NOTES

A transparent contact response key for operant studies*

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The design and construction of a simple operant manipulandum for contact responding is described. The response key is fabricated from transparent conductive glass which allows for rear projection of stimuli. Since the key requires virtually no force to operate, both shaping and response rates are faster than found with conventional operant press plates.

In studies of stimulus control, Es have generally required Ss to respond directly at or near a presented stimulus, the assumption being that discrimination learning is often impaired when there is a separation between cue and response (cf. Stollnitz, 1965). Thus, investigations with pigeons and primates have usually employed "pecking keys" and "press plates" designed for use with in-line digital display cells or other rear-projection devices. Since pigeons tend to look where they peck and monkeys tend to look where they point, a response to the pigeon key or monkey press plate can function as an "overt orienting response" (Mackintosh, 1969) providing "facilitative feedback" (Estes, 1969) that improves learning and the acquisition of stimulus control. However, in our studies of stimulus control with squirrel monkeys, the standard squirrel monkey press plate (BRS/LVE, Model SMP-001) requires a minimum operating force of .74 N. This response requirement is extremely difficult for squirrel monkeys of 1-2 kg to achieve, and we have been unsuccessful in shaping such responses in a group of five animals even after 15 daily 1-h training sessions. While suitable response rates have been maintained by these same animals on response levers located below the stimuli, such operants do not allow for the "overt orienting response" and "facilitative feedback" necessary for maximum stimulus control. The device described below was designed to provide the animal with a transparent contact response key for in-line use with rear-projected stimuli. It differs from previous opaque contact response devices which must be placed adjacent to the stimuli and require the S to be grounded (e.g., Jarvik & Carley, 1964).

The basic response key consists of an optically clear glass disk (5.08 cm diam, 3.175 mm thickness) with an EK and EC3 conductive coating and overcoating (Keim Precision Mirrors, 124 E. Angeleno, Burbank, California 91502; \$3). The glass was 100 ohms per square,

Fig. 1. Schematic diagram of amplifier circuit for conductive glass key. All resistors are in ohms.

although glass as low as 14 ohms per square is also available. The fewer ohms per square, the less light is transmitted as the glass tends to become darker. Stimuli projected through the 100-ohm/square glass key used here were not measurably affected. The conductive glass key was cemented to a Plexiglas rim which was cemented to the rear of a 3.20-cm-diam hole located on the intelligence panel of an operant discrimination unit. A wire was attached to the glass coating with conductive cement and connected to the amplifier circuit shown in Fig. 1. This allowed for interfacing with conventional 12- and 24-V programming equipment.

In operating this key, the animal simply touched the glass coating, thus offering high resistance between the grounded cage and the conductive glass. The ultra-high gain amplifier was triggered (by the unshielded noise of the animal), and a response was recorded.

This device does not respond to nonconductive sources, and the relatively nonconductive beak of a pigeon would probably not operate the key. Physical contact has to be broken in order for a subsequent response to be recorded. In addition, a 24-V relay located behind the intelligence panel and adjacent to the glass key provides "feedback clicks" (cf. Catania, 1963). Following 15 sessions of unsuccessful shaping to the standard squirrel monkey press plate, all five animals acquired the glass key response during the next session. Response rates increased during subsequent sessions, and by Session 15 all animals were being maintained on a VI 60-sec schedule.

REFERENCES

- Catania, A. C. Techniques for the control of monocular and binocular viewing in the pigeon. *Journal of the Experimental Analysis of Behavior*, 1963, 6, 627-629.
- Estes, W. K. New perspectives on some old issues in association theory. In N. J. Mackintosh and W. K. Honig (Eds.), *Fundamental issues in associative learning*. Halifax: Dalhousie University Press, 1969. Pp. 162-189.
- Jarvik, M. E., & Carley, J. L. A simple circuit for contact responses. *Journal of the Experimental Analysis of Behavior*, 1964, 7, 82.
- Mackintosh, N. J. Epilogue: Issues and problems in associative learning. In N. J. Mackintosh and W. K. Honig (Eds.), *Fundamental issues in associative learning*. Halifax: Dalhousie University Press, 1969. Pp. 190-203.
- Stollnitz, F. Spatial variables, observing responses, and discrimination learning sets. *Psychological Review*, 1965, 72, 247-261.

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