Consummatory drinking of the chinchilla*

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The first of two experiments monitored the water consumption of 11 chinchillas for 83 consecutive hours. Ss displayed not only a diurnal rhythm of drinking, but faster rhythms as well. Ss drank at a consistent rate of 3-4 licks/sec. Significant between-S differences in the duration of bursts of licking were found. In the second experiment, 10 non-water-deprived chinchillas showed a preference for apple juice over water as measured by licks/hour.

The chinchilla has become a popular S for behavioral, physiological, and audiometric research. The selection of an animal as a S for research requires detailed study of its behaviors to aid in experimental design, research efficiency, etc. The present investigations were conducted to provide information concerning the chinchilla's drinking behavior. Thompson (1971) recorded the drinking habits of five species and several strains of rodents other than chinchilla. In general, they were found to be nocturnal and to consume the bulk of their water at night. Since Van Twyver (1969) found the chinchilla to be a nocturnal rodent, it was expected to display a nocturnal drinking behavior.

The first experiment evaluated the occurrence of rhythmic drinking behavior, the rate of licking, and the duration of the bursts of licking. The second experiment investigated preferential drinking of the chinchilla, using water and apple juice.

EXPERIMENT I

Method

Subjects

Eleven male, farm-bred chinchillas (*Chinchilla laniger*), between 12 and 18 months of age, served as Ss. All Ss were housed in individual cages with free access to a metal drinking tube attached to a water bottle filled with tap water. The opening of the spout of the drinking tube was 3 mm in diam. The Ss were maintained on chinchilla chow (Purina) on an ad lib basis throughout data collection.

Apparatus

Individual licks were transmitted from the drinking tube via a BRS Drinkometer (DO-201). Counting circuits were constructed of BRS logic modules. An Esterline-Angus 20-pen recorder (A620T) registered the Ss' licking responses.

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Procedure

The Ss were transferred from their individual cages in the colony to identical cages in the test room. In the colony, Ss were maintained on a 12-h light-dark cycle, with the light cycle from 6 a.m. to 6 p.m. and the dark cycle from 6 p.m. to 6 a.m. This schedule was continued in the test room during data collection. The recording of drinking responses began after 7 days of adaptation to the new surroundings. Records were taken continuously for 83 h. The recording paper was changed twice daily and the water supply was replenished every other day.

Results

All Ss drank only during the dark cycle (6 p.m.-6 a.m.), as can be seen in Fig. 1. A PDP-8 computer was used to perform a Fourier analysis on the first 62.5 h of the data to determine the presence of circadian rhythms. Due to a limited storage capacity, only the first 62.5 h of the data could be analyzed. Each S's record was analyzed separately in terms of the number of licks emitted during consecutive 15-min intervals. The resolution of the power spectra of three Ss was too poor to allow meaningful interpretation, and the data were discarded from this portion of the study. A 6-dB increase from each S's base line magnitude of licking was used as the criterion for indicating the presence of a circadian rhythm. All eight remaining Ss showed a 24-h rhythm. Faster drinking rhythms were found in all Ss. Table 1 presents the proportion of the Ss displaying each of the faster rhythms.

Lick rates were calculated by dividing the number of licks emitted during a burst of licking by the duration of the burst. Following the data collection, it was

Fig. 1. Median number of licks/hour as a function of time of day for 83 h. Only those hours when drinking occurred are depicted.

Table 1
Proportion of Ss Showing Each Rhythm

Proportion	Rhythm (Hours)
8/8	24
4/8	12
4/8	8
5/8	4
5/8	1

determined visually that rates lower than 1 lick/sec did not occur when the Ss' primary activity was consummatory drinking. Rather, these rates accompanied activity such as eating and grooming. Therefore, all bursts were eliminated where the lick rate was less than 1 lick/sec. The mean lick rate for all Ss was 3.2 licks/sec, and the range of the individual means was 1.8-4.9 licks/sec. Analysis of the lick rates across all Ss did not indicate any significant differences between the Ss ($F < 1$, $df = 10/503$). The lick rate of the individual Ss appeared to be stable, with the standard deviation of the rates of only two animals greater than 1 (1.1 and 1.5). The duration of the licking bursts did differ significantly between the Ss ($F = 18.6$, $df = 10/503$, $p < .01$), with the individual mean durations ranging from 37 to 352.5 sec.

EXPERIMENT II

Erber and Beeler (1966) collected data which suggested that water-deprived and non-water-deprived chinchillas preferred apple juice to water. The second experiment was conducted to determine if non-water-deprived chinchillas would, in fact, display a preference for apple juice over water when allowed to drink either liquid. Unlike the previous design of Erber and Beeler, in which preference was based on total amount consumed, the present design called for a paired comparison based on lick rate.

Method

Subjects and Apparatus

The Ss were 10 male, farm-bred chinchillas, 12 to 18 months of age. One S had been used in Experiment I. The apparatus was the same as that of Experiment I.

Procedure

After 3 days of adaptation to the test room, during which time water was available on an ad lib basis, 2 days of preference testing followed. Each S had access to two drinking tubes placed side-by-side on its cage. One tube was connected to a bottle filled with tap water and the other to a bottle filled with unsweetened apple juice. The position of the tubes was determined randomly for the first day, and the tubes were reversed on the second day to control for possible position biases. Food was available as in Experiment I. Since Experiment I revealed that the peak period of drinking was during the dark cycle, recording began at 5:30 p.m. and ended at 6:00 a.m.

Results

The results are depicted in Fig. 2. All Ss displayed a

definite preference for apple juice over water. There was no intake of water when the apple juice was available. The median number of licks hour emitted for apple juice for Night 1 was about three times the number emitted for water in Experiment I. Drinking on Night 2 declined to a level comparable to that for water intake in the first experiment. This increase and subsequent decline apparently reflects a novelty effect and its adaptation.

DISCUSSION

The results indicate that, like other rodents (Thompson, 1971), the chinchilla consumes its daily intake of water at night. In addition to this 24-h rhythm, there was also evidence of faster rhythms. All of the faster rhythms were not found in every S. Although it could be suggested that analyzing only the first 62.5 h of the data produced the across-S inconsistency, this is doubtful, since the time interval would provide adequate sampling of the faster rhythms. However, the inconsistency requires further research.

Stellar & Hill (1952) found the rat to drink at a rate of 6-7 licks/sec. The chinchilla's rate is apparently about half that of the rat—3-4 licks/sec. Stellar & Hill (1952) and Corbit & Luschei (1969) found the rat's lick rate to be stable. The present study indicates that the chinchilla's lick rate is also stable, at least under nondeprived conditions. A test of this stability requires a comparison of the chinchilla's lick rate in both deprived and nondeprived states to determine if it can be manipulated by conditions of deprivation. The duration of the chinchilla's bursts of licking varied across animals—one chinchilla may drink in 1-min bursts and another may drink in 5-min bursts.

Fig. 2. Median number of licks hour (apple juice) as a function of time of day for 2 consecutive nights. Ss did not consume any water during these periods, and consequently, water intake in licks hour falls to zero.

Further investigation of the use of apple juice as a reinforcer for the chinchilla may be useful. The pronounced preference for apple juice over water indicates its potential use as a reinforcer in experiments involving licking with the chinchilla.

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Discrimination learning and behavioral contrast as a function of component duration*

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Following 10 sessions of keypeck training on a VI 120-sec reinforcement schedule, 24 pigeons were placed into one of three groups for subsequent discrimination training on a multiple VI-EXT schedule. The discriminative stimuli (two hues) alternated every 10 sec (10-sec group) or every 3 min (3-min group) during each 30-min session. The third group received one 15-min exposure of S+ and one 15-min exposure of S- per session (15-min group). Discrimination performance of these groups was best for the 10-sec group and worst for the 15-min group. The 10-sec group demonstrated higher S+ rates, while the 15-min group had the highest S- response rates.

Many details of discrimination training procedures have been shown to influence operant discriminative performance. For example, if Ss are first trained to respond to either a variable-interval (VI) or a multiple VI-VI schedule of reinforcement, subsequent discrimination training on a multiple VI-EXT schedule commonly results in an enhancement of response rates to S+ correlated with the extinction of responding to S-. Reynolds (1961) and Terrace (1963) have termed

this phenomenon "behavioral contrast." However, there are limits to the generality of behavioral contrast in multiple VI-EXT schedules. For example, when conditions are arranged such that the increase in response rate to the VI component is made at the cost of a reduction in reinforcement frequency in that component (as in tandem VI-DRL schedules), behavioral contrast is severely attenuated (Yarczower, Dickson, & Gollub, 1968).

The present experiment was designed to investigate another manipulation of training conditions which might influence the properties of discriminative performance, the temporal duration associated with exposure to the reinforcement schedules and related stimuli. Typically, the schedules have been alternated or randomized, using fixed stimulus exposure periods of 3 min. Bloomfield (1967) conducted a study in which the VI and EXT components of a multiple schedule were alternated on a session basis. That is, only one component was presented in any one daily session. Although behavioral contrast was still found, the magnitude of the effect was considerably attenuated. More recently, Shimp & Wheatley (1971) and Todorov (1972) have employed multiple VI-VI schedules which differed in reinforcement density, and found that, as the durations of the schedule components were increased in length, the different rates controlled by the two VI schedules tended to converge. Thus, in all three studies, the enhanced rates normally associated with the denser

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