Schedule-induced polydipsia: A partial reinforcement effect

JAMES L. MOTTIN, *York University,
Downsview, Toronto, Canada*

Several degrees of polydipsia were induced in three pairs of rats fed on VI 20-, 45-, or 120-sec free-pellet schedules. The number of licks to extinction was proportional to the number of licks per pellet emitted during training trials. The results are consistent with the assumption that schedule-induced licking is maintained (superstitiously) as an operant for food and not simply as a function of meal termination or thirst.

"Psychogenic" polydipsia (Falk, 1961, 1967) occurs when hungry rats are supplied intermittently with small amounts of food (e.g., 45-mg Noyes pellets), and water is continuously available. The polydipsia is manifested as excessive postprandial drinking. Stein (1964) and Falk (1966) suggest

that the polydipsia is a function of intermittent feeding interacting with the tendency of rats to drink after eating. However, Segal (1965) argues that such an interaction may only initiate drinking which later becomes elaborated and maintained as superstitious responding. In the present experiment it was assumed that if licking was maintained as an operant for food (superstitious responding), then it would function like other operants, in that the number of responses to extinction would differ according to the number of responses emitted per reinforcement.

METHOD

Six adult male Wistar rats, maintained at 80% of ad lib weight by food deprivation, water ad lib, received daily sessions in a Gerbrands operant box in which a water spout replaced the operant bar. A brief light and a click accompanied each operation of the pellet dispenser.

Training sessions consisted of the delivery of 100 Noyes pellets (45 mg) according to one of three different noncontingent VI schedules: VI 20 sec, VI 45 sec, and VI 120 sec. The three schedules were composed of nonoverlapping rectangular distributions with ranges of 4, 9, and 24 sec, respectively. Two rats were run for 55 days on each of these three schedules.

Extinction began on Day 56 when all animals were run in a session in which the pellet dispenser was operated 150 times, with pellets being delivered on only the first 50 operations. The following day a session was run in which the dispenser was operated 100 times, with no pellets being delivered.

RESULTS AND DISCUSSION

All animals were considered polydipsic since their water to food ratios (cc/gm) were markedly higher during training sessions (6-26) than during preexperimental ad lib feeding (1.0-1.2). Figure 1 shows the relationship between training-session licks and the extinction criterion of 15 lick-free dispenser operations. The percentage of food-reinforced licking is simply the reciprocal of the number of licks per food pellet times 100. The ordinate represents the natural log of the number of licks to extinction. Other slightly different functions could be plotted using different measures of extinction or licks per reinforcement. These would similarly show the partial reinforcement effect shown in Fig. 1.

Schedule-induced licking is known to resemble an operant response in several ways: It requires several sessions to develop fully (Segal, 1965) and appears to be subject to extinction and retraining (Segal, Oden, & Deadwyler, 1965). The results of the present experiment are consistent with this interpretation and suggest that licking occurred as an operant since the number of licks to extinction varied according to the number of licks emitted per food reinforcement.

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Fig. 1. Partial reinforcement effect of polydipsic licking.