Does food deprivation affect the role of taste in a two-choice preference test? I: Some considerations¹

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Results of 30-min two-choice preference tests comparing quinine and saccharin adulterated diets to a control diet show an increase in relative intake for the preferred diets as a function of length of food deprivation. These results are, however, consistent with the view that the importance of taste is independent of degree of deprivation. Critical to an interpretation of the data is one's view concerning the S's behavior in a two-choice situation.

There are two current views concerning the effect of deprivation on preference. One is that the role of taste is diminished by deprivation (Epstein, 1967). Much of the evidence for this position is based on single-choice tests. The interpretation of this kind of evidence was discussed in an earlier paper (Hoff & Gentile, 1969).

Jacobs (1966) has suggested that taste becomes relatively more important under deprivation. This position was based in part on Campbell's (1958) results, which showed increased two-bottle preference discrimination—as measured by changes in percent intake—for sucrose solutions in food-deprived rats. Campbell's data, however, do not clearly support Jacobs's position for several reasons: (1) The use of sucrose does not rule out effects of differential caloric content. (2) Solutions are ambiguous stimuli; they may be perceived as either water or food. By food-depriving the S, one is perhaps only insuring that hunger is stronger than thirst, that the more food-like (sweeter, more caloric, etc.) solution is now more desirable. No explanation involving a change in the importance of taste is necessary to explain the change in preference. (3) The use of changes in percent intake—without reference to changes in absolute intake—is inadequate. This will be dealt with in greater detail below.

An earlier study (Hoff & Gentile, 1969) suggested that the importance of taste was not changed by deprivation in a one-choice intake test. The present investigation was undertaken to test this suggestion in a two-choice situation and also to improve

on previous techniques. The latter objective was achieved by (1) using noncaloric taste stimuli (quinine sulfate and saccharin); (2) using a wet mash medium instead of water to insure that Ss under all deprivation conditions would treat both choices as food; and (3) using absolute as well as relative intake in the analysis of the results.

SUBJECTS

Thirty-six male albino rats (Holtzman), 5 months old, were used. Ss were housed in steel cages, 7 x 7 x 9½ in., during all phases of the experiment.

STIMULI

Diets were made from a wet mash base of 50% tap water and 50% meal (Wayne Mouse Breeder Blox). The diets differed only in taste stimuli added, which were (wt/vol): 0.2% quinine sulfate (QSO₄), 0.1% QSO₄, 0.05% QSO₄, no additive (H₂O), and 0.1% saccharin.⁴

TESTS

Thirty-minute preference tests, comparing each of the four flavored diets to the control (H₂O) diet, were carried out under food deprivation conditions of 4, 8, and 24 h. Twelve Ss were used in each test. Each S was tested under all deprivation conditions (i.e., run three times). Order of deprivation condition was counterbalanced between Ss. The 12 Ss used in the 0.1%-saccharin vs H₂O test were randomly selected from animals previously used in the other three tests.

RESULTS AND DISCUSSION

The results of the four preference tests are shown in Fig. 1. Intake of the preferred diet, in each case, increases with deprivation, whereas the intake of the nonpreferred diet is constant across deprivation conditions. Insofar as the intake ratios increase with deprivation, these data are consistent with Campbell's (1958) results.

The authors, however, are not satisfied that these findings imply an increase in preference discrimination or importance of taste. One important feature of the data that suggests this is the fact that nonpreferred diet intake does not decrease as deprivation increases. For an unequivocal demonstration of a change in preference, there should be a clear shift away from the nonpreferred diet rather than just an increase in preferred diet intake added onto an unchanged nonpreferred diet intake.

In order for these results to be consistent with the hypothesis of no effect one must merely make the assumption that Ss are capable of making choices. After an initial sampling between diets, an animal chooses the one it prefers and subsequently eats exclusively from it. The amount of preferred diet eaten after the choice is made will be a function of deprivation level and the diet's palatability minus the total amount eaten from both choices during sampling. In the 4- and 8-h groups, preselection sampling would account for most, if not all, of the animal's intake. In the 24-h group, a substantial portion of the meal would be taken in after selection. This portion would come mostly from the selected, or preferred, diet. These differences in amount eaten after selection of the preferred diet could account for the apparent change in preference discrimination as a function of deprivation.

If the selection hypothesis is correct, then the use of intake ratios as a measure of preference discrimination is invalid unless one is measuring only preselection sampling behavior. During this initial phase, ratios are a valid measure of the relative abilities of the two diets to initiate and maintain eating.

In the second part of this investigation we shall look at behavior during the first 5 to 10 min of a two-choice test. If the present hypothesis is correct, the increase in taste preference ratio as a function of

Fig. 1. Diet intakes in 30-min preference tests as a function of hours of deprivation. All diets were calorically identical wet-mash diets with the addition of the substances indicated. The H₂O diet was a wet-mash diet with no additional flavoring.

deprivation level should be absent during these relatively brief exposures insofar as Ss will not have time to identify and select the preferred diet. If this hypothesis is incorrect, the increase should remain.

SUMMARY

The data obtained in this study may be interpreted either as showing increased preference discrimination with increased food deprivation (if one assumes that Ss do not select a preferred diet) or as not showing a change in preference discrimination (if one assumes that Ss do select). The latter interpretation does not rule out the possibility of increase or decrease in preference discrimination. It merely says that, if animals are capable of

selecting a preferred diet, these results cannot be interpreted as demonstrating either an increase or a decrease in preference discrimination.

REFERENCES

(See following article.)

NOTES

1. Research carried out at Pioneering Research Laboratory, Behavioral Sciences Division, U.S. Army Natick Laboratories, Natick, Mass. 01760.
2. USPHS (NIMH) Post-Doctoral Fellow, Department of Biology, Clark University. Correspondence address same as in Note 1.
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4. Quinine sulfate (NF), Fisher Scientific Co.; saccharin (insoluble), Eastman Organic Chemicals.

Does food deprivation affect the role of taste in a two-choice preference test? II: Some conclusions¹

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Ss that were food-deprived for 24 h were found previously to show an apparent increase in preference discrimination in a 30-min two-choice test. This increase is not found in 5-min and 10-min tests, at least for the standard diet vs 0.05% QSO₄ diet comparison. It is concluded that the apparent increase in the 30-min test was an artifact of S's ability to identify and select a preferred diet.

In a previous article (Gentile & Hoff, 1970), it was argued that increased preference ratios across deprivation conditions did not necessarily imply a shift in preference or a change in the importance of taste in preference behavior. The data were held to be not inconsistent with the position taken elsewhere by the authors (Hoff & Gentile, 1969) that deprivation has no effect on the role of taste in food intake and preference.

It was proposed that 30-min preference tests measure both preselection sampling of the choice diets and postselection eating of

the preferred diet. The apparent increase in preference demonstrated by the most deprived (24 h) group was hypothesized to be the result of increased postselection eating.

The present investigation was undertaken to show that such an argument is highly plausible. If Ss do select a preferred diet and eat from it exclusively after an initial exploratory period of sampling then preference data cannot be treated as ratio data. Only the period before selection takes place can be so treated. If the hypothesis that food deprivation does not affect the role of taste in preference is correct and the 30-min results are an artifact of selection, then results from the preselection period should fail to show the increased intake ratios found at 30 min.

SUBJECTS

Ss were 24 male albino rats (Holtzman), weighing between 300 and 400 g. Twelve Ss had had previous experience with wet mash diets in a single-choice quinine-adulteration experiment (Hoff & Gentile, 1969). The other 12 were naive.

APPARATUS

The animals were housed and tested in standard laboratory cages. Diets were

presented in ceramic cups with metal lips to reduce spillage.

Stimuli

The choices given to the Ss were two wet mash (50% H₂O) diets made from Wayne Mouse Breeder Meal. The quinine choice contained 0.05% QSO₄.⁴ The standard diet did not contain any additional flavoring substances.

PROCEDURE

The method was identical to that used in the previous experiment (Gentile & Hoff, 1970), with the one change that 5-min and 10-min preference tests were conducted as well as a 30-min test. Twelve Ss were given the tests in the following order: 30 min, 10 min, 5 min. The other 12 were tested in the reverse order (5 min, 10 min, 30 min).

As before, each S was tested once on all deprivation conditions (4, 8, and 24 h), with order of condition counterbalanced between Ss.

RESULTS AND DISCUSSION

Results of the present experiment are given in Fig. 1, in terms of percent preference for the preferred (H₂O) diet. It is clear that the animals in the 5-min test, as predicted, did not show any change in preference ratio as a function of

Fig. 1. Percentage of preference for H₂O diet vs 0.05% QSO₄ diet as a function of hours of deprivation. Results are for 5-min, 10-min, and 30-min preference tests. Estimated percentage preference for the 10- to 30-min period is included with the 30-min test data (see text).