A RESTRAINING DEVICE FOR USE IN THE MEASUREMENT OF EYELID RESPONSES IN LABORATORY RATS

HARVEY C. EBEL

UNIVERSITY OF MAINE^{1,2}

In studies of classical conditioning the behavioral attribute measured is, generally, a relatively restricted member of a class of response events which is effected by the unconditioned stimulus. Specifically, one might wish to isolate a particular system such as the eyelid response to a corneal air puff. One currently popular way to measure this relatively minute skeletal movement is to link some type of transducer directly to the eyelid of the organism and, either fix the transducer to the head of the organism (as is typically done with larger subjects, such as humans), or mount (*i.e.*, physically ground) it external to the subject. In the latter case, the "noise" problem created by slight head or body movement can readily produce recording artifacts. The technical problem, then, is total immobilization of the subject in order to prevent confounding responses.

It is clearly difficult to impose considerable restraint while permitting the examination of conditioned behavior.³ Hughes and Schlosberg (1938) and Biel and Wickens (1941) utilized devices which, apparently, were insufficient to prevent the contribution of head, shoulder, and backward bodily movements to eyelid response protocols. Lykken and Rose (1959) developed a device, incorporating Ace-bandage wrap, which was intended for use with GSR recording in rats and which likewise permitted

ditioned responses in animals. But, the majority of them (*e.g.*, Cowles and Pennington, 1943; Haggard and Thompson, 1954) have neither attempted, nor succeeded in obtaining, total immobilization. One noteworthy exception, is a device described by Schneiderman, Fuentes, and Gormezano (1962) to record eyelid and eyeball movements in the albino rabbit.

The present note describes a means of restraining the laboratory rat (see Fig. 1) to permit measurement of the eyelid response. Head and body movements which would otherwise be superimposed on the response record are eliminated.

The animal rests upon a platform (see Fig. 2) with its legs hanging freely through four appropriately placed holes. Gross body movements are restricted by foam-lined U-clamps lowered around the body and over the forelegs. These clamps are secured in position with thumbscrews set in a bar mounted along the longitudinal axis.

A Plexiglas device consisting of a $\frac{5}{32}$ -in. hole to locate and fix the position of the subject's upper incisors, a bite-board to support the upper jaw, and holes to receive the tips of a padded snout U-bolt, is also illustrated in

Fig. 1. Rat is shown completely restrained just before the potentiometer rod is placed on eyelid.

¹The original development of this apparatus was undertaken while the author was a National Institute of Mental Health Predoctoral Research Fellow at Pennsylvania State University. Later work was supported in part by the National Aeronautics and Space Administration (Grant No. NsG-338).

²Reprints may be obtained from the author, Laboratory of Neurophysiology, College of Physicians and Surgeons, Columbia University, New York, N.Y. 10032

³See Hall, Clayton, and Mark (1966) for references to restraining devices related to studies of operant behavior.

Fig. 2. Restraining device for use in the measurement of eyelid responses in laboratory rats.

considerable head movement. There exists a variety of other techniques directed at permitting the measurement of classically conditioned eyelid response. The entire platform is housed in a sound-deadened chamber, and supported within it by foam-padded runners. The apparatus for recording eyelid movements consists of a microtorque potentiometer, of the type described by Spence (1953), which is mounted beside the subject on the restraining platform. A rod is mechanically coupled to the shaft of the potentiometer and its free end attached to the subject's upper lid structure by means of a drop of flexible collodion. The

signal from the potentiometer, generated by movement of the eyelid, may readily be amplified and recorded. In the course of conditioning, subjects have remained under restraint with little apparent discomfort for periods up to 90 min.

One serviceable feature of this apparatus is that, in contrast to techniques which require that the subject's legs be tied and made immobile (which may induce vascular damage), the present method allows such freedom of restriction of the legs that a similar use of a potentiometer may be applied to measure limb responses (*e.g.*, Caldwell and Werboff, 1962). The present author has found that with practice, less than 1 min is required to secure the subject, thereby allowing the use of a light anesthetic such as ether for "strapping-in".

REFERENCES

- Biel, W. C. and Wickens, D. D. The effects of vitamin B₁ deficiency on the conditioning of eyelid responses in the rat. *J. Comp. Psychol.*, 1941, **32**, 329-340.
- Caldwell, D. F. and Werboff, J. Classical conditioning in newborn rats. *Science*, 1962, **136**, 1118-1119.
- Cowles, J. T. and Pennington, L. A. An improved conditioning technique for determining auditory acuity of the rat. *J. Psychol.*, 1943, **15**, 41-47.
- Haggard, E. A. and Thompson, W. R. Electrodes for measuring the GSR in small animals. *Amer. J. Psychol.*, 1954, **67**, 357-358.
- Hall, R. D., Clayton, R. J., and Mark, R. G. A device for the partial restraint of rats in operant conditioning studies. *J. exp. Anal. Behav.*, 1966, **9**, 143-145.
- Hughes, B. and Schlosberg, H. Conditioning in the white rat: IV. The conditioned eyelid reflex. *J. exp. Psychol.*, 1938, **23**, 641-650.
- Lykken, D. T. and Rose, R. A rat-holder with electrodes for GSR measurement. *Amer. J. Psychol.*, 1959, **72**, 621-622.
- Schneiderman, N., Fuentes, I., and Gormezano, I. Acquisition and extinction of the classically conditioned eyelid response in the albino rabbit. *Science*, 1962, **136**, 650-652.
- Spence, K. W. Learning and performance in eyelid conditioning as a function of intensity of the UCS. *J. exp. Psychol.*, 1953, **45**, 57-63.