

LEARNING PROCESSES IN FOOD INTAKE

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ABSTRACT

Learning processes play a major role in controlling intake of food. Through repeated experiences an animal acquires the ability to predict the postingestive effects of a particular food (*i.e.*, of its nutrients and energy) from its sensory characteristics. What is unclear from the literature, however, is whether an animal can anticipate the duration of subsequent food deprivation from predictive sensory qualities of a food, and hence increase the amount eaten of that cueing food. Therefore, the aim of this work was to investigate the characteristics of this under-researched type of learning, *i.e.*, anticipatory eating, using laboratory rats trained on two lengths of fasting (short: 2-3 h, long: 8-10 h). The main findings were as follows. 1) Anticipatory eating is learnt when a choice is given between protein- and carbohydrate-rich foods as well as on a single balanced test food. 2) The learnt extra intake of food is instrumental to preventing the return of hunger, removal of which negative reinforcement extinguishes the response. 3) The resulting return of hunger induces re-learning of anticipatory eating. 4) During the training sessions, learning of anticipatory eating competes with classical conditioning of sensory preference. Conditioning of preference is likely to be stronger with the shorter than with the longer length of fasting. Therefore, the difference between intakes before the long and the short fast at each trial is the summed result of these two mechanisms of acquired increase in intake. While preference conditioning usually reaches a maximum rapidly, depletion-avoidance increases for as long as has been tested, with interruptions of rapid self-extinction and re-learning. This self-extinction contributes to the homeostatic character of this learning. 5) High-fat maintenance diet attenuates the learning of anticipatory eating. Overall, the findings provided robust evidence that eating in rats can be controlled by instrumental learning reinforced by

hunger. Accordingly, the design of an experiment on such instrumental control of eating in human subjects is proposed to conclude this thesis.