A RETRACTABLE LEVER FOR USE IN BEHAVIORAL RESEARCH¹

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A simplified retractable lever can be constructed from materials available in most laboratory workshops. Figure 1 shows the lever. As seen in the front view, it consists of a wedge-shaped surface which protrudes from the wall of the S's chamber. The lever is constructed of sheet metal cut in the illustrated pattern and folded in the configuration shown in the assembly detail. The joints along the bottom are soldered or brazed, as are the joints between the hinge and the lever. Since the hinge is at the top, a response will force the lever flush with the wall and, in effect, cause the lever to disappear.

The back view shows the construction details. The slug of the solenoid rests on a stop constructed of 1/16 in. aluminum. There is a small hole in the stop directly below the solenoid slug. A short length of nylon fishing line passes through the hole and connects the slug to the movable leaf of the hinge. A second bend at the bottom of the aluminum fitting limits the inward movement of the lever. When the solenoid is activated, the slug retracts and the lever is pulled in so that its front surface is flush with the wall of the chamber. When the solenoid is deactivated, the lever returns to its former position. A microswitch detects responses. Pressure on the lever forces the movable leaf of the hinge against the arm of the microswitch and activates the contact system.

As seen in Fig. 1, the upper leaf of the hinge is bolted to the wall of the chamber. The other components are mounted on a sheet of 1/8 in. plastic which is also bolted to the chamber wall. It is important that the curved bottom surface of the lever form an arc that is everywhere equidistant from the axis of

the hinge. This can be achieved by drawing the curved portion of the pattern with a compass with centers (marked *c* in Fig. 1) located at the point to be occupied by the axis.

The dimensions and specific components of a given lever are not critical and can be determined by the problem at hand. For example, our prototype lever was designed for avoidance work with rats. Its front surface is 1 1/8 in. by 1 3/4 in. and its bottom edge is mounted 2 5/8 in. above the grid floor of the S's chamber. The solenoid (Guardian electric, type 22, cost approximately \$3.50) operates on 24v dc, is rated for continuous duty and draws only .167 amps. The switch is single pole double throw (Microswitch BZ 2 RW-A2, cost approximately \$2.00). The hinge is constructed of 1/32 in. brass and is 1 1/2 in. long. Hinges of this sort can be obtained from most hardware stores at nominal cost.

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One purpose in designing this lever was to present the *S* with an "operandum" (Skinner, 1962) which would discourage holding responses following escape from electrical shock. Since the lever becomes flush with the wall during a response, *Ss* cannot climb on to it. Moreover, by mounting the lever fairly high, *Ss* are discouraged from holding it in for extended periods. We have trained a number of rats to escape shock. Although they tended to hold the lever for periods up to 1 min following the first few shocks, they seldom held it in for more than a second or so thereafter.

By increasing its dimensions, the lever could be easily adapted for use by a variety of species (including man). Moreover, it would be a relatively simple matter to mount a light bulb

within the lever and to substitute a translucent screen for the front surface. In this fashion, the *S* could be provided with a relatively discriminable stimulus in a context which requires that the response involve manipulation of the stimulus itself.

Finally, it should be noted that the lever is probably not suited for applications which demand the achievement of high response rates (*e.g.*, more than 100 responses/min). With this exception, however, the unit seems to offer an inexpensive and readily available solution to a pressing problem.

REFERENCE

- Skinner, B. F. Operandum. *J. exp. Anal. Behav.*, 1962, 5, 224.