AN OPERANT-DISCRIMINATION APPARATUS FOR INFANTS¹

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Operant-conditioning and discrimination procedures have been used successfully with older children (Warren & Brown, 1943; Bijou, 1955; Long, 1959). Students of infant behavior have also adapted the operant procedure for the study of early-learning processes. Brackbill (1958) has conditioned a smiling response in 4-month-old babies, with contact stimulation as reinforcement; and Rheingold, Gewirtz, and Ross (1959) trained 3 monthers to vocalize, with auditory, tactual, and visual components as reinforcement.

This paper describes an operant technique that (a) uses manipulanda suitable to the response repertoire of infants; (b) provides a choice situation to enable the study of discriminative behavior; and (c) allows automatic recording of response frequency to different stimuli within time units.

Figure 1 is a photograph of the apparatus. It consists of two units: one contains the stimuli, manipulanda, and auditory-reinforcement sources; and the other contains the ex-

Fig. 1. The apparatus.

perimenter's remote-control switches. The child's unit is a rectangular box, shaped so that it rests on the playpen floor with the front panel sloping toward S. Two 6-inch white square insets are the manipulanda. In the center of each square is a 2-inch-diameter aperture of flashed opal glass; and behind each of these is a cluster of four colored (red, pink, blue, and yellow) bulbs, each activated independently. The manipulanda rest on microswitch leaves which allow them to be moved about 0.5 inch when tapped or banged. When a panel is moved, either the sound of chimes or no sound will occur, depending on the setting made

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by *E* at the remote unit, from which the stimulus lights are also controlled. From counters, *E* reads the cumulative frequency of responding to each panel every 30 seconds.

Data from two infants are reported here to exemplify the procedures used. Each experimental session lasted 8 minutes, divided into four 2-minute phases. In Phase 1, the positive stimulus (e.g., red light and chimes) occurs in the left panel, while the negative stimulus (e.g., blue light and no sound) occurs in the right. In Phase 2, the positive stimulus is switched to the right panel and the negative stimulus to the left panel. In Phase 3, both panels are negative; thus, a response to either panel produces no sound. In Phase 4, the positive stimulus is again associated with one of the panels and the negative stimulus with the other.

Figure 2 shows the data from one infant in a red-positive, blue-negative discrimination setting. The same data are plotted in two ways. The top graph is a continuous recording of

Fig. 2. Cumulative-frequency curves to the two panels from a 10-month-old girl. The data in the bottom graph are replots of the data above.

responses to the left and right panels. In Phase 1, the child pushed the left positive panel with a greater frequency than the right negative panel. In Phase 2, where red and chimes were switched to the opposite panel, the child's relative frequency of responding to the two panels switched accordingly. In Phase 3, an extinction phase in which both panels are negative, the child tended to stop responding, particularly in the second minute of the interval. In Phase 4, a pattern of discriminative responding was restored, with almost no responses occurring to the negative panel. The bottom graph shows the same data, resetting the frequency curves at zero in each new phase. The data from the next subject are plotted in this manner in Fig. 3.

Figure 3 shows the data from another infant tested on two occasions separated by 3 days. On the first occasion, the discrimination was a red-positive, pink-negative one; on the second day, pink was associated with chimes and red was the negative stimulus. On the first day, the discrimination was readily established in Phase 1, and in Phase 2 the infant's be-

Fig. 3. Cumulative-frequency curves from a 12-month-old boy on two different occasions. The positive stimulus was red on the first occasion and pink on the next.

havior shifted appropriately. In Phase 3, this child produced more responses than in any other phase. This may represent an initial frustration reaction produced by the withdrawal of the previously positive stimulation. However, this reaction was short-lived and extinction behavior ensued. Responses decreased greatly in the second minute of that phase relative to the first. The bottom part of Fig. 3 shows the second session, in which pink was now the positive stimulus. In the first two phases, discriminative behavior was present but it was not so striking as on the first day; by the fourth phase, differential responding was clearly present.

The procedures described here offer a technique for the study of learning and discrimination processes in the human infant. Variations of these procedures may be used to assess the sensory capacities of the young child who is unable to verbally report perceived differences in paired stimuli.

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