future. In the university population from which these Ss were drawn it appears that the decision to be mobile is highly related to the individuals' optimal level of stimulation and the extent to which he has been mobile in the past. It is an open question as to whether the same predictors would apply to other populations in the South or in other parts of the country. The ability to predict mobility plans for this population, using a relatively small sample size, and the observation of the same pattern of relationship in a different sample suggests that these variables are related to mobility plans at least in this sample. In the broadest sense, the psychologist has a place in the investigation of population mobility.

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(Received for publication January 28, 1974.)

Bulletin of the Psychonomic Society
1974, Vol. 3 (5A), 332-334

Quality reward preference in the rat

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Rats' preferences among three qualitatively different food pellets (alfalfa, regular, and 93% sucrose) were determined by a free-choice and barpress procedure. In both situations, it was found that reward qualities can be ordered on an ordinal scale with sucrose most preferred, then regular, and finally alfalfa. The results raise the question of extending the vast literature which now exists on reward quantity to include reward quality.

The present studies were designed to determine the rats' preference among three qualitatively different Noyes food pellets (alfalfa, regular, and 93% sucrose). While it has been known for some time that animals prefer more palatable to less palatable solid rewards (e.g., Young, 1961), little information exists on the relative preference for qualitatively different food pellets that are readily available from the same manufacturer. Such an investigation could yield practical information regarding the single best choice for an appetitive reward. In addition, if the assumption is made that larger quantities of reward are more preferable than smaller quantities, the obtained preference data might suggest that quantity and quality have some parallel effects on performance and/or learning. If different reward qualities can be ordered on an ordinal scale, it appears that future research could be directed toward the extension of the vast literature which now relates to the influence of reward quantity and behavior.

EXPERIMENT I

Method

The Ss were 11 experimentally naive male albino rats, obtained from Carworth Farms, Portage, Michigan. They were approximately 130 days old at the beginning of the experiment. The animals were housed in individual cages and placed on a 23-h food-deprivation schedule 10 days prior to the start of the study. Water was freely available in the home cages. Directly after each experimental session, all Ss were given 1 h access to Purina Lab Chow.

The test compartment consisted of a standard wire mesh rat cage equipped with a feeding tray located at floor level and

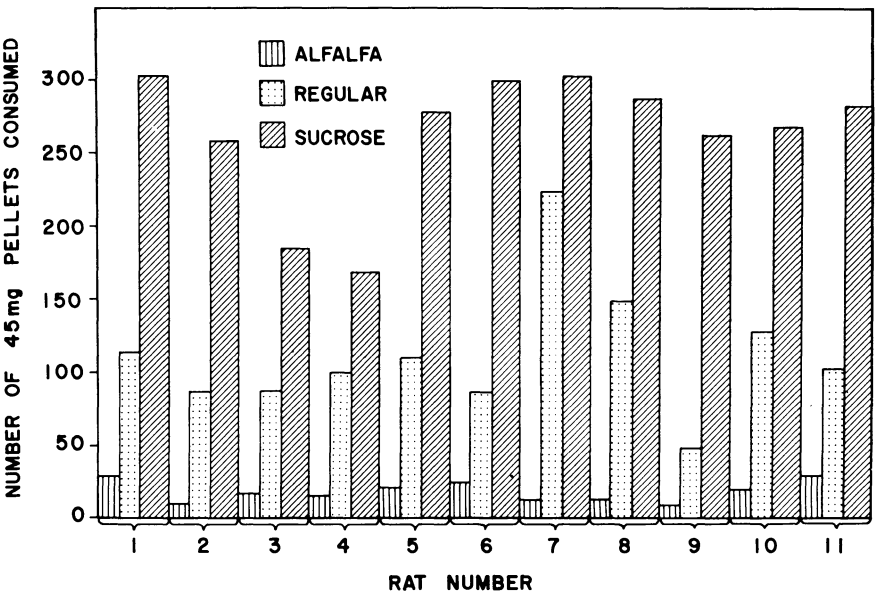

Fig. 1. Total number of qualitatively different food pellets consumed by individual Ss in the paired-comparison situation.

centered at the back side. The food tray was painted flat blue and measured 4 x 4½ x 1 in. and contained two small foodcups separated approximately 1 in. apart. Rewards consisted of 45-mg alfalfa (A), regular (R), and 93% sucrose (S) Noyes pellets.

Each S was given access to each of the incentives in a paired-comparison fashion as follows: SA, SR, SS, RA, RR, AA. During each test session, only one pair of rewards was presented, the order of the paired-comparison preference tests being random for each S. The position of the pairs of incentives was also counterbalanced for each S, insuring that the animals sampled both rewards and controlling for initial position preferences.

Each S was given a 2-min adaptation period in the cage prior to the preference test. The animal was then removed and the food tray was inserted, each foodcup containing 50 pellets of the predetermined rewards. The S was then immediately placed back into the test cage for 90 sec and allowed to consume as many pellets as possible, upon which time S was removed from the test compartment and returned to his home cage. This same procedure was followed for all Ss on each of the test sessions. The Ss' scores included the number of pellets consumed in each foodcup. Each S was tested each day for 12 consecutive days.

Results

Both the intrasession and intersession data were essentially the same for a given reward for each animal. Consequently, preference scores were expressed as the total number of qualitatively different food pellets each of the animals consumed over the 12 test days. As is clearly indicated by Fig. 1, all Ss showed a preference for sucrose pellets to the regular pellet. Animals also preferred the regular pellet to the alfalfa pellet. It is particularly impressive that the total number of different food pellets consumed was somewhat equal across all Ss.

The preferences presented in this graph were subjected to a single factor analysis of variance and the reward main effect was significant, $F(2,20) = 155.36$, $p < .001$. A Tukey a posteriori test of the paired-comparison procedure indicated that significantly ($\alpha = .01$) more sucrose pellets were eaten than either regular or alfalfa pellets. Similarly, significantly more regular pellets were consumed than alfalfa pellets.

EXPERIMENT II

The second experiment was primarily undertaken to provide additional information on reward preference utilizing a barpressing response.

Method

Six experimentally naive male albino rats, approximately 130 days at the start of the experiment, were employed. They were obtained from the same breeder and were maintained and adapted as in Experiment I. Grason-Stadler (Gerbrands) standard rat operant boxes served as the training and test chambers throughout the experiment. The Ss were initially shaped to leverpress for 45-mg regular pellets. They then received three 30-min sessions on successive days, during which time 45-mg regular pellets were available on a CR schedule. After this preliminary training, all Ss received 10 further daily test sessions on an FR-5 schedule. During each test period, each S was exposed to each of the alfalfa, regular, and 93% sucrose rewards for a 5-min period. A different operant chamber was used for each type of reward and the order of the reinforcements was randomly determined for each S on each test session. As in Experiment I, rewards consisted of Noyes 45-mg alfalfa, regular, and 93% sucrose pellets. All Ss were returned to their living cages at the end of each session (day) and fed Purina Lab Chow for 1 h. Data obtained from only the last 3 min of each 5-min session were used for statistical analysis.

Results

The results using the operant rate procedure are presented in Fig. 2. These data illustrate the summed number of responses for each of the qualitatively different rewards for each animal. As is evident from the figure, all Ss showed a high-response rate for sucrose and a low-response rate for alfalfa. The barpressing rate for regular food was in the middle range. Inspection of these data shows that, in general, barpressing rates for each of the rewards was quite consistent for all animals.

An analysis of variance of the summed responses

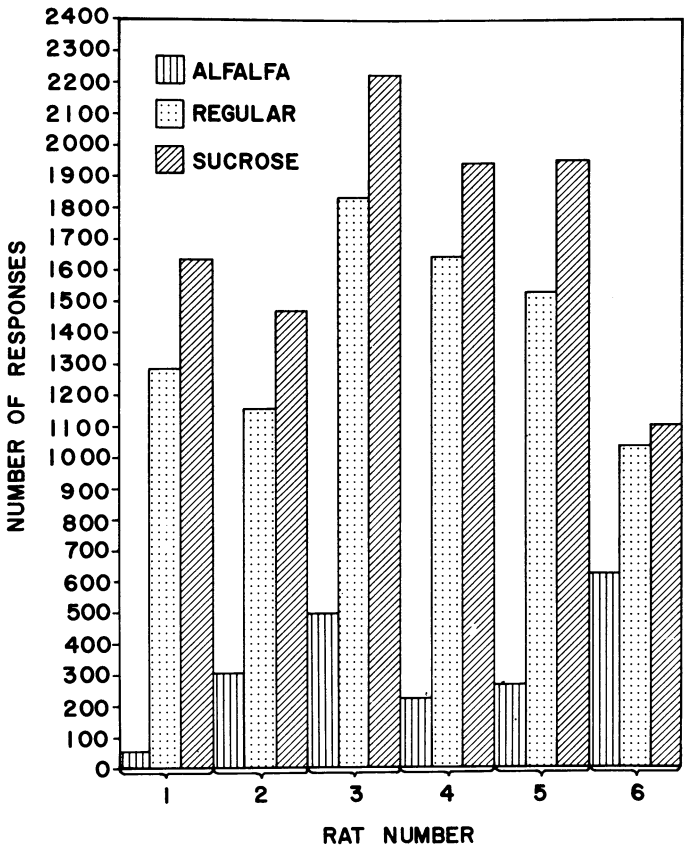

Fig. 2. Total barpresses for each of the qualitatively different rewards for individual Ss.

revealed significant differences among the number of responses emitted for each of the three rewards, $F(2,10) = 47.25$, $p < .001$. A Tukey multiple-comparison test ($\alpha = .01$) of the reward preferences indicated that the operant response rate for sucrose was significantly higher than for alfalfa. In addition, the differences between the barpressing rates for regular and alfalfa rewards were also significant, and in favor of regular reward. Although the barpressing rate for sucrose pellets was higher than for regular pellets, the difference was not reliable at the chosen alpha level.

GENERAL DISCUSSION

In both the operant and free-choice preference situation, the present results clearly demonstrated that animals show an initial preference for 93% sucrose pellets over regular and alfalfa pellets. Taken together, the results of these experiments also give relatively strong evidence that the three rewards may be ordered, in terms of preference, along a reward continuum. These findings are consistent with previous observations that rats (e.g., Young, 1961) and monkeys (Polidora & Schneider, 1964) prefer sweeter rewards to less sweet rewards. It should be kept in mind, however, that the present results may only reflect initial or short-term preferences and that longer exposure to the rewards than was used in these experiments may obscure the distinct preferences reported above.

Besides demonstrating an ordinal relationship among the three rewards, there are certain broad implications of these data for future experimentation. A series of studies could, for example, be conducted to ascertain whether reward quality (solid food) operates in a manner similar to that reported for reward magnitude. Recent studies within the sequential hypothesis framework (e.g., Boyer, Russin, & Cross, 1971) have already demonstrated that the use of qualitatively different rewards may produce results like those Capaldi (1967) and his associates (e.g., Leonard, 1969) have found with variations in reward magnitude. Similarly, experiments could be designed specifically to test a primary frustration effect in a double runway situation (Amsel, 1967) where midbox reward can be "reduced" even though the weight or number is held constant. It is also possible that the positive and negative contrast effects (e.g., Crespi, 1942) reported with shifts in reward magnitude may occur following shifts in qualitatively different rewards, again maintaining their weight or quantity constant.

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(Received for publication January 28, 1974.)