A COMBINED MANIPULANDUM-REINFORCEMENT ARRANGEMENT¹

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The arrangement described here permits rats to be conditioned in a free-operant situation in a short time and with greater control over chaining factors. This arrangement also assures very short, constant delays of reinforcement.

The manipulandum-reinforcement arrangement in Fig. 1 is an adaptation for bar pressing of an arrangement devised by Teichner (1952). In Teichner's device, a tube was fastened to a fulcrum. When the rat pressed the tube, *E* released a pellet that slid down the tube into the rat's mouth. The principle of Teichner's arrangement was incorporated into a bar, replacing the bar and food tray of the Grason-Stadler (Model E3125A) "rat box."

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Fig. 1. Schematic of the modified manipulandum for bar pressing by rats.

The lower part of Fig. 1 shows the important features of the proposed manipulandum-reinforcement arrangement for bar pressing. The 2- by 1-in. bar was fabricated from sheet metal, with a trough in the center 1 in. long, 1½ in. wide, and ⅞ in. deep. The approximately ⅜ in. of surface on each side is sufficient for a "normal" paw press; yet the trough is large enough to allow rats immediate and easy access to the pellet as it drops into the trough.

The bar is mounted in a bracket so that the travel distance can be controlled. A 7-g force tips the bar, and the tab on the right rear of the bar assembly rises to trip a microswitch mounted on the underside of the pellet dispenser; this activates the dispenser to release a pellet.

The apparatus can be easily adapted for discrimination problems. The upper part of Fig. 1 shows one of two apertures, one on either side of the bar, through which light from two stimulus projectors can be directed. These projectors are mounted on the backside of the panel at a 35° angle. Cylindrical shields prevent light leakage and direct the light on the face of the rat when it is in position to operate the manipulandum. The effect is similar to shining a flashlight on each side of *S*'s face.

One advantage of this manipulandum-reinforcement arrangement is to shorten the response chain by eliminating the response of going from the bar to the food tray. Thus, as noted, delays of reinforcement are very short and constant. Also, holding *Ss* in the vicinity of the bar shortens the approach-to-the-bar component of the chain.

A possible shortcoming of this arrangement is some unconditioned magazine behavior which might be mistakenly scored as bar pressing. Such behavior does occur, in the form of licking up pellet dust and exploring the tray. However, a bar press is recorded only on release of the bar. Because unconditioned maga-

zine behavior usually occurs during the time the bar is depressed, such behavior would not be recorded as additional conditioned presses.

After 23.5 hr of food deprivation, 42 male albino rats were trained with this manipulandum-reinforcement arrangement. In order to facilitate the Ss' initial response, the bar was baited with one food pellet. Depressing the bar to obtain this pellet released a second pellet, and each subsequent press delivered an additional pellet. All rats learned to press the

bar within a 30-min period. The mean number of presses was 127.8 per 30 min ($SD = 11.52$). Most of the variability among Ss was due to the difference in time before the first press. After the first press and subsequent reinforcement, Ss worked at a steady rate.

REFERENCE

- Teichner, W. H. Experimental extinction as a function of the inter-trial intervals during conditioning and extinction. *J. exp. Psychol.* 1952, **44**, 170-178.