AN OBJECTIVE TECHNIQUE FOR RECORDING SHOCK-INDUCED AGGRESSION IN UNRESTRAINED PAIRS OF RATS¹

WARREN SELEKMAN AND EDWARD MEEHAN

ADELPHI UNIVERSITY

Pairs of rats received grid shock in a conical enclosure. Each shock elicited the stereotyped fighting posture. An omnidirectional pole, which was always between the rats, was accidentally operated whenever the rats fought. The number of pole hits, and the number of observed fight bouts, increased with current intensity. The number of pole hits served as a reliable and objective measure of shock-induced fighting in rats.

When unrestrained pairs of rats are exposed to inescapable electric shocks delivered through a grid floor, they typically engage in a stereotyped fighting bout in response to each shock (*cf.*, Ulrich and Azrin, 1962). Immediately after each shock, the rats reflexively rear up on their haunches and begin to strike each other with their forepaws. Heretofore, the recording of such fighting bouts has been done by one or two human observers. While the stereotyped fight topography has made subjective reporting fairly reliable, it is desirable that the recording technique be objective. An objective recording technique would free the experimenter from any criticisms of experimental bias, especially when the experimenter serves as one of the observers. In addition, such a technique would obviate the need for constant observation and would allow aggression experiments to be conducted when observation is impractical (*e.g.*, at night), or impossible (*e.g.*, in the dark). The present paper details a technique for the objective recording of fight bouts in unrestrained pairs of rats.

The present technique is predicated on the accidental operation of a manipulandum in the course of a fighting bout between two rats in a confining enclosure. The apparatus consisted of a standard rat chamber with a stainless steel grid floor, a BRS constant current

shocker and scrambler unit SGS003, a conical enclosure, and a Lehigh-Valley omnidirectional pole 121-20.

A diagram of the apparatus is presented in Figure 1. The conical enclosure was a commercially produced, clear acrylic plastic flower pot purchased from a department store for \$2.98. The enclosure was placed on the grids of the rat chamber. The lip of the conical enclosure was filed down so that the base fit snugly against the hinged roof of the experimental chamber. To prevent the enclosure from moving laterally inside the chamber, a sheet of 6.35-mm thick clear acrylic plastic whose outside dimensions exactly matched the inside perimeter of the chamber, was placed around the conical enclosure. When the chamber roof was closed, the pole, which was attached to the chamber roof, protruded 6.0 cm into the base of the enclosure. It was necessary to enlarge the hole in the base of the flower pot in order to accommodate the pole.

During an experimental session, a pair of rats was placed in the chamber, and the conical section was then placed over the pair and was secured by the sheet of plastic. Rats were then exposed to noncontingent shocks of 0.5-sec duration delivered on fixed and variable time schedules. After the first few shocks in a given session, the rats would begin to fight in the stereotyped posture immediately after each subsequent shock. Each fight bout, which lasted from 0.5 sec to 2.0 sec, was followed by a period during which the rats froze while still on their haunches. This freezing posture lasted until the next shock was delivered, which then produced the next fight bout. Be-

¹Reprints may be obtained from Warren Selekman, Department of Psychology, Adelphi University, Garden City, Long Island, New York 11530. The authors wish to thank Ms. Ann Leaver, Mr. George Hess, Mr. Edward Weir, and Mr. Fred Newman for their assistance.

Fig. 1. Cross-sectional diagram of conical enclosure in chamber.

cause of the conical configuration of the enclosure, the pole was always between the rats whenever they were on their haunches. Consequently, the pole was deflected at least once whenever the rats fought. The frequency of pole deflections was taken as the objective record of fight bouts.

A photograph of a typical fight bout elicited by shock in the conical enclosure is shown in Figure 2. Observe that the rats are striking each other in the stereotyped posture and that the pole is accidentally deflected.

Cumulative records of pole hits and fight reports from a typical session are shown in Figure 3. The figure shows high agreement between pole hits and reported fights.

In general, agreement between independent observers was over 95%. Furthermore, 97% of pole hits corresponded with reports of aggres-

sion within the 2.0-sec interval after shock offset.

Occasionally, pole hits occurred that were unrelated to fight bouts. Two of these are indicated with arrows in Figure 3. Such false reports, which were in general few in number, were related to the freezing pattern that was prevalent after a fight bout during the inter-shock interval. If one or both of the rats froze while holding on to the pole, then minor movements caused the pole microswitch to close. The problem of false reports can probably be eliminated by increasing the force required to activate the pole microswitch so that only the relatively intense movements that characterize the fighting bout will be sufficient to activate the microswitch. Alternatively, false reports can be "eliminated" if pole operations are counted during only the

Fig. 2. Photograph of two rats fighting in the enclosure after a shock.

first 2 sec after each shock. Virtually no false reports occurred during this interval.

The frequency of pole hits per shock in-

creased as shock intensity increased. At 5.0 mA, the number of pole hits per shock averaged across subjects was 3.01 (range 2.10 to

Fig. 3. Concurrent cumulative records of pole hits and fight reports. Cumulative pole hits are shown in the bottom curve; offsets on this record indicate shock occurrences. Reports of fight bouts by two independent observers are shown in the top two records. The broken lines represent temporally corresponding points. The arrows indicate the occurrences of false reports, pole hits unrelated to aggression.

3.72). At 7.0 mA, average pole hits per shock increased to 4.84 (range 2.97 to 6.89). This increase corresponds to the increased fighting with higher shock intensities reported by Ulrich and Azrin (1962).

The present experimenters have found the omnidirectional pole to be a virtually indestructible manipulandum; the current pole has been operated, often violently, over 100,000 times without failure.

In the technique described thus far, the pole is a passive manipulandum; a manipulandum that is operated incidentally to fighting and whose operation has presumably no consequences with respect to the occurrence or duration of shock. As such, the technique could be used to measure aggression as a function of any independent variable, e.g., drug

injections, brain lesions, sensory deprivation, etc. The present technique may also be used to relate quantitatively shock-induced aggression with any other behavior. It is also possible to use the pole as an active manipulandum, as in escape or avoidance paradigms. If it is used first passively as a measure of fight bouts and then actively in either escape or avoidance, it would be possible to investigate quantitatively the relationship between fighting and the acquisition and maintenance of shock-motivated operant behavior.

REFERENCE

- Ulrich, R. E. and Azrin, N. H. Reflexive fighting in response to aversive stimulation. *Journal of the Experimental Analysis of Behavior*, 1962, 5, 511-520.