

Retractable-bar avoidance¹

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In an avoidance learning situation with rats, the usual fixed bar was replaced with a bar that was introduced at warning signal onset and retracted after a bar press. Acquisition of bar-press avoidance with the retracting bar was significantly faster than with a fixed bar; that is, retracting-bar Ss reached the criterion of 95% avoidance for two successive days, significantly faster and with fewer shocks than fixed-bar Ss.

In a discriminative bar-press avoidance situation, a warning signal is presented at a fixed interval prior to the onset of an aversive stimulus. A bar press terminates the signal and postpones the aversive stimulus. Under these conditions, bar pressing can acquire a high probability of occurrence during the warning signal (Ulrich, Holz, & Azrin, 1964), though several investigators have reported that difficulties such as bar holding, freezing or crouching, and warm-up have hampered their attempts to rapidly establish a discriminative bar-press avoidance response with rats, (Hoffman, Fleshler, & Chorny, 1961; Meyer, Cho, & Wesemann, 1960; Hurwitz, 1964). This report describes a procedure in which these difficulties were overcome so that bar-press avoidance was rapidly acquired.

Twelve experimentally naive male albino rats, ap-

proximately 90 days old, were randomly assigned either to a retracting-bar or fixed-bar group.

The experimental space was constructed of wood, with a clear plastic door. A bulb (7-1/2 W) on the back wall of the enclosure illuminated the chamber. The response lever was a Lehigh Valley Electronics Model 1405R retractable lever. A buzzer served as the warning signal. Illumination of a safe-light above the bar denoted the safe period. **Procedure**

Figure 1 illustrates the difference between the retracting-bar procedure and the fixed-bar procedure. In the retracting-bar procedure the Ss were placed in the apparatus with the bar retracted. After 27 sec the warning signal was presented and the bar extended. If no bar press occurred within 5 sec, a continuous shock (1.5 mA) was introduced, followed 5 sec later by the termination of the warning signal, the shock, and the retraction of the bar. After 2 sec elapsed, the warning signal and the bar were again introduced. If a bar press occurred within 5 sec, the warning signal alone was terminated and the shock avoided. If the bar press occurred after the shock onset (escape), both the warning signal and the shock were terminated. In

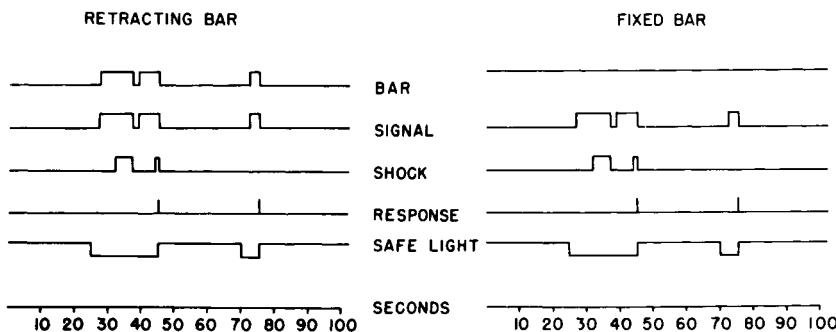


Fig. 1. Diagrammatic representation of the experimental procedures. (see text).

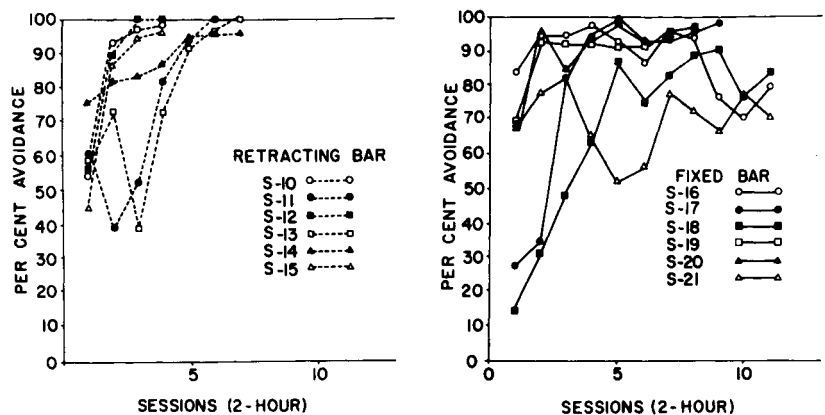


Fig. 2. Percent avoidance per session for each S. Dotted lines indicate retracting bar. Solid lines indicate fixed bar.

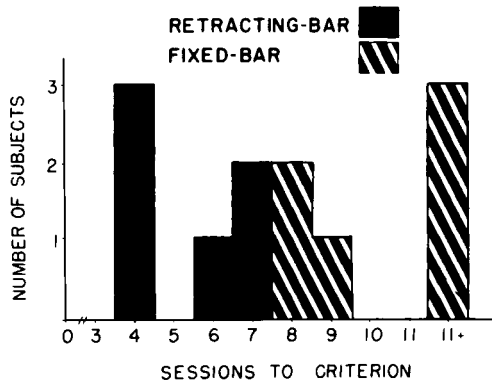


Fig. 3. Comparison of the number of sessions necessary to reach criterion for the retracting-bar Ss (black) and the fixed-bar Ss (striped). Each column represents the number of Ss for each group that reached criterion.

each case a bar press resulted in the presentation of the safe-light for 25 sec. Two seconds after the termination of the safe-light, the warning signal and the bar were again introduced and the cycle was reinstated. In the fixed-bar procedure, the only difference was the constant availability of the bar.

Results and Discussion

Figure 2 shows individual acquisition curves for each individual S of the retracting-bar group on the left and the fixed-bar group on the right. The criterion selected for acquisition was two consecutive sessions with at least 95% avoidance.

Another aspect of the differential success of the two training procedures is shown in Fig. 3. All retracting-bar Ss reached criterion by the seventh session. The fastest of the fixed-bar Ss reached

criterion in the eighth session. Thus, by this measure, there was no overlap between the two groups ($t=5.09$, $df=10$, $p=.002$). The retracting-bar group also took significantly fewer shocks prior to reaching criterion ($x=152$) than did the fixed-bar group ($x=404$), ($t=2.87$, $df=10$, $p=.01$).

These comparisons show that the use of a retracting bar facilitated acquisition of the bar-press avoidance response. This facilitation might be attributed to (1) elimination of bar holding as a response competing with bar pressing, (2) elimination of nonreinforced bar presses, i.e., bar presses outside the warning signal interval, and/or (3) the discriminative properties acquired by introducing the bar with the warning signal prior to the shock.

References

HOFFMAN, H. S., FLESHLER, M., & CHORNY, H. Discriminated bar-press avoidance. *J. exp. Anal. Behav.*, 1961, 4, 309-316.
 HURWITZ, H. M. B. Method for discriminative avoidance training. *Science*, 1964, 145, 1070-1071.
 MEYER, D. R., CHO, C., & WESEMANN, ANN. On problems of conditioning discriminated lever-press avoidance responses. *Psychol. Rev.*, 1960, 67, 224-228.
 ULRICH, R. E., HOLZ, W. C., & AZRIN, N. H. Stimulus control of avoidance behavior. *J. exp. Anal. Behav.*, 1964, 7, 129-133.

Notes

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