Social facilitation of eating in the rat

KERMIT T. HOYENGA and STAN AESCHLEMAN, Western Illinois University, Macomb, Ill. 61455

The study investigated the effect of feeding schedule and social living conditions upon weight gain. The data suggested that "social facilitation" occurs under ad lib as well as periodic feeding but Ss on a periodic feeding schedule are more sensitive to social living conditions than Ss on an ad lib feeding schedule.

Prior to 1965, when Shelley reported "social inhibition" of eating in his rats, most studies (Harlow, 1932; Ross & Ross, 1949; Smith & Ross, 1952; James, 1955, 1960) have reported "social facilitation" of eating, i.e., animals eat more when eating in groups than when eating alone. Shelley argued that while "social facilitation" may occur when Ss are on a deprivation schedule and periodically fed (conditions which minimize drive which might compete with hunger), "social inhibition" may occur when Ss are placed on an ad lib feeding schedule (conditions which allow other drives, e.g., curiosity, to compete with the hunger drive).

Other attempts to explain social facilitation have postulated secondary reinforcement (James, 1960), imitation (Ross & Ross, 1949), and competition (Harlow, 1932; Tolman, 1964, 1965). The present study was designed to replicate Shelley's 1965 study and to further test Harlow's and Tolman's hypothesis that competition is necessary for facilitation of eating.

SUBJECTS

Subjects were 32 male Holtzman rats obtained from the colony maintained by the psychology department at Western Illinois University.

APPARATUS

The apparatus consisted of 12 double (16¼ x 9½ x 7 in.) and 16 single (7 x 9½ x 7 in.) Unifab cages. The double cages were employed for all social conditions while the single cages were used for the isolated condition. The partial social and visual social cages were partitioned by ½ in. wire mesh screens and sheets of 1/8-in. Plexiglas, respectively. The partitions divided the cages in a manner that allowed stimulation only through the partitions.

PROCEDURE

Phase 1

At weaning (21 days), Ss were randomly assigned to the two experimental conditions: social and isolated rearing. The 16 Ss assigned to social rearing were placed into four cages, each containing four Ss. Each isolated S was placed into a single cage. During this period food and water were available at all times for all Ss. Dry pellets, were placed in a bin on the outside of the cage. Ss were under Phase 1 conditions from weaning to 100 days of age and were weighed periodically as a check on their development.

Phase 2

At the beginning of Phase 2, which lasted 14 days, one half of the Ss from each rearing condition were assigned to the periodic feeding schedule–½ h access to wet mash every 24 h. The other Ss had continual access to wet mash. The Ss were weighed every other day. Those on periodic feeding were weighed before and after feeding and their reported weight was the average of these two weighings.

Phase 3

After the weighing on the 14th day of Phase 2, Ss in each of the four conditions were divided into four social conditions. Two from each were assigned to the following: (1) visual social–one pair of Ss separated by a Plexiglas partition, (2) partial social–one pair of Ss separated by a wire mesh partition, (3) complete social–one pair of Ss with no partition, and (4) complete isolation–each individual S in a separate cage. Feeding schedule remained the same for all Ss in Phase 3 as Phase 2. The completely isolated Ss were housed in single cages while Ss in the three social conditions were housed in double cages. The partitions in the partial and visual social conditions divided the cages into two 8-1/8 x 9-1/4 x 7 in. units. One dish of mash was given to each S in the partial social, visual social, and complete isolation conditions. Ss under complete social conditions were given one dish per cage (two Ss). This phase again lasted 14 days with data being collected and expressed in the manner reported in Phase 2.

RESULTS

Subjects' weights were compared at the end of Phases 1, 2, and 3. A percentage was established using the beginning and last weights in each phase, the last weight being the per cent original weight of that phase. A percentage was used as it made allowance for varying weights between Ss. Means at the end of Phase 1 were 776.00% and 704.56% for the social and isolated conditions, respectively. A t test comparing the means indicated the difference was significant ($t = 1.70$, $df = 30$, $p < .05$). Means at the end of Phase 2 were as follows: periodic isolated, 88%; periodic social, 90%; ad lib isolated, 103%; and ad lib social, 106%. The F values associated with both living condition ($F = 6.78$, $df = 1/28$, $p < .05$) and feeding schedule ($F = 71.82$, $df = 1/28$, $p < .001$) were significant. Thus, the data from Phase 1 and Phase 2 did not support Shelley's (1965) results as social facilitation was demonstrated in Ss under ad lib conditions.

The data for Phase 3 is depicted in Fig. 1. The analysis of variance indicated that in the Feeding Schedule condition $F = 45.58$, $df = 1/16$, $p < .001$; in the Prior Social condition $F = 20.56$, $df = 1/16$, $p < .001$; and in the Present Social condition $F = 15.45$, $df = 3/16$, $p < .001$. The interaction of Feeding Schedule and Prior Social condition ($F = 3.29$, $df = 1/16$, $p < .05$), and the interaction of Feeding Schedule and Present Social condition ($F = 12.08$, $df = 3/16$, $p < .001$) were significant variables. Moreover, an F test comparing the variance between the periodic condition and that of the ad lib

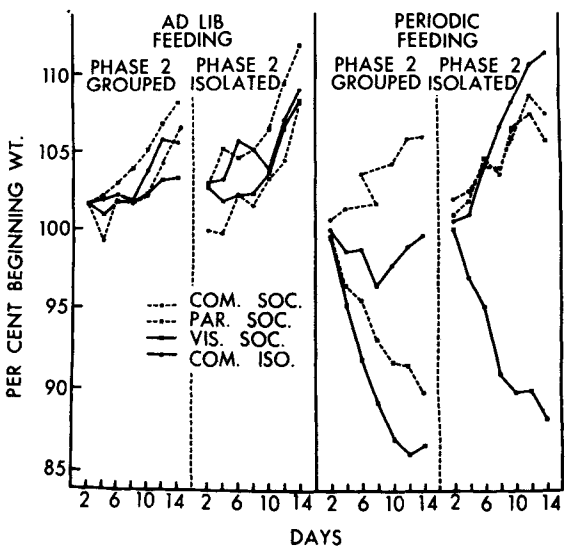

Fig. 1. Change in weight in Phase 3 as a function of feeding schedule, present social condition, and prior social condition.

(Continued on page 241)

(autonomic) as represented by respiratory rate, shock avoidance, and swimming, reflect differences at most levels of the range of doses tested. The quantitative amount of alcohol injected appears to be rather nonspecific in behavioral functioning at the lower dosages. Inspection of the various mean pairs reflected a negative linear function of behavioral responsiveness as effected by increasing doses, as reported by Cartwright & Buckalew (in press).

It was concluded that a cumulative dose effect relationship existed across four alcohol dose levels, with statistically critical differentiation occurring between various dosages on both respiration rate and shock avoidance latency.

REFERENCES

ARVOLA, A., SAMMALISTO, L., & WALLGREN, H. A. A test for level of alcohol intoxication in the rat. Quarterly Journal of Studies on Alcohol, 1958, 19, 563-572.

BROADHURST, P. L., & WALLGREN, H. A. Ethanol and the acquisition of a conditioned avoidance response in selected strains of rats. Quarterly Journal of Studies on Alcohol, 1964, 25, 476-489.

CARTWRIGHT, G. M., & BUCKALEW, L. W. The effects of intraperitoneally administered ethanol dosages on an operant response in albino rats. Southern Journal of Educational Research, in press.

FRIEDMAN, S. L., & INGALLS, J. W. A note on the tilting-plane technique for measuring the performance of rats in relation to the degree of their alcohol intoxication. Quarterly Journal of Studies on Alcohol, 1960, 21, 211-222.

KLINGMAN, G. I., & HAAG, H. B. Studies on severe alcohol intoxication in dogs: I. Blood and urinary changes in lethal intoxication. Quarterly Journal of Studies on Alcohol, 1958, 19, 203-225.

MOSKOWITZ, H., & ASATO, H. Effect of alcohol upon the latency of responses learned with positive and negative reinforcers. Quarterly Journal of Studies on Alcohol, 1966, 27, 604-611.

(Continued from page 239)

condition indicated greater variance under periodic feeding ($F = 31.00$, $df = 14$, $p < .001$).

DISCUSSION

In order to facilitate discussion each phase of the study will be considered separately.

Phase 1.

This phase was essentially a replication of Shelley's (1965) study as only animals under ad lib feeding were tested. Social facilitation was demonstrated in these animals which did not support Shelley's results.

Phase 2

A further test of Shelley's hypothesis as well as a test for results of earlier studies using periodic animals was provided in this phase. It will be recalled that this stage enlisted four conditions: periodic, social, periodic isolated, ad lib social, and ad lib isolated. Results from this phase again gave evidence that social facilitation occurs under ad lib as well as periodic feeding conditions.

A possible explanation for Shelley's results may be the manner in which his animals were fed. In his study, the lab blocks were placed on the cage floors. Possibly because of the crowded situation (eight Ss) in the grouped cages, the food became contaminated by the fecal boll and urine, thus becoming unpalatable to the social Ss.

Phase 3

The results indicate that social facilitation was influenced by a number of variables. The present results did not support Harlow's (1932) and Tolman's (1964, 1965) hypotheses that social facilitation is dependent upon unrestrained and actively competing animals, for both partial- and visual-social Ss gained as much weight as the complete social Ss under certain conditions. Nor does it seem possible to conclude that facilitation of eating is dependent on imitation of the eating response or to secondary reinforcement, as even isolated Ss gained as much as the social Ss in several instances.

Present social condition affected Ss' weight gain, but no trend across conditions was evident. It was apparent that visual social Ss exhibited a definite decrease in weight under periodic conditions. However, there was no such decrease in visual-social Ss under ad lib conditions, nor did any partial-social Ss decrease in weight as sharply. The visual-social situation seemed to have a unique effect on periodically fed Ss. Prior social condition also affected Ss' present gain. As indicated in Fig. 1, Ss previously isolated ate more under three conditions—complete isolation, visual social and partial social—than Ss previously grouped. The previously grouped Ss seemed to be "inhibited" under conditions other than complete social. It is possible that Ss perceived both the visual and partial social conditions as "isolated" situations. Thus, previously grouped Ss may have been "inhibited" by these conditions while previously isolated Ss were unaffected. This suggests that social facilitation was influenced by a learning variable, possibly secondary reinforcement from other Ss as suggested by James (1960). Furthermore, it will be recalled that an F test for variance indicated that the data from the periodic Ss had a greater variance than that from the ad lib Ss. This suggested that the Ss under periodic feeding were more sensitive to the varying social conditions. While the present study suggested that a number of variables influence eating, the present results do not suggest that age is necessarily a critical variable as these adult Ss remained sensitive to varying feeding-schedule and social-living conditions. Prior studies, with the exception of Bayer's 1929 classical study done with chickens, have generally investigated the effect of social living arrangement on feeding behavior in nonadult Ss.

REFERENCES

BAYER, E. Beitrage zur Zweikomponententheorie des Hungers. Zeitschrift für Psychologie, 1929, 112, 1-53. Cited by S. Ross and J. G. Ross, Social facilitation of feeding behavior in dogs. Journal of Genetic Psychology, 1949, 74, 97-108.

HARLOW, H. F. Social facilitation of feeding in the albino rat. Journal of Genetic Psychology, 1932, 41, 211-221.

JAMES, W. T. The development of social facilitation of eating in puppies. Journal of Genetic Psychology, 1960, 96, 123-127.

JAMES, W. T., & GILBERT, G. F. The effect of social facilitation of food intake of puppies fed separately and together for the first 90 days of life. British Journal of Animal Behaviour, 1955, 3, 131-133.

ROSS, S., & ROSS, J. G. Social facilitation of feeding behavior in dogs. Journal of Genetic Psychology, 1949, 74, 97-108.

SHELLEY, H. P. Eating behavior: Social facilitation or social inhibition. Psychonomic Science, 1965, 3, 521-522.

TOLMAN, C. W. Social facilitation of feeding behavior in the domestic chick. Animal Behaviour, 1964, 12, 245-251.

TOLMAN, C. W. The effect of sound tapping on feeding behavior of domestic chicks. Animal Behaviour, 1967, 15, 145-148.

TOLMAN, C. W., & WILSON, G. F. Social feeding in domestic chicks. Animal Behaviour, 1965, 13, 134-142.