# Adaptation to prolonged food deprivation in the pigeon*

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Three groups of pigeons were maintained at 70% of their free-feeding weights for 0, 50, or 100 days. All groups were then totally deprived of food. Ss exposed to the 70% deprivation for 50 and 100 days lived longer and lost a greater percent of their original body weights before dying than did Ss deprived for 0 days.

A number of investigators have found that increasing motivation (drive) increases the strength (magnitude) of a variety of responses no matter how that increase in motivation is obtained (cf. Baker, 1955; Bersh, Notterman, & Schoenfeld, 1956; Thomas & King, 1959; Karsh, 1962; Wong & Amsel, 1971). To equate drive among Ss of different sizes, some investigators have used a percentage of Ss' free-feeding weight as a convenient measure of motivation. Williams & Campbell (1961) have concluded that for rats, percentage of free-feeding weight is a better index of severity of deprivation than are hours of deprivation. Davenport & Goulet (1964) presented a refined method of obtaining free-feeding weights using a constant percentage of a nondeprived same-aged weight control group rather than each S's own free-feeding weight, since rats constantly increase in weight when allowed free access to food and water. Without such a control, the use of a constant percentage would not truly be constant. Potential weight after a given number of days on deprivation would have increased and a constant percentage calculated from S's own free-feeding weight would maintain Ss at a lower absolute weight than if the percentage were calculated from a weight control group which had been constantly increasing in weight.

Based on the Williams & Campbell (1961) and Davenport & Goulet (1964) work, it has become the common practice to use a changing percentage of free-feeding weight as an index of motivation with rats. It is also common practice to use percentage of free-feeding weight as a measure of motivation when pigeons are used, but, since experimental pigeons are almost exclusively adults and are at their asymptotic weight, there has been no need for a weight control group. The purpose of the present study is to determine whether pigeons maintained at a constant 70% of their individual free-feeding weights for extended periods of time adapt to the prolonged deprivation. If adaptation does occur, then the use of a constant percentage of free-feeding weight as an index of constant motivation can be questioned in the pigeon as it has been in the rat.

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## METHOD

### Subjects

Ss were 58 adult domestic pigeons obtained from a local supplier.

### Apparatus

The only apparatus used was a scale with a range from 0 to 1,600 g (Dial-O-Gram Ohaus Scale Corporation).

### Procedure

Upon arrival at the laboratory, birds were weighed, individually housed, and allowed free access to food, water, and grit until stable weights were obtained. Birds were then randomly assigned to a 0-, 50-, or 100-day deprivation group. Mean free-feeding weights did not reliably differ and were 492.7, 488.3, and 510.6 g, respectively. Each bird was then reduced to 70% of its free-feeding weight by total food deprivation. Upon reaching 70%, birds in the 0-day group were put on terminal deprivation, i.e., total food deprivation was continued until death occurred. The 50- and 100-day groups were maintained at 70% through a controlled single daily feeding for 50 and 100 days, respectively, and then put on terminal deprivation.

## RESULTS

Two measures were taken as indices of adaptation to deprivation: the number of days on terminal deprivation and the percentage of original body weight at death. If adaptation to the prolonged deprivation does not occur, the three groups should not differ on the two measures. On the other hand, if birds do adapt to food deprivation, those in the 50- and 100-day groups should remain viable longer (take longer to die) and reach a lower percentage of their original body weights than those in the 0-day group.

Figure 1 presents the mean percentage of free-feeding weight at death for the three groups and indicates that prolonged food deprivation increases the percentage loss in original body weight before death occurs. An analysis of variance applied to these data revealed that the groups did reliably differ ($F = 13.12$, $df = 2/55$, $p < .01$). Further analysis via t tests indicated that the 50- and 100-day groups did not reliably differ from one another, while both differed reliably from the 0-day groups (0- and 50-day groups: $t = 3.61$, $df = 39$, $p < .005$; 0- and 100-day groups: $t = 3.43$, $df = 39$, $p < .005$). Also from Fig. 1, it can be seen that the mean number of days on terminal deprivation before death occurred was greatest when prolonged deprivation preceded terminal deprivation. An analysis of variance applied to these data again revealed a reliable difference among the three groups ($F = 4.35$, $df = 2/55$, $p < .025$), and as with the

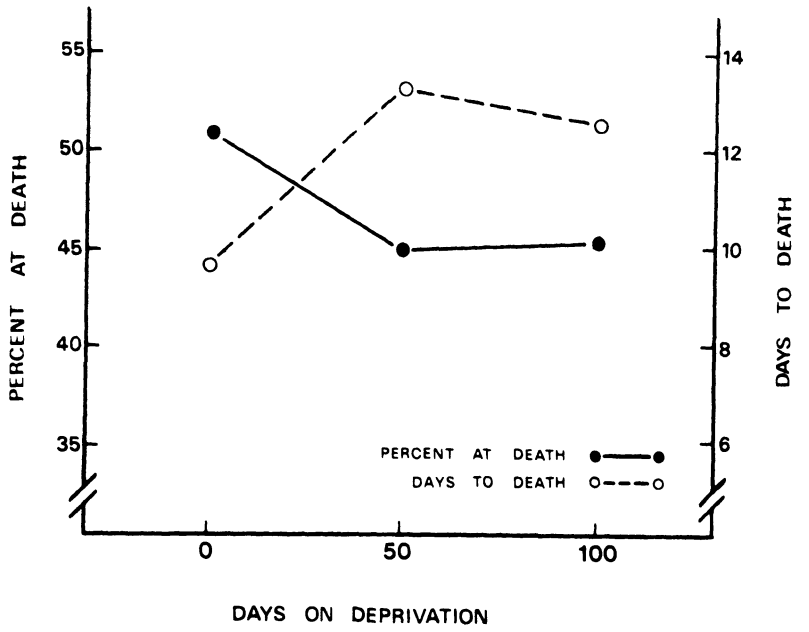


Fig. 1. Percent of original body weight at death and number of days on terminal deprivation (days to death) as a function of number of days maintained at 70% deprivation.

percentage of the original body weight measure, the 50- and 100-day groups did not reliably differ from one another, while both differed reliably from the 0-day group (0- and 50-day groups: $t = 2.79$, $df = 39$, $p < .005$; 0- and 100-day groups: $t = 2.25$, $df = 39$, $p < .025$).

## DISCUSSION

The results of the present study indicate that pigeons do adapt to prolonged deprivation when maintained at 70% of free-feeding weight, the adaptation occurring between 0 and 50 days of deprivation. These results suggest that comparisons between data obtained early in training and that obtained later may be confounded by a change in motivation. It is possible that the change in motivation would be too small to have any significant behavioral effect. Nonetheless, until more definitive evidence is obtained, investigators should at least be cognizant that such changes may occur.

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