

## Rapid Communication

# Monotony and choice: repeated serving of the same item to soldiers under field conditions

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Studies of monotony are usually conducted in the laboratory where the same food or foods are served to subjects (Meiselman *et al.*, 2000; Rolls *et al.*, 1984). Such studies are conducted without the subject having choice of what to eat—the subject consumes either the varied or the monotonous diet. These studies usually show that subjects fed a monotonous diet consume less and rate the food lower, while subjects fed a more varied diet eat more and rate the food higher. The essence of monotony appears to be repetition, and its effects appear to be reduced intake and palatability.

We have had the opportunity to collect extensive food acceptance and intake data on soldiers eating prepared Army rations in the field. Soldiers in these studies typically have a degree of choice when selecting a meal but there are often insufficient meals and/or time available to ensure that all options are present. The soldiers are sometimes handed their meals or take them out of a case, but they can and do trade entire meals and individual items. Therefore, soldiers do eat food items repeatedly and have some measure of control over this.

Data were analysed from two independent field studies of the standard, individual, Army packaged ration (Meal, Ready-to-Eat or MRE). Rations are made up of several standard components including a main dish (e.g. beef stew), a starch (e.g. rice), snacks/desserts (sweet and savory as well as fruit), flavored beverage bases, hot sauce, and accessory items such as salt, sugar, coffee and creamer. The main purpose of these studies was to evaluate ration performance (i.e. hedonic ratings and intake). Subjects were healthy U.S. Army men. Subjects were issued rations on a daily basis, either one per day as a lunchtime meal (site 2) with a hot meal provided at breakfast and dinner or three MREs per day as the sole food source (site 1) (Table 1).

Food intake and food acceptability were measured daily using MRE record cards, which consist of preprinted forms naming all items in the rations. Subjects indicated the relative amount eaten of each item by circling one of the alternatives: 0, 1/4, 1/2, 3/4, 1, 2 and 3. Food acceptability was measured for each tasted item using the standard 9-point hedonic scale (1 = “dislike extremely”, 9 = “like extremely”). Data collectors saw subjects daily at breakfast when records were turned in and reviewed for completeness. Subjects were also required (for at

least a portion of the study) to keep all leftover food, food wrappers and the like in individually labeled plastic bags, which were returned with the completed record cards. Food records and ration waste were compared to improve the validity of the information recorded by the subjects. Discrepancies between the information on the record cards and observed waste were resolved between data collectors and subjects on subsequent data collection visits. The rations for subsequent meals were also distributed at breakfast.

The instances in which a specific food was consumed only once were compared to those instances in which it was consumed more than once by the same person. We examined the number of people who had consumed the ration at each frequency and the average acceptance rating and average percentage consumed for items eaten once and more than once. For those items consumed two or more times the rating and percentage consumed when first eaten were compared to the mean rating and percentage consumed for all subsequent occasions. The analyses were run once utilizing all available data and then again using only main dish findings, as these have proven to be the most dominant component in overall meal acceptance (Hedderley & Meiselman, 1995).

Tables 1 and 2 show the results for all food items and main dishes, respectively. The results are ordered by the number of times a food was eaten over the course of the studies—once, two times, etc.—with frequency of consumption showing how often that particular outcome occurred. For instance, in Table 1 we see that a food was eaten twice over the course of the site 1 study 1037 times. The mean acceptance ratings and the percentages of the items consumed were consistently higher for items eaten repeatedly relative to those eaten only once. For example, this is shown for site 1 data where those selecting foods once rated them 7.41 on average, while those selecting foods multiple times rated them 7.70 on average ( $p < 0.01$ ) at the first eating occurrence and 7.82 for all subsequent occasions. For items eaten repeatedly, the differences between the first time the item was eaten and subsequent occasions were minimal for both acceptance ratings and percentage consumed. Note that while the numbers were significantly different for site 1 (7.70 vs. 7.82,  $p < 0.01$ ) for all foods (Table 1) the effect size is small and the *N*s large. These results are clearly in the opposite direction as would be expected from a simple model of monotony which argues that repetitive consumption is associated with decreased acceptance.

**Table 1.** All Foods. Frequency of consumption and first occurrence acceptability and percentage consumed vs. average of all subsequent occurrences

No. of times item was consumed	Site 1			Site 2		
	Frequency of consumption	Acceptance rating <sup>1</sup>	Percentage consumed (%) <sup>1</sup>	Frequency of Consumption	Acceptance rating <sup>1</sup>	Percentage consumed (%) <sup>1</sup>
1	2159	7.41 <sup>a</sup> /NA	95 <sup>a</sup> /NA	1085	6.80 <sup>a</sup> /NA	84 <sup>a</sup> /NA
2	1037			395		
3	538			162		
4	263			72		
5	140			46		
6	95			24		
7	60			19		
8	45			14		
9	39			9		
> 9	222			0		
≥ 2	2439	7.70 <sup>b</sup> /7.82 <sup>c</sup>	97 <sup>b</sup> /98 <sup>c</sup>	741	7.23 <sup>b</sup> /7.13 <sup>b</sup>	90 <sup>b</sup> /88 <sup>b</sup>

<sup>1</sup>First/Subsequent; Within each column ratings or percentages sharing a superscript are not significantly different.

**Table 2.** Main dishes. Frequency of consumption and first occurrence acceptability and percentage consumed vs. average of all subsequent occurrences

No. of times item was consumed	Site 1			Site 2		
	Frequency of consumption	Acceptance rating <sup>1</sup>	Percentage consumed (%) <sup>1</sup>	Frequency of consumption	Acceptance rating <sup>1</sup>	Percentage consumed (%) <sup>1</sup>
1	879	7.25 <sup>a</sup> /NA	94 <sup>a</sup> /NA	302	6.28 <sup>a</sup> /NA	85 <sup>a</sup> /NA
2	305			100		
3	73			28		
4	20			5		
5	2			0		
6	1			2		
7	1			2		
≥ 2	402	7.66 <sup>b</sup> /7.78 <sup>b</sup>	98 <sup>b</sup> /98 <sup>b</sup>	137	7.07 <sup>b</sup> /6.89 <sup>b</sup>	90 <sup>ab</sup> /91 <sup>b</sup>

<sup>1</sup>First/Subsequent; Within each column ratings or percentages sharing a superscript are not significantly different.

These data demonstrate that when people have a choice of what to eat, some people choose to eat the same item repeatedly. They choose items that they like, and this preference does not subside over the course of repeated eating. However, a good index of monotony appears to be frequency ratings. Very few foods were consumed more than four or five times in 9 (site 2) or 10 (site 1) days and there was a monotonic decrease in frequency of choosing the same item. Most people do not like to eat the same food repeatedly. This is reflected in their choosing another food. This finding is in agreement with Zandstra *et al.* (2000) who found no decrease in pleasantness for a repeatedly served product in a home-use test when choice of three alternatives was present.

These data have implications for the conceptualization of what monotony is, and how to measure it. When monotony is studied in a non-choice situation, it is hypothesized that decreased acceptance and decreased consumption will be associated with repeated servings of the same food. Lack of choice is not limited to the laboratory. In many situations it is difficult for eaters to refuse to eat. Most people cannot refuse to eat at home, especially when someone else has done the cooking.

People cannot refuse to eat in other people's homes, or at business meetings. Subjects can probably refuse to eat in an experiment, but the demand characteristics of the research situation probably make that extremely unlikely. When monotony is studied in a choice situation, it is hypothesized that stable acceptance or even slightly enhanced acceptance will result. The definition of monotony needs to include the notion of choice, because repetitive serving of the same food with and without choice might be different phenomena.

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