Relationship of reward quantity to vigor of r_g

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The experiment was conducted to study the rate of consuming a reward as a function of the amount of reward. In the framework of Spence's (1956) model, reward magnitude is presumed to be a determinant of the incentive variable K via consummatory response strength. Spence proposed the question of whether greater consummatory response strength with larger amounts of reward is to be attributed to a more vigorous consummatory response per unit of time or simply to a consummatory response period of longer duration. The present study, using 30 male Wistar rats as S s, revealed that animals drank a palatable sucrose solution faster ($p < .005$) when given a larger amount and that this difference became more pronounced as training progressed.

The notion that magnitude of reward is related to the performance of an organism has been a prevalent idea in behavioral research for some time. Spence (1956) has proposed that amount of reward affects performance through the incentive factor, K . In Spence's formulation, K is construed as an intervening variable which symbolizes the quantitative, motivational features of the r_g - s_g mechanism. He assumes that any characteristic of the goal object which produces consummatory responses of differential vigor will likewise affect the vigor of r_g and thus the value of K . Therefore, the best overt index of the strength of K is the vigor of the consummatory response. Spence presumes that increasing the magnitude of reward will likewise increase K because of greater vigor of the consummatory response. Spence (1956) proposed two possible ways in which the strength of the consummatory response might vary with different quantities of reward. Greater reward may lead to a more vigorous consummatory response per unit of time. Or, with larger reward the animal may simply spend a longer time period consuming the goal object. Does reward quantity affect K through the duration or the speed of the consummatory response?

Young & Shuford (1954) present data which apparently support the position that longevity of the consummatory response is the crucial dimension. They found that duration of contact with a sugar solution was positively related to the rate of approach. Goodrich (1960), however, found that number of laps allotted S s had a significant effect on both running speed and rate of lapping. The present study attempts to differentiate the two views by focusing on consummatory response as a function of amount of reward. It was hypothesized that the S s would consume a larger reward faster than a smaller one.

Subjects

The S s were 30 male Wistar rats, 100-110 days old at the beginning of the study. They were assigned without bias to three equal groups.

Apparatus

The apparatus was a white goal box and a graduated pipette. The tip of the pipette was presented through a 1/4 in. hole 2 in. from the rear wall and 2 in. above the floor of the goal box. The 25 percent sucrose solution was mixed from commercial sugar and distilled water 24-48 hr. before use. A mechanical timer was used to assess duration of drinking.

Procedure

Variables. A Lindquist Type I design was used to assess the relationship of three volumes (.50, 1.00, 2.00 ml) of 25 percent sucrose concentration and four trial blocks (1-5, 6-10, 11-15, 16-20) to vigor of consummatory response.

Pretraining. The S s received five days of 23-hr. food and water deprivation, 1 min. handling per day, and magazine training. The last consisted of drinking from a 4 mm tube in the home cage during the daily feeding-drinking hour. In addition, the S s received a goal box trial on the last pretraining day during which they consumed an amount of solution appropriate for their group.

Experimental Training. Each S received 20 experimental trials, one per day for 10 consecutive days and two per day for five additional days. The daily trials were preceded by 21 hr. deprivation, and the two trials per day were spaced by 20 min. One hr. following the completion of the daily trials the animals were allowed to eat and drink ad lib in the home cages for 1 hr. In the experimental trials a mechanical timer was activated when the animal began consuming the solution. Only the time the S actually spent drinking was calculated. To provide a cue that the reward supply had been exhausted, each animal was allowed to spend two additional seconds at the drinking tube after consumption of all the solution.

Results

Drinking rate was computed by dividing amount of reward by duration of drinking time. An analysis of variance of the rate of drinking for the three magnitude of reward conditions yielded an F of 31.34 ($p < .005$). Appropriate t tests showed the main effect of reward magnitude to be $2.00 \text{ ml} > 1.00 > .50$ ($p < .01$). Figure 1 shows the rate of consumption for each of these groups throughout the 20 experimental trials.

A significant AB interaction was also obtained ($p < .005$). Appropriate t tests revealed that on the first two trial blocks (1-5 and 6-10) the drinking rate for the 2.00 ml and 1.00 ml group did not differ significantly. Otherwise the simple effects of reward magnitude correspond to the main effect.

Discussion

The present study is formulated in the framework of Spence's analysis of the role of reward quantity in instrumental conditioning. Since numerous studies

Fig. 1. Average rate of consumption per second for the three magnitude of reward groups.

(Crespi, 1942; Hellyer, 1954; Zeaman, 1949) have shown a positive relationship between amount of reward and instrumental response strength, the experimenter has not attempted to study the relationship of these two variables. Instead, the study relates only to Spence's inquiry concerning the vigor of the consummatory responses with different amounts of reward. Does a larger reward lead to an increase in the strength of the instrumental response simply because of the duration of the consummatory response or is a more vigorous consummatory response per unit of time conditioned to goal box stimuli? The most definitive answer to the inquiry was provided by the test of the A (amount of reward) main effect for average rate of consumption. The analy-

sis indicated that the Ss drank faster with larger amounts of reward. The test of the AT simple effects demonstrated, however, that the differential effect became more pronounced as training progressed.

While the results of this study indicate that the rate of consummatory response is more fundamental to K than the duration, it must be admitted that the two variables are difficult to isolate. Quite frequently, with larger rewards animals not only eat or drink faster, but also longer. Unless the consummatory response is presumed to be based on visual perception of the goal object, varying reward quantity, but allowing an equal period of exposure to the goal object, would not provide a conclusive answer to the inquiry. If time is held constant, the magnitude of reward that can be consumed is also a constant.

References

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