Readiness to eat in the pigeon

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The relationship between food deprivation and readiness to eat in the pigeon was explored in both novel and familiar test situations and in Ss of different sexes and strains. The function relating food deprivation to food intake was also obtained and an analysis of responses competing with feeding was carried out. Readiness to eat in the pigeon, as in the rat, is directly proportional to body weight loss and correlates well with food intake. It therefore appears to be a useful index of hunger in the pigeon.

In a series of experiments on the rat, Bolles (1962; 1965a, b) has shown that readiness to eat is proportional to the animal's percentage body weight loss over a wide range of deprivation and stimulus conditions for all ages and both sexes. Because of the potential utility of this measure in the study of feeding behavior its applicability to a species other than the rat is of interest. The present study explores the relationship between food deprivation and readiness to eat in the pigeon. In order to assess the generality of this measure data were obtained in a number of test situations varying in their novelty and for Ss of both sexes and two different strains. The relationship between deprivation and food intake was also examined and an analysis of responses competing with feeding was carried out. The results indicate that readiness to eat is as useful a measure of hunger for the pigeon as for the rat.

Subjects. The Ss were 12 adult pigeons of two different strains (six Silver King and six White Carneaux) and there were an equal number of males and females in each strain sample. All birds were experimentally and deprivationally naive and were kept on ad lib feeding schedules for three weeks prior to the start of the experiment. Water was always available in the home cage and a 12 h light/dark cycle was in effect in the laboratory.

Apparatus. The test apparatus was a rectangular wooden box, 16 x 34 x 16 in. with a glass front. The other three walls, the floor and the ceiling were flat white. The back wall was fitted with a guillotine door which could be manipulated at a distance. A 15 W fluorescent ceiling fixture provided diffuse illumination. Food and water dishes were placed against a side wall and their position was varied randomly between trials.

Procedure. An ad lib weight was obtained based upon the average weight over a two week period preceding the beginning of deprivation. Pigeons were assigned to three groups of four birds, so that there was a male and female of each strain in each group. Each group was tested at each of three weight levels

in the following sequence: Group 1, 70%, 80%, 90% of ad lib weight; Group 2, 80%, 70%, 90% of ad lib weight; Group 3, 90%, 80%, 70% of ad lib weight.

The Ss were deprived of food until they reached their appropriate testing level, then, depending on their group, they were either further deprived or fed to bring them to the next weight level. In order to avoid handling, each bird was carried to the apparatus in its home cage, the cage door was opened and set flush against the guillotine door of the test box. Latency to feed was defined as the time taken by a pigeon to begin pecking at the food and to feed continuously for 30 sec. The latency measurement was begun at the instant the bird's head crossed the guillotine door opening. The trial was concluded when a bird had fed continuously for 30 sec or when 10 min in the box had elapsed.

A time-sample technique (Bindra & Spinner, 1958) was used to record behavior in the test box. An electric timer sounded a click every 6 sec, and E noted the behavior occurring at that moment. The following response categories were exhaustive for the test situation: *exploratory activity* (head movement, walking); *feeding* (eating food); *other* (preening, pecking at the box).

At the conclusion of observations in the test box the bird was returned to its home cage which was replaced on the cage rack. After a 20 min interval during which the bird was not disturbed, the food cup was replaced and latency to feed was recorded. The bird was then allowed continuous access to food in the home cage and the amount eaten in the first hour was recorded.

In order to vary the novelty of the test situations the same sequence of deprivation conditions was repeated for the same group in each of the three separate test sessions. The home cage provided a test situation of minimal novelty.

Results. Raw latency scores were transformed to logarithmic units in order to help normalize the distributions, make the variances more homogeneous and simplify the graphical presentation of results.

Analysis of variance of the latency data obtained in the novel situation indicates that the variables of weight ($F = 54.33$, $df = 2/99$, $p < .001$) and replication ($F = 3.07$, $df = 2/99$, $p < .05$) are significant. The data were therefore summed across sex, strain and order to produce the function shown in Fig. 1a. Analysis of the latency data taken in the familiar (home cage) situation indicates that only the variables of weight ($F = 12.79$, $df = 2/99$, $p < .001$) and sex ($F = 5.38$, $df = 2/99$, $p < .05$) are significant. Figure 1b presents the function relating percentage weight loss and latency with sex as the parameter.

The amount of food eaten in the home cage during a 1 h test increases significantly with increasing body weight loss ($F = 49.82$, $df = 2/99$, $p < .001$).

Fig. 1. Mean latency to eat (sec) as a function of percentage weight loss, in the novel test situation (left) and in the home cage (right).

Exploration is the principal activity competing with feeding in the novel situation. Analysis of variance indicates that with increasing body weight loss there is a significant decrease in exploratory behavior ($F = 49.82$, $df = 2/99$, $p < .001$) accompanied by an increase in time spent feeding.

One anomalous finding merits brief comment. Figure 1a shows that birds in the novel situation have longer latencies with a 10% weight loss on the second and third replication. This finding is probably a procedural artifact. In only the first replication of Group 3 (90%, 80%, 70%) were the birds dropped from ad lib to 90% of their ad lib weight and then allowed to drop back to 90% for testing. Thus, on the second and third replication the 90% birds had been fed much more recently than they had in the first replication.

Discussion. Bolles (1965a) has shown that readiness to eat in the rat is directly proportional to body weight loss. He noted that the function relating these two variables may be fit by the equation $L = 3000/W$ "... where L is the latency to eat in seconds and W is the percentage weight loss corrected for normal growth." The only data in the present study directly comparable with those of Bolles are the latencies obtained in the test box during the first replication. (A correction for growth was considered unnecessary because Ss were *adult* pigeons.) The pigeon data are fit to a very close approximation by the Bolles equation. We may conclude, therefore, that readiness to eat in the pigeon, as in the rat, is directly proportional to body weight loss.

The present results are in agreement with those of Bolles in several other respects. There is a tendency, in both pigeon and rat, for latencies to decrease with prior familiarization with the test situation. In the pigeon, as in the rat, exploration is the principal behavior which competes with feeding in the novel test situation. In both species, the proportional relationship between

weight loss and readiness to eat is relatively independent of a variety of other parameters.

Food intake in the pigeon is also proportional to percentage weight loss over the range of values explored. As the pigeon's readiness to eat increases so does the amount of food consumed. (The correlation between amplitude and latency measures is significant; $r = -.64$, $p < .001$.) The existence of such a close relationship between these two measures in the pigeon is of interest in view of the failure of some investigators (e.g., Miller, 1956) to find a close agreement between different measures of hunger in the rat.

The present study suggests that readiness to eat is as useful a measure of hunger for the pigeon as for the rat. It is easily measured in naive animals, appears to have considerable generality and correlates significantly with a measure of food intake. It may therefore be a valuable measure for use in the analysis of motivational processes underlying feeding behavior.

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NOTES

1. Now at the University of Maryland.
2. This study was supported by Research Grant MH-08366 of the National Institutes of Health, United States Public Health Service.