

Further hoarding preferences in hamsters*

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As an extension of a previous experiment in which hamsters hoarded more sucrose than plain chow pellets, a wider range of novel materials was presented in hoarding bins. The following preferences were shown: citric-acid-flavored pellets over plain chow, sucrose over citric acid, and glass beads over sucrose, with a very high level of hoarding of glass beads. While novelty may be a factor, some absolute qualitative preferences probably underlie the disposition to hoard.

Previously (Scelfo & Hammer, 1969) we showed that hamsters greatly preferred sucrose pellets to plain chow pellets for hoarding purposes. Greatly elevated hoarding activity was found, even though the sucrose pellets did not form a part of the food supply but were removed immediately after each test period. Our original assumption was that their sweet taste made the sucrose pellets preferable. We could not rule out the possibility that novelty underlay the preference, however, since plain chow had made up the hamsters' earlier diet. The present paper describes a more extensive series of tests that varied both the palatability and edibility of the hoarding materials.

PROCEDURE

The experiment was carried out in five successive stages, using the same Ss and methodology throughout. Eight female golden hamsters were purchased from a local pet dealer. They were litter mates, estimated to be about 5 weeks old. (The litter included one male, which was rejected in order to have a more homogeneous group.) They were housed in individual cages in the laboratory, with fresh food (Purina rodent chow), water, and running wheel always available. A 12-h day/night cycle was maintained, with hoarding tests conducted about midway in the night cycle.

After about 3 weeks of laboratory maintenance, when it was ascertained that all Ss were "hoarding" food pellets in a corner of the cage, the hoarding tests were begun. Ss were about 2 months old at this time.

In each stage of the experiment, tests were conducted over 5 or more consecutive days. Materials to be hoarded were presented in round double-compartmented bins attached to the front of the cages (see Scelfo & Hammer, 1969, for details). After ½ h, the bins were removed and the remaining pellets counted. Within 10 min, the hoards were also removed

from the cages and counted. Almost all of the pellets were retrieved; hence, hoarded food was rarely eaten. All food was removed from the cages just before the test and was replaced by fresh food immediately after.

TESTS AND RESULTS

Chow Alone: Pretest Control

Plain chow (Noyes Precision Pellets, 1.1 g) was presented for 9 days. The number of pellets hoarded varied rather widely among Ss, although only one S showed little or no interest in the hoarding materials (an indifference that persisted throughout the experiment). Over the 9-day period, the mean size of hoard increased by about 10%. Table 1 shows the 9-day mean.

Chow vs Citric Acid

It had been shown that the more palatable substance is preferred. Now a taste was chosen that was also novel to the Ss' experience but was one usually found by ingestion tests (Carpenter, 1956; Pfaffmann, 1964) to be relatively unpalatable to hamsters. Plain chow pellets were soaked in a 20% citric-acid solution for about 15 sec then air-dried overnight. The solution did not completely penetrate the pellets, but to human judges, the pellets had a distinctly sour flavor when bitten into.

Plain and flavored pellets were

presented together, with the left and right locations in the bins alternated daily. Preference was tested over 5 consecutive days. The outcome was an overall preference for citric acid, with acid pellets forming about 60% of the total pellets hoarded (again, see Table 1). This result seemed to support the position that novelty of taste outweighs palatability.

Sucrose vs Citric Acid

To determine whether there is any preference specific to taste, sucrose (Noyes pure-sucrose pellets, 1.1 g) and citric acid were presented together for 5 days, following the same procedure as above. The sucrose pellets were the same size, shape, and weight as plain pellets, but white in color. The result was a decided preference for sucrose, although citric acid was not avoided altogether. Indeed, at least half the Ss hoarded more acid on one day or another. Overall, however, sucrose comprised 66% of the total hoard. Apparently specific taste quality plays some part in choosing materials to be hoarded.

Sucrose vs Glass Beads

It need not be assumed that materials are hoarded for future consumption. Another approach to the question of taste specificity was to compare sucrose with nonedible tasteless materials matched in as many other sensory properties as possible. The best match that could be found was opaque glass beads or marbles. The beads were of the same color, the same spherical shape, and only slightly larger than the sucrose pellets. They were, however, smoother, shinier, and heavier—and, of course, could not be penetrated by the teeth. Preference between beads and sucrose was tested in the next 5-day stage.

Unexpectedly, the glass beads were highly preferred. On the first day, when the beads were presumably most novel, about the same number were

Table 1
Mean Number of Pellets Hoarded (N = 8)

	Day					Mean
	1	2	3	4	5	
Test 1 Chow Alone	(9-Day Mean)					41.8
Test 2						
Chow	24.8	22.0	22.7	19.0	21.4	22.0
Citric Acid	27.3	17.6	48.1	41.1	29.1	32.6
Preference (Acid/Total)	.52	.44	.68	.68	.58	.60
Test 3						
Sucrose	37.4	33.0	29.3	30.4	34.6	32.9
Citric Acid	15.7	13.4	14.4	15.8	25.6	17.0
Preference (Sucrose/Total)	.70	.71	.67	.66	.57	.66
Test 4						
Glass Beads	32.0	42.8	62.8	71.8	69.1	55.6
Sucrose	30.4	40.8	35.1	24.6	55.0	37.0
Preference (Beads/Total)	.51	.51	.64	.74	.56	.60
Test 5						
Chow Alone	30.6	42.0	44.0	36.0	46.8	39.9

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hoarded as of sucrose. Thereafter, the size of the bead hoard rose sharply until the fourth day, then leveled off. Moreover, even sucrose hoarding increased, so that the total hoard doubled over the 5 days of testing. This avidity for glass beads presented a supply problem by the last 2 days, for simply not enough beads were available. In many cases, the bins were emptied after about 25 min. Hence the highest hoarding scores were limited artificially and could probably have gone still higher.

Chow Alone: Posttest Control

To check the possibility that the Ss' sudden spurt in hoarding activity was a result of perhaps experience or maturity rather than a genuine preference, plain chow pellets were again tested for 5 days. In this stage, the number of pellets hoarded dropped slightly below the previous level (Test 1). Hence we may conclude that the increased hoarding in Test 4 was indeed potentiated by the properties of the glass beads.

DISCUSSION

Because such widely differing properties as sweet, sour, and hard and shiny but tasteless induced hoarding in preference to plain food, it would be tempting to conclude that any novel or unfamiliar material would be preferred to a familiar one regardless of sensory attributes. In each test there was a drop in relative preference

by the fifth day, which could suggest a waning novelty as the preferred material became more familiar. This view is offered with serious reservations, however, because of the short duration of each phase and because this decline was associated with an overall increase in total amount hoarded. It is almost surely an artifact in Test 4, when the bead supply was exhausted before the sucrose was. Furthermore, the initial reaction to each novel material, with the exception of sucrose, was not impressive. Even the strongest preference of all, that for glass beads, increased greatly over the first few exposures. Thus, while some of the internal evidence does not favor the novelty hypothesis, there was no conclusive test in which novelty was constant and only taste varied.

Until a material is found that is rejected in preference to familiar chow, sensory novelty probably cannot be dismissed as a factor governing hoarding activity. Yet until more definitive studies are made, "novelty" seems too vague to serve as a satisfactory principle. In particular, there is a need both for long-term tests of the course of response to novelty and for tests in which the familiarity of the materials is matched. The large differences in hoarding activity to different kinds of material argue that qualitative factors are at least as

important. It is even possible that the choice of citric acid in Test 2 tells us something about the relative unpalatability of standard chow!

That some nonedible materials will be hoarded has been known for some time (e.g., Licklider & Licklider, 1950). The striking attraction of glass beads is more understandable if we do not assume that materials are hoarded as food and selected on the basis of palatability. Even the hamster may collect articles in his home because they are pleasing—pleasing to taste, to feel, to look at, or to carry about. An innate liking for and disposition to hoard these articles may be comparable to the reaction to innate releasing stimuli in other behavior systems. Correspondingly, these stimuli for which greater liking is shown may act as supernormal releasers and be collected, or hoarded, in even greater numbers.

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