactivity of the wild rat. At its logical extreme, such a notion might explain a complete absence of avoidance conditioning in passive female pack rats who react to grid shock with an apparent attempt to sleep (Boice & Logan, 1967).

This study examined shuttle box avoidance in two species of rodents, gerbils, and kangaroo rats, selected for their similarly unusual docility. Both groups of desert rodents were expected to be nonreactive to shock relative to a comparison group of domestic mice. Accordingly, the latter were expected to avoid at a higher level than the former.

Subjects

The Ss were three males and three females from each of the following species: (a) gerbils—*Meriones unquiculates*[2]; (b) kangaroo rats—*Dipodymus meriones;* and (c) domestic mice—*Mus musculus.* The kangaroo rats were adults trapped from the Albuquerque, New Mexico, area. All other Ss were 90-110 days of age at the time of running. All animals were housed in individual cages with a sand and sawdust substrate.

Apparatus

The shuttlebox had two chambers, each 18 x 4 x 18 in. high, one white and one black, separated by a guillotine door. Stainless steel grids, spaced 3/8 in. center to center, were charged through neon bulbs (NE 2) in series with 200 μA at 400 V dc. In this inexpensive system which replaces a scrambler, the S is shocked when he contacts two of the grids because a rodent offers less resistance than the bulbs[3]. Electric timers and relay circuitry controlled the CS-UCS interval and measured response latency.

Procedure

All Ss were run for 120 consecutive two-way trials in one session. A trial was signaled by the opening of the guillotine door. If a S did not cross over (avoid) to the opposite side, shock was presented to the chamber 5 sec after the door opened and until S ran to the other side. The ITI was 10 sec in the black side and 100 sec in the white side. The hind feet of the gerbils and kangaroo rats were shaved to ensure good contact with the grids.

Results

Mean escape latencies for the first ten trials were as follows: mice—4.8 sec; gerbils—13.4 sec; and kangaroo rats—12.2 sec. Figure 1 summarizes the acquisition of avoidance responding toward the long side and toward the short side. Species differences were significant ($F = 5.3$, $df = 2/15$, $p < .05$) but did not interact over trials ($F = 1.53$, $df = 10/75$). Sex differences were not significant. Avoidance responding was greater toward the side with the long ITI ($F = 42.94$, $df = 1/15$, $p < .05$), as a function of species ($F = 6.79$, $df = 2/15$, $p < .05$), and over trials ($F = 3.18$, $df = 5/75$, $p < .05$).

Discussion

The reactive behaviors of the docile gerbils and kangaroo rats were similar. Both were slow to react to the shock, displaying escape latencies nearly three times that of the mice. Whereas the mice squealed loudly and ran quickly when shocked, the desert rodents hopped slowly and rarely vocalized when shocked. The avoidance performance of the mice was generally

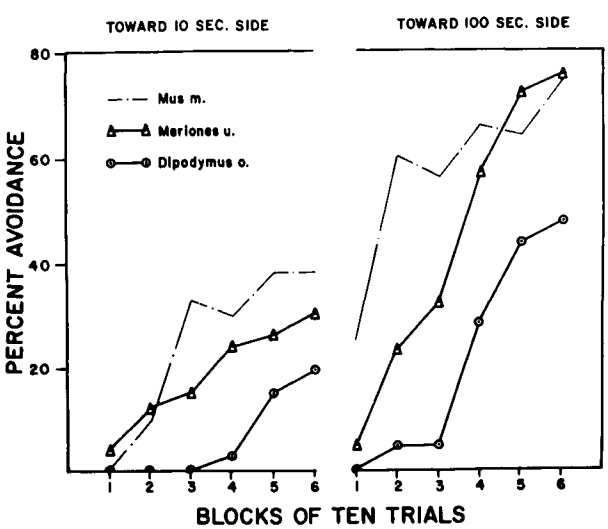

Fig. 1. Percentage of avoidance responses in 120 consecutive two-way shuttlebox trials, 60 trials toward 10 sec nonshock confinement and 60 trials toward 100 sec nonshock confinement.

superior to that of the gerbils and markedly above that of the kangaroo rats (Fig. 1). Assuming that active movement in response to stress may be maladaptive for a desert rodent, the relative superiority of the gerbils over the kangaroo rats may be explained by the supposition that the gerbil is not a true desert rodent (Robinson, 1959). The kangaroo rats in this and in other studies in our laboratory showed little tendency toward active or anticipatory responding. The gerbils, however, tend to be much more active in their cages, suggesting that shuttling for them may be a more "natural" response (see Van Bergeijk, 1967).

It is also interesting to note that the Denny relaxation effect with differential nonshock confinement (Weisman, Denny, & Zerbolio, 1967) apparently extended to the species of this study. That is, avoidance toward the side where the Ss had longer to relax was significantly better than toward the side where the short ITI was spent.

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Notes

1. Supported by an NSF grant to Frank A. Logan.
2. The authors thank T. Bennett for providing the gerbils.
3. The schematic was generously provided by S. P. Grossman.