

RSB-52

## A FIELD STUDY OF FOOD MONOTONY<sup>1</sup>

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In a laboratory setting, Siegel and Pilgrim (5) have examined hypotheses concerning monotony in the eating situation. The present study generalizes to field conditions. We shall not review these hypotheses and their development here; rather, each hypothesis will be considered in the relevant context of the discussion.

In a study of the relationship between nutrition and performance (3), men were maintained for the first five weeks on a diet of only four daily menus, including only 41 foods. The conditions of the test imposed a limitation on variety of menus more severe than any that might be expected to occur in the field. In comparison, the normal dietary in the Army, the A Ration served in the Zone of Interior, provides about 150 different food items each month. During the course of this study it was possible to observe some of the effects of monotony of diet on the preference for and acceptance of foods. In addition, certain personal variables were studied in relation to food monotony.

### METHOD

This study was conducted at the same time and with the same Ss as an investigation of nutrition and performance in a cold environment (3, 4). The experimental treatment and many of the measures obtained in the latter study were irrelevant to the food monotony research, except as indicated in the procedure section.

*Subjects.*—86 Ss were military personnel employed at an Army hospital in various technical capacities. All were informed of the conditions of the test before they volunteered and had been screened so that all men chosen were in good physical condition. They were randomly assigned to four platoons and to the two experimental groups (3). National background and Army General Classification Test scores were obtained from personnel records.

*Diet.*—All the meat, vegetable, and fruit items were canned. All items other than milk, bread, butter, and dry cereals were components of the operational rations. The foods are listed in Table 1.

Due to the increasing rejection of the meat items and the numerous com-

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plaints of gastro-intestinal disturbances, fresh meat items were substituted for the canned meats on Day 35.

*Procedure.*—The diet of half of the Ss was supplemented with high levels of the B-vitamins and ascorbic acid; the other half received placebos (3). Since the two groups did not differ significantly on physical fitness tests, several psychological tests, anthropometric measures, and food consumption (3, 4), or on food preference ratings obtained in the present study, the treated and control groups are considered as one for the purposes of the present study. The day on which the diet of the restricted number of items was introduced is designated Day zero.

Control of Ss' food intake was maintained by not allowing access to food except during the regular meal hours, which were as follows: breakfast, 7 A.M.; lunch, 12 M.; dinner, 5 P.M.; evening snack, 8 P.M. Each man was served fixed amounts of food totaling approximately 4100 calories per day. During the entire study Ss had no other source of food. No exchange of food while in the mess hall or the removal of food from the mess hall was allowed. All the meals were served in cafeteria style and Ss sat at tables accommodating approximately 10 men.

*Food preference ratings.*—The food preference rating schedule used was a modification of that used for Army food preference surveys. The present questionnaire consisted of a page of instructions followed by several pages of lists of foods, each opposite a 9-point like—dislike scale (2). The scale categories were numbered integrally from 1 at the dislike end to 9 at the like end for statistical purposes. The 41 foods used were listed in a random order. The schedules were administered on Days 9 and 37, between 2 and 3 P.M.

*Consumption of foods.*—The individual records of amount served and amount eaten at each meal were summed to obtain total number of servings, total amount served, and amount returned uneaten for Days 1 to 9, 10 to 37, and 25 to 33. For each period the percentage consumption was calculated for each item.

*Interviews.*—On Day 38, the day after the second preference rating and three days after the addition of fresh meats to the diet, 24 Ss, consisting of the platoon leader plus five others chosen randomly from each platoon, were interviewed. The interview consisted of six specific questions designed to elicit information about changes in attitudes toward the foods served, and was preceded by a period of general conversation in order to obtain rapport.

*Minnesota Multiphasic Personality Inventory.*—The MMPI was administered on Day 12. Ss answered the questions on standard IBM answer forms (4).

## RESULTS

*Preference questionnaires.*—The average ratings for the 41 foods are shown for both rating sessions in Table 1. This table also includes the *p* values for the mean difference between the first and second ratings for each

TABLE 1  
FIRST AND SECOND RATINGS, *p* VALUE OF DIFFERENCE, NUMBER OF  
TIMES SERVED, AND INDEX OF RELATIVE CHANGE FOR ALL FOODS

Foods	First Rating	Second Rating	<i>p</i>	Number of Times Served†	Index of Relative Change
<i>Canned Fruits</i>					
Peaches	8.06	7.86	.05 < <i>p</i> < .1	620	-.0258
Fruit Cocktail	7.54	7.55	<i>p</i> > .9	534	+.0015
Pineapple	7.09	6.79	.02 < <i>p</i> < .05	1109	-.0280
Cherries	7.03	7.05	<i>p</i> > .9	624	+.0025
Pears	6.98	6.99	<i>p</i> > .9	1245	+.0006
Plums	6.40	6.55	.5 < <i>p</i> < .6	975	+.0123
Apricots	5.98	5.78	.3 < <i>p</i> < .4	1063	-.0154
Applesauce	5.53	6.18	.001 < <i>p</i> < .005	709	+.0734
Mean	6.83	6.84	<i>p</i> > .9		+.0026
<i>Cereals, dry</i>					
Corn Flakes	7.04	7.71	<i>p</i> < .001	356	+.1505
Rice Krispies	6.49	7.04	.001 < <i>p</i> < .005	623	+.0706
Wheat Flakes	6.14	7.01	<i>p</i> < .001	263	+.2644
Bran Flakes	5.66	6.93	<i>p</i> < .001	799	+.1270
Mean	6.32	7.17	<i>p</i> < .001		+.1531
<i>Canned Meats</i>					
Beans & Franks	6.78	7.18	.05 < <i>p</i> < .1	717	+.0046
Beef Steak	6.43	4.66	<i>p</i> < .001	702	-.2018
Fried Ham	5.82	4.74	<i>p</i> < .001	609	-.1419
Beef Stew	5.61	4.98	.002 < <i>p</i> < .003	259	-.1950
Boned Chicken	5.52	4.70	.007 < <i>p</i> < .009	617	-.1064
Hamburgers	5.51	4.30	<i>p</i> < .001	963	-.1008
Chicken & Vegetables	5.50	4.34	<i>p</i> < .001	346	-.2685
Ham and Eggs	5.08	4.46	.05 < <i>p</i> < .1	700	-.0709
Sausage Pattie	4.11	3.04	<i>p</i> < .001	1176	-.0729
Beef & Pork Loaf	3.55	2.61	<i>p</i> < .001	568	-.1323
Mean	5.39	4.50	<i>p</i> < .001		-.1246
<i>Canned Vegetables</i>					
Corn	6.72	6.50	<i>p</i> = .5	974	-.0180
Peas	6.58	6.26	.05 < <i>p</i> < .1	1062	-.0240
String Beans	6.31	5.72	.004 < <i>p</i> < .005	666	-.0709
Lima Beans	5.65	5.19	.007 < <i>p</i> < .009	618	-.0596
Carrots	5.39	4.39	<i>p</i> < .001	708	-.1130
Beets	4.89	4.17	.001 < <i>p</i> < .002	657	-.0877
Mean	5.92	5.37	<i>p</i> < .001		-.0622
<i>Desserts, Sweets</i>					
Sandwich Cookie	7.20	7.59	<i>p</i> = .05	1061	+.0294
Oatmeal Cookie	6.76	7.12	.02 < <i>p</i> < .05	88	+.3273
Chewy Choc. Roll	6.53	6.60	.7 < <i>p</i> < .8	438	+.0013
Choc. Fudge Disc	6.22	6.28	.7 < <i>p</i> < .8	437	+.0011
Starch Jelly Disc	4.84	6.20	<i>p</i> < .001	690	+.1578
Pound Cake	6.05	6.16	.5 < <i>p</i> < .6	701	+.0126
Fruit Cake	4.99	4.82	.5 < <i>p</i> < .6	528	-.0258
Date Pudding	4.66	2.67	<i>p</i> < .001	339	-.4693
Jam (3 varieties)	5.39	5.39	<i>p</i> > .9	3883	.0000
Mean	5.85	5.87	<i>p</i> > .9		+.0038
<i>Staples</i>					
Bread, white	7.47	7.55	.5 < <i>p</i> < .6	7222	+.0009
Butter	7.18	7.24	.6 < <i>p</i> < .7	7762	+.0006
Milk	8.37	8.47	.8 < <i>p</i> < .9	9534	+.0008
Coffee	6.69	6.76	.7 < <i>p</i> < .8	—†	+.0008
Mean	7.43	7.51	<i>p</i> < .9		+.0008
Grand Mean	6.14	5.94	<i>p</i> > .9		-.0265

\*Based on *t* tests for correlated data; 79 degrees of freedom for individual foods

†From first to second rating, 10th to 37th day ‡No rejection calculated

food. The foods are grouped by type and the mean for each type is given for both rating sessions. *t* tests for correlated data between the mean differences for individual foods indicate that fruits, desserts, and staples do not change significantly in rating, cereals go up, while meats and vegetables decline in preference between sessions.

Table 1 also shows the number of servings of each food between Days 10 and 37. From this value an index of relative change was computed by dividing the differences between the first and second rating for each food by the number of times served per person. This measure enables one to compare foods, taking into account that they may have been served a different number of times. These figures show the same pattern as the change in mean ratings.

The grand mean of all foods is lower at the second rating. Of the 41 foods, 14 were rated significantly lower ( $p = .05$ ) at the second rating, 9 were significantly higher ( $p = .05$ ), and 18 did not change significantly in rating. The  $r$  (product-moment) between the change in rating for each food and the number of times it was served from Day 10 to Day 37 is .22, which is not significant. The  $r$  between the index of relative change and the initial mean rating is .35, which is significant at the .05 level.

*Correlations between ratings and percent consumption.*—The percentage of each food consumed was computed for three periods, Days 1 to 9, Days 10 to 37, and Days 25 to 33. This latter period, which occurs within the second period, was analyzed separately since it covered the same time (9 days) as did the first. The percentages were converted to anglics (1) before computing the correlations between consumption and mean preference ratings. For each period there is a highly significant ( $p = .01$ ) correlation between ratings and actual consumption of food items; the  $r$ s range from .69 to .81 ( $p < .01$ ).

The mean ratings for the 10 foods that were rated highest initially and the 10 foods that were rated lowest initially were compared with their respective second ratings. The *t* tests for correlated data indicate that the mean of the high 10 did not change while that of the low 10 went down significantly ( $p = .001$ ).

*Interviews.*—The responses to the interview questions served mainly to confirm the preference ratings. However, in addition, there were many spontaneous comments of "getting tired" of having the same foods served so often. The canned meats were mentioned most often as the items toward which the men's attitudes had changed. There was little change of attitude toward the desserts, cereals, and sweets. Of the comments elicited, 23 were interpreted as related to monotony, 12 referred to the quality of the meat items, and 12 indicated production of physical disturbances of the gastrointestinal tract.

*The Minnesota Multiphasic Personality Inventory.*—Correlations between an *S*'s change in mean rating for all foods and for 13 selected foods with his

scores on the 12 scales of the MMPI were obtained. The 13 foods were those that decreased significantly in rating at the .01 level. Only three  $r$ s are significant ( $p = .05$ ,  $N = 81$ ): Depression vs. all foods ( $r = -.21$ ), the selected foods vs. Hypochondriasis ( $r = .24$ ), and Masculinity-Femininity ( $r = -.24$ ).

*Individual differences.*—Two groups of 10 men each were selected on the basis of their preferences to explore individual differences that might be related to change in rating. One group consisted, in general, of those men whose ratings declined most for the 13 selected foods as well as for all foods; the other group consisted of those men whose ratings increased most. The two groups did not differ significantly on the basis of their initial ratings. Age, height, and intelligence (AGCT scores) did not show significant differences, and there did not appear to be any obvious differences in national background for the two groups. However, the heavier group exhibited a significant ( $p = .01$ ) decline in preference ratings.

As a possible measure of personality differences between these two groups, which might be related to the existing differences in rating changes, the MMPI scores for the men in each group were averaged for each scale. The scales that indicated a difference were the Depression and Masculinity-Femininity scales, which is in accord with the results of the entire group.

#### DISCUSSION

The results are discussed in relation to the appropriate hypothesis set forth earlier (5).

*Monotony is some positive function of the number of times a food item has been consumed totally or in part.* This hypothesis is supported by the results for certain foods, but it does not hold if consideration is given to the  $r$  of .22 between number of times served and change in rating. This is due to the fact that items, such as milk, bread, and butter, which were served many times, do not decline in rating. With those foods that are susceptible to change in rating, it appears that repetition is the factor related to rejection. This idea is borne out by the comments from the interviews, such as, "serve the same things over and over too often."

*In time, eating monotony dissipates very slowly or not at all.* Attitudes toward the rations at the time of the second rating session were measured on the third day after fresh meats were added to the diet. In spite of this, the canned meat items showed a large decline in preference. It would seem defensible to say that the monotony does not dissipate in time, at least in the short period of three days, even though fresh meats were added to the diet.

*High initial palatability level slows the growth of eating monotony.* Two analyses throw some light on this hypothesis. The first is the  $r$  between initial preference rating and index of relative change. This significant  $r$  of .35 lends support to the hypothesis. The second analysis was the one on the 10 initially

high and the 10 initially low rated foods. The high rating foods do not change in rating while the low decline significantly ( $p = .001$ ). No food that rated over 7.00 initially declined in rating at the time of the second rating session.

A corollary states that the growth of monotony varies with the nature of the ration. In Table 1 the foods are grouped by type, and the mean for each of the two ratings is given. The fact that only meats and vegetables show a significant drop in rating while some foods, such as cereals, show an increased preference indicates that ration type is an all-important variable in determining the occurrence of monotony. It seems reasonable to explain the rise in preference for some foods as due to a contrast effect, i.e., the foods that are monotonous make the other foods seem better. There were some foods that did not follow a food-type hypothesis, such as beans and franks, which went up in preference, and pineapple, which went down. Also, date pudding and starch jelly discs are atypical.

*The growth of eating monotony is in large part affected by personality characteristics.* There is some indication that those who score high in Depression ( $r = -.21$ ) and those scoring high in Femininity ( $r = -.24$ ) are less susceptible to monotony. There is also evidence that those scoring high in Hypochondriasis ( $r = .24$ ) are more prone to monotony. However, in general the MMPI scales are not good measures of susceptibility to monotony.

On the basis of our evidence this hypothesis can be expanded to include other individual differences in addition to personality differences. For two extreme groups, individual differences in intelligence (AGCT), age (range was relatively small—88% were between 18 and 30 yr.), height, and national background are not related to development of monotony, but the group more subject to monotony is significantly heavier than the other. This, plus the fact that these Ss exhibited the greatest decline in ratings, which in turn correlated highly with consumption, suggests that the heavier group had a greater interest in and concern about foods.

*Eating monotony is overtly expressed in the symptoms of lowered food acceptance.* The interviews give ample supporting evidence that Ss were experiencing what we have called "monotony." Also, those items which were mentioned most as having changed with "familiarity" were those for which preference and consumption decreased. This was especially noticeable with the canned meat items. It appears then that this hypothesis is valid, or provides an adequate operational definition.

#### SUMMARY

86 men were maintained for 35 days on a qualitatively restricted diet of four daily menus made up from only 41 foods. Ss were on a program of high physical activity in a cold environment. Consumption of each food item

at each meal was measured, and a food preference questionnaire was administered on the 10th and 37th days of the experiment. Results were evaluated against five hypotheses developed earlier. The hypotheses were supported in general. Food monotony, overtly expressed as lowered consumption and preference, is primarily a function of repetition. However, its course is modified by the initial palatability of the food and the type of item, e.g., meat or fruit. Personal characteristics, including MMPI scores, were related to only a small degree to the monotony phenomena.

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