

## Lick rates in hamsters\*

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Lick rates in three male and three female golden hamsters were measured for water under 12-, 24- and 48-h deprivation, and for 4% and 32% sucrose solutions under 12- and 24-h deprivation. Mean lick rate was found to be constant for all Ss and to be independent of sex, level of deprivation, and type of fluid consumed.

All evidence presently available indicates that in several mammals the licking response occurs at a relatively constant momentary rate. For example, rats consistently exhibit a modal lick rate of 6 to 7 licks/sec, with mean lick rate independent of sex, varying deprivation levels, and type of solution (Stellar & Hill, 1952; Davis & Keehn, 1959). Further evidence suggests that lick rates in the rat are largely independent of environmental influence and, therefore, are primarily innate and reflexive (Schaeffer & Premack, 1961). Schaeffer and Premack found that neonatal rats, raised without an opportunity to drink, upon their first contact with fluids displayed a mean lick rate identical to that of adults. More recently, Pierson and Schaeffer (1973) have presented evidence suggesting that rates of licking in excess of the normally occurring fluctuations about mean lick rates can not be instrumentally reinforced and conditioned.

Schaeffer and Huff (1965) have demonstrated that lick rates in cats only vary between 3.4 and 4.5 licks/sec. This mean lick rate was found to be constant for all Ss and to be independent of age, sex, level of deprivation, and type of fluid consumed. The intraspecies constancy of lick rate observed in the cat has been further corroborated in two studies by Schaeffer and David, using New Zealand white rabbits as Ss (1973b), and gerbils as Ss (1973a).

These consistent intraspecies lick rates suggest that each species may exhibit a characteristic lick rate (just as each species exhibits characteristic heart rates and respiration rates) which is genetically determined and neurologically organized and which distinguishes it from other species. The purpose of the experiment reported here was to examine lick rates in hamsters to determine if the hamster exhibits a constant, characteristic lick rate.

\*Supported in part by Public Health Research Grants MH-08775 and MH-12025 from the National Institute of Mental Health to R. W. Schaeffer, principal investigator.

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### METHOD

#### Subjects

Ss were three experimentally naive male and three experimentally naive female golden hamsters approximately 12-14 months old when tested. All Ss were maintained on ad lib food and water and were individually housed in Hoeltge HB-11A cages. Constant light and temperature conditions were maintained throughout the experiment.

#### Apparatus

The Ss were placed and housed individually in .375-in. Plexiglas test chambers (8 x 8 x 8 in.) with a wire mesh top and an aluminum drinking platform. Standard stainless steel watering nipples, coated with an electrical insulating compound (Formvar) so as to provide electrical continuity only through the solution, were inserted 2 in. into the chamber and 1 in. above the platform. Lehigh Valley Electronics drinkometer circuits were used to sense tongue-fluid contacts. Each tongue lap was recorded by an Esterline-Angus digital recorder on tape moving at 1.905 cm/sec. The test solutions were tap water and 4% and 32% sucrose solutions, by weight, prepared from commercial granulated sugar and tap water.

#### Procedure

Lick rates for water were obtained for a 24-h period under 12-, 24-, and 48-h water deprivation. Lick rates for 4% and 32% sucrose solutions were also obtained for a 2-h period under 24-h deprivation. Immediately following each sucrose test session, the Ss were given ad lib water for 24 h.

### RESULTS AND DISCUSSION

Lick rates were analyzed using the procedures described by Schaeffer and Premack (1961) and Schaeffer and Huff (1965). The specific lick rates obtained were (1) momentary lick rates, obtained from a second by second analysis of all recorded licks in a session, (2) mean lick rates obtained only from sustained bursts of licking that were of 3 or more seconds duration, and (3) changes in momentary lick rates within sessions.

The results of the experiment are presented in Table 1. It is clearly evident that lick rates for all Ss were highly consistent and were independent of type of solution and number of hours of deprivation. Maximum

**Table 1**  
**Mean Momentary Lick Rates and Overall Ranges for 1-Sec Measures and Bursts of 3 Sec or More\***

S	Measure (in Sec)	Solution Tested								Grand Mean and Range All Conditions	
		Water			4% Sucrose		32% Sucrose				
		12	24	48	12	24	12	24			
Male	1	5.0	5.0	4.8	5.1	5.6	5.4	5.5	5.2	5.0-6.0	
	3	4.8	4.8	4.5	4.8	5.1	5.2	5.5	5.0	4.0-6.0	
Male	1	5.0	5.0	4.9	5.1	5.1	5.0	5.0	5.0	5.0-6.0	
	3	4.9	4.4	4.4	4.8	5.0	4.8	4.8	4.7	3.0-6.0	
Male	1	4.5	4.5	4.0	4.7	4.0	4.0	4.2	4.3	4.0-5.0	
	3	4.1	4.0	3.4	4.5	3.6	3.6	4.0	3.9	3.0-5.0	
Female	1	4.0	4.0	4.5	4.4	4.1	4.5	4.6	4.3	4.0-5.0	
	3	3.7	3.6	4.1	4.1	3.9	4.3	4.1	4.0	3.0-5.0	
Female	1	5.1	5.6	5.5	5.0	5.0	5.0	5.0	5.2	5.0-6.0	
	3	4.8	4.9	5.2	4.6	4.8	4.8	4.8	4.8	3.0-6.0	
Female	1	5.0	5.0	5.0	5.5	5.2	5.0	5.0	5.1	5.0-6.0	
	3	4.6	4.7	4.7	5.2	5.0	5.0	4.9	4.9	4.0-6.0	

\*Data for water and sucrose in terms of hours of deprivation.

between-S variability for mean momentary lick rates was less than 1 lick/sec. Moreover, the data in Table 1 show that neither sex, deprivation level, nor solution had any significant influence upon the mean momentary lick rates. These results are in general agreement with earlier preliminary observations cited by Schaeffer and Huff (1965) in which a mean lick rate of 4.0-5.5 licks/sec was found in hamsters.

For all Ss, the mean lick rate measured in the first second tended to be slightly higher than the mean momentary lick rate for the session, but these hamsters did not exhibit the dramatic within-burst decrement previously described by other investigators for rats, cats, and rabbits (cf. Schaeffer & Premack, 1961; Schaeffer & Huff, 1965; Schaeffer & David, 1973a, b). In only a small percentage of the bursts was the terminal lick rate (measured in the last complete second of licking) different from the mean momentary rate for the entire session. Lick bursts of 6/sec were noted only to occur during initial seconds of bursts and then with a frequency of less than 10%. It should also be noted that the Ss terminated sustained licking bursts on the 32% sucrose within approximately 1 h after presentation of this solution. Periodic sampling of the 32% sucrose solution did occur during the remaining 23 h of the test session, but long drinking bouts were not emitted. Apparently, hamsters, like gerbils, cats, and rabbits (Schaeffer & David, 1973a; Schaeffer & Huff, 1965; and Schaeffer & David, 1973b) find high concentration sucrose solutions aversive, whereas rats prefer them and

are capable of ingesting substantial amounts of 32% sucrose in brief daily test sessions (Schaeffer, Hunt, & Kimeldorf, 1967).

In conclusion, regular periodicities in ingestive behaviors that have been observed at the macroscopic level (e.g., circadian rhythms) and at the more microscopic level (e.g., the licking reflex) appear to have potential value for behavioral taxonomies and species identification. It is interesting to speculate that behavioral preferences and behavioral topography potentially may have taxonomic value of equal importance to behavioral periodicities.

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(Received for publication February 21, 1974.)