A SHAPING TECHNIQUE FOR PRODUCING RAPID AND RELIABLE SIDMAN BAR-PRESS AVOIDANCE¹

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The problem of generating efficient bar-press behavior in a relatively convenient period of time and in a satisfactorily high percentage of subjects has been a problem for experimenters working with Sidman avoidance (Bolles and Popp, 1964; Leaf, 1965; Weissman, 1962). The present procedure demonstrated an extension of appetitive shaping principles to Sidman avoidance that produced responding quickly in all subjects studied.

Subjects were 10 male albino rats. Three of the Charles River strain were obtained commercially and were between 150 and 200 days of age at the start of the experiment. The other seven were naive Wistars between 72 and 92 days of age taken from the home colony. The apparatus consisted of a Grason-Stadler Model E 3125B 100 two-lever rat chamber with only the right bar operative. The bar was 0.4 in. (1 cm) thick, 2.4 in. (6 cm) wide, projected 0.4 in. (1 cm) into the box, and was located 3.5 in. (9 cm) above the grid. A 32-g dead weight was required to depress it over a 2-mm excursion to produce a response. Shocks were delivered through a model E 1064GS combination shock generator and scrambler.

Subjects were reduced to 80% free-feeding weight and shaped to an appetitive bar press with standard procedures (Michael, 1963). Each subject was then given one 30-min session in which every bar press produced a 45-mg Noyes food pellet (FR 1). This was continued for 10 reinforcements on the subsequent day. The avoidance program was then added while the appetitive responding continued. Initial shock intensity proved ideal at 0.05 mA. Higher shocks elicited jumping, hyperactivity, or discontinuation of eating when pellets were available. Initially, each response

postponed the next shock 30 sec (R-S interval) and each shock was followed by another shock every 1.5 sec (S-S interval). After several slight increases in shock intensity were followed immediately by responses (*i.e.*, the S-S intervals did not elapse), the food contingency was discontinued. The remainder of the session consisted of gradual increases in shock intensity and S-S intervals as avoidance developed at lesser values of these parameters. The time required for the first session rarely exceeded 90 min, with the food contingency usually terminated after about 20 min.

In the second session, the concurrent FR 1-avoidance program began immediately. The initial S-S interval and shock intensity were higher than at the start of the previous day but lower than at the finish. These were increased until the terminal parameters were reached (RS = 30 sec, SS = 5 sec, shock = 0.1 sec, 2 mA).

The third session started at the terminal parameters without food and followed at least 24 hr of free feeding. The white noise level was raised to a more standard value, having been lowered in the earlier sessions so it would not interfere with auditory feedback from the bar press (Bolles and Popp, 1964).

Figure 1 shows the percentage of shocks avoided for three of the last four subjects. The transition from FR 1 to avoidance was smooth, the response rate averaging around 4.5 per minute in all three sessions. Probably the most noteworthy aspect of the acquisition process was the absence of any prolonged periods without responses. It was impossible to discern any point at which stimulus control could be said to have transferred from the appetitive to the aversive contingencies. The fourth subject required four shaping sessions, but after 2 hr of the fifth session, was avoiding 90%+ of the shocks at the terminal parameters.

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Fig. 1. Percentage of shocks avoided for 5-min blocks during the first avoidance session at terminal parameters, calculated in terms of S-S intervals (60 shocks due per block).

Since some trial attempts were required before the most expedient set of operations had been decided upon, the first six subjects were shaped with slight variations of the final standardized procedure. The first three began with higher shock intensities and S-S intervals (1 mA and 5 sec), and their acquisition was longer, more sporadic, and required reverting to lower levels of both variables. The second three (Charles River) acquired the response in a way comparable to the rats shown in Fig. 1, but with intensities not lowered at the start of the second shaping session. All 10 subjects continued to perform at a high level in subsequent sessions while normal weight was being regained.

In addition to the virtually immediate acquisition, the early avoidance behavior was more mature than that reported for comparable stages with other procedures. For example, Leaf (1965) obtained 100% avoidance acquisition in 6 hr with S-S intervals of 1 and 3 sec, but his criterion for acquisition stipulated only that subjects spend less than 50% of their time in S-S intervals. His interresponse time (IRT) distribution showed that respond-

ing consisted predominantly of IRTs either exceeding the R-S interval or with values of 0 to 2 sec. In contrast, the three subjects shown here spent less than 2% of their time in S-S intervals and emitted 81% of their responses with IRTs between 3 and 29 sec (inclusive). Periodic observation failed to yield any evidence of the bar-holding behavior reported with other procedures, presumably because the press-release topography had been previously established during the FR 1.

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