A comparison of albino and wild rats in shuttlebox avoidance

ROBERT BOICE[1], M. RAY DENNY, AND THOMAS EVANS
MICHIGAN STATE UNIVERSITY

Two groups of 10 Norway rats, one of Sprague-Dawley and one of wild F_1 stock, were run in a two-way shuttlebox with one chamber always associated with a 180 sec ITI and the other with a 30 sec ITI. Results: (a) The wild Ss tended to avoid more quickly, although the difference was not significant over all trials. (b) The proportion of avoidances toward the chamber associated with the long ITI was significantly greater for both groups. (c) Grooming behaviors were closely aligned with the transition from escape to avoidance learning for the albino but not for the wild rats.

Criticism of the use of domestic rats in learning research (e.g., Beach, 1951; Bitterman, 1960) and diverse speculation as to the learning abilities of wild rats (e.g., Robinson, 1965; Tinbergen, 1965) persist in the face of limited supporting evidence. For instance, in the only published study which compared wild and domestic rats in a learning paradigm (Stone, 1932), the suspiciousness of the wild rats rendered them unsuitable for a test of maze ability.

Recent research (Boice, 1966) points out both efficient means for trapping and breeding wild rats and the practicality of measuring appetitive learning in wild rats. The present research extends the study of learning in wild rats to a shuttlebox situation and compares wild and albino strains as to anticipatory responding and grooming behaviors, behaviors which may help mediate avoidance learning.

Subjects

Two groups of 10 experimentally naive female Norway rats (160-180 days old), one of wild F_1, and one of Sprague-Dawley stock were used in this study. All Ss were raised, without handling, in individual cages from weaning.

Apparatus

The shuttlebox had two chambers, each 18 x 4 x 11 in. high, one white and one black, separated by a guillotine door. The Ss were observed through overhead mirrors, since the chambers were fully enclosed. Stainless steel grids, spaced 5/8 in. center to center, were charged through relay shock scramblers. A C. J. Applegate stimulator delivered 1.1 mA with a peak of 100 V dc. Electric timers and appropriate relay circuitry controlled the CS-UCS interval and ITI and measured response latency.

Procedure

All Ss were transferred to and from the shuttlebox mechanically. Each S had 80 trials, 40 trials in each direction, in a single session. Half the rats in each group had a 30 sec ITI in the white chamber, and the other half had the opposite combination. The ITI differentials were constant over trials. Trials were signalled by the opening of the guillotine door. If S failed to cross (avoid) to the opposite chamber within 5 sec of the onset of opening the door, shock was delivered to the chamber until S escaped by crossing to the opposite chamber.

Results

Figure 1 summarizes the acquisition of avoidance responding toward the 30 sec and 180 sec sides of the shuttlebox for both strains. Although the wild F_1 rats began avoiding earlier (mean trial number of first avoidance = 24.5 for wild F_1 Ss and 39.6 for albino Ss), an analysis of variance of avoidance responses over trials revealed a lack of significance between strains ($F = 2.1$, $df = 1/18$) or in strain by side ($F = .8$, $df = 1/18$). The significance of the ITI variable ($F = 15.6$, $df = 1/18$, $p < .01$) replicates the finding of Weisman, Denny, & Zerbolio (1967) that the longer ITI associated with a chamber results in a greater proportion of avoidance toward that side and extends this phenomenon to undomesticated rats.

Figure 2 depicts the development of grooming behaviors (as differentiated from paw licking in response to shock induced irritation) of both strains during acquisition. There was a close correspondence between the long ITI and the transition between escape and avoidance responding for the albino rats (mode = 15th and 19th trials toward the long side, respectively)

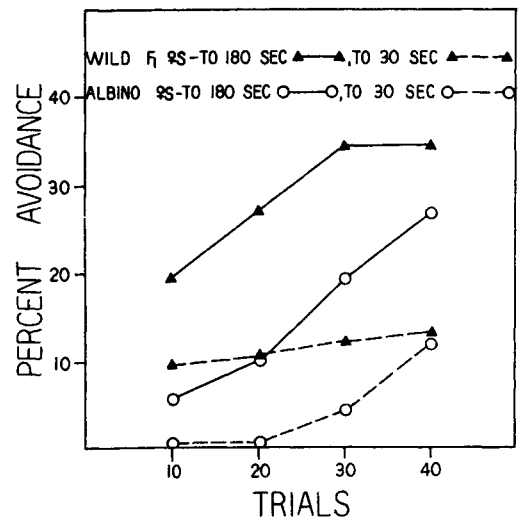

Fig. 1. Percentage of avoidance responses for both strains toward the long confinement chamber (180 sec ITI) and toward the short confinement chamber (30 sec ITI).

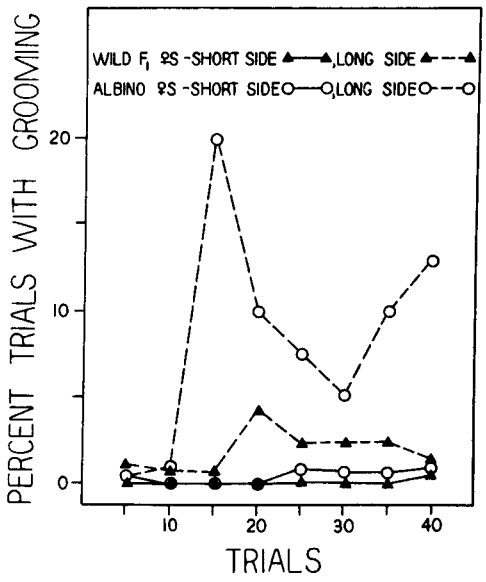

Fig. 2. Percentage of trials with grooming behaviors for both strains while waiting in short side (30 sec ITI) and in long side (180 sec ITI).

but not for the wild F_1 rats (mode = 10th and 21st trials toward the long side, respectively).

Discussion

The most important finding of this study is that wild-type rats can be used in a conventional avoidance learning apparatus without making unreasonable precautions. Although behaviors associated with escape responding in the wild rats are far more dramatic (e.g., hissing, teeth chattering, and leaping and biting at the door), there was no noticeable difference in response incompatibility for either strain during early trials. In fact, observations of initial avoidance responding suggested a definite superiority for the wild rats. The selection of the two ITI values, however, placed an apparent ceiling on the asymptote of performance (Weisman, Denny, & Zerbolio, 1967) and may have masked the potential difference as training progressed.

The correspondence between grooming behaviors and the onset of anticipatory responding in the albino Ss lends support to a disinhibition hypothesis which places grooming in the transition between freezing and other behaviors (Hinde, 1966) or to a relaxation-mediated notion of avoidance learning as in Denny's elicitation theory (Weisman, Denny, & Zerbolio, 1967). The undomesticated rats apparently mediated the transition from escape to avoidance responding via behaviors more implicit than grooming, even though there is no obvious strain difference in grooming behaviors in a non-shock situation (Barnett, 1963).

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Note

1. Now at the University of New Mexico.