

UNCLASSIFIED

---

---

AD. 282 975

*Reproduced  
by the*

ARMED SERVICES TECHNICAL INFORMATION AGENCY  
ARLINGTON HALL STATION  
ARLINGTON 12, VIRGINIA



---

---

UNCLASSIFIED

NOTICE: When government or other drawings, specifications or other data are used for any purpose other than in connection with a definitely related government procurement operation, the U. S. Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

62-4-5

QMFCIAF REPORT 31-62

CATALOGED BY ASTIA  
As AD No. \_\_\_\_\_

282975

282975

**FOOD PREFERENCES IN A STRESSFUL SITUATION**

**Interim Report**

ASTIA  
RECEIVED  
SEP 4 1962  
TISIA E

Astia Availability Notice: "QUALIFIED  
REQUESTORS MAY OBTAIN COPIES OF THIS  
REPORT FROM ASTIA."

**August 1962**



**QUARTERMASTER FOOD AND CONTAINER INSTITUTE FOR THE ARMED FORCES  
QUARTERMASTER RESEARCH AND ENGINEERING COMMAND, U.S. ARMY  
CHICAGO 9, ILLINOIS**

<p>AD _____ Accession No. _____  QM Food &amp; Container Institute for the Armed Forces,  QM Research &amp; Engineering Command, U. S. Army,  Chicago 9, QMFCIAF Rpt. No. <u>31-62</u>  Date <u>AUG. 1962</u> Proj. No. _____  pp <u>29</u> tbl <u>4</u> fig. _____</p> <p>Food Preferences in a Stressful Situation  by J. M. Kamen</p> <p>Food preferences of paratrooper trainees  were determined and related to various  phases of training and to individual  differences in anxiety.  Primary Field: Food preferences  Secondary Field(s): <u>Psychological stress</u></p>	<p>AD _____ Accession No. _____  QM Food &amp; Container Institute for the Armed Forces,  QM Research &amp; Engineering Command, U. S. Army,  Chicago 9, QMFCIAF Rpt. No. <u>31-62</u>  Date <u>AUG. 1962</u> Proj. No. _____  pp <u>29</u> tbl <u>4</u> fig. _____</p> <p>Food Preferences in a Stressful Situation  by J. M. Kamen</p> <p>Food preferences of paratrooper trainees  were determined and related to various  phases of training and to individual  differences in anxiety.  Primary Field: Food preferences  Secondary Field(s): <u>Psychological stress</u></p>	<p>UNCLASSIFIED</p> <p>1. Food Preferences  2. Stress (Physiology)</p>	<p>UNCLASSIFIED</p> <p>1. Food Preferences  2. Stress (Physiology)</p>
<p>AD _____ Accession No. _____  QM Food &amp; Container Institute for the Armed Forces,  QM Research &amp; Engineering Command, U. S. Army,  Chicago 9, QMFCIAF Rpt. No. <u>31-62</u>  Date <u>AUG. 1962</u> Proj. No. _____  pp <u>29</u> tbl <u>4</u> fig. _____</p> <p>Food Preferences in a Stressful Situation  by J. M. Kamen</p> <p>Food preferences of paratrooper trainees  were determined and related to various  phases of training and to individual  differences in anxiety.  Primary Field: Food preferences  Secondary Field(s): <u>Psychological stress</u></p>	<p>AD _____ Accession No. _____  QM Food &amp; Container Institute for the Armed Forces,  QM Research &amp; Engineering Command, U. S. Army,  Chicago 9, QMFCIAF Rpt. No. <u>31-62</u>  Date <u>AUG. 1962</u> Proj. No. _____  pp <u>29</u> tbl <u>4</u> fig. _____</p> <p>Food Preferences in a Stressful Situation  by J. M. Kamen</p> <p>Food preferences of paratrooper trainees  were determined and related to various  phases of training and to individual  differences in anxiety.  Primary Field: Food preferences  Secondary Field(s): <u>Psychological stress</u></p>	<p>UNCLASSIFIED</p> <p>1. Food Preferences  2. Stress (Physiology)</p>	<p>UNCLASSIFIED</p> <p>1. Food Preferences  2. Stress (Physiology)</p>

<p>AD _____ Accession No. _____  QM Food &amp; Container Institute for the Armed Forces,  QM Research &amp; Engineering Command, U. S. Army,  Chicago 9, QMFCLAF Rpt. No. <u>31-62</u>  Date <u>Aug. 1962</u> Proj. No. _____  pp <u>29</u> tbl <u>4</u> fig. _____</p> <p>Food Preferences in a Stressful Situation  by J. M. Kamen</p> <p>Food preferences of paratrooper trainees  were determined and related to various  phases of training and to individual  differences in anxiety.  Primary Field: Food preferences  Secondary Field(s): <u>Psychological stress</u></p>	<p>UNCLASSIFIED</p> <p>1. Food Preferences  2. Stress (Physiology)</p>	<p>UNCLASSIFIED</p>
<p>AD _____ Accession No. _____  QM Food &amp; Container Institute for the Armed Forces,  QM Research &amp; Engineering Command, U. S. Army,  Chicago 9, QMFCLAF Rpt. No. <u>31-62</u>  Date <u>Aug. 1962</u> Proj. No. _____  pp <u>29</u> tbl <u>4</u> fig. _____</p> <p>Food Preferences in a Stressful Situation  by J. M. Kamen</p> <p>Food preferences of paratrooper trainees  were determined and related to various  phases of training and to individual  differences in anxiety.  Primary Field: Food preferences  Secondary Field(s): <u>Psychological stress</u></p>	<p>UNCLASSIFIED</p> <p>1. Food Preferences  2. Stress (Physiology)</p>	<p>UNCLASSIFIED</p>
<p>AD _____ Accession No. _____  QM Food &amp; Container Institute for the Armed Forces,  QM Research &amp; Engineering Command, U. S. Army,  Chicago 9, QMFCLAF Rpt. No. <u>31-62</u>  Date <u>Aug. 1962</u> Proj. No. _____  pp <u>29</u> tbl <u>4</u> fig. _____</p> <p>Food Preferences in a Stressful Situation  by J. M. Kamen</p> <p>Food preferences of paratrooper trainees  were determined and related to various  phases of training and to individual  differences in anxiety.  Primary Field: Food Preferences  Secondary Field(s): <u>Psychological stress</u></p>	<p>UNCLASSIFIED</p> <p>1. Food Preferences  2. Stress (Physiology)</p>	<p>UNCLASSIFIED</p>

QMFCIAF Report No. 31-62

**PROJECT:** Human Factors in QM Corps  
Operations

**TASK:** Attitude toward and  
Acceptance of QM Materiel

**PHASE:** Patterns of Preference  
under Stress

**FOOD PREFERENCES IN A STRESSFUL SITUATION**

Interim Report

by

Joseph M. Kamen

Food Acceptance Branch, Food Division

August 1962

Quartermaster Food and Container Institute for the Armed Forces

## FOOD PREFERENCES IN A STRESSFUL SITUATION

When an individual is under stress, certain autonomic behavior is elicited. The activity of the sympathetic nervous system increases so as to bring about a mobilization of physiological resources. Vasodilation, increased blood pressure, heart rate, sweating, and adrenalin secretion, and hyperglycemia are examples of the physiological manifestations of stress. At the same time certain other functions are depressed -- functions related to the activity of the parasympathetic nervous system such as sexual activity and digestive processes (Darrow and Henry, 1949).

From a practical standpoint, food preferences and consumption during brief periods of stress are largely unimportant insofar as the individual is concentrating his energies and attention on meeting and overcoming the threatening situation. For longer periods of stress, of course, food preferences and consumption may assume major significance because extended nutritional deficiencies resulting from non-consumption may lead to performance decrements. The problem is complicated by the fact that gastrointestinal disturbances associated with stress may restrict the range and types of acceptable foods (Darrow and Henry, 1949; Brožek and Mickelsen, 1949).

Also important for purposes of dietary planning are the changes in patterns of food preference and consumption when the stressful situation has passed and the individual is recovering from its influence. Reactions to stress do not cease abruptly once the stressful situation is removed; the "calm down" may take hours, days, or even weeks or longer.

Except for occasional reports of introspective experiences or casual observations, little is known on what changes in food preference occur under stress or during recovery from stress. Such knowledge would furnish guidance to those planning diets for men subjected to stress, such as combat stresses, as well as shed light on certain behavioral manifestations of exposure to stress.

### Definitions of stress

Over the past decade, hundreds of journal articles and books on stress have appeared. In some, the definitions of stress have been conspicuously avoided, whereas in others, certain unique definitions emerge. But basically, three broad types of definitions appear:

1. Stimulus-inferred definitions. Stress is inferred because the situation is such that it "ought to" arouse stress. These definitions are in large part derived from the researcher's expectations or anticipations on how he himself would react to certain conditions. A bombing or strafing, mine disaster, tornado, and surgery are examples of situations which a researcher believes should arouse stress reactions; but no independent checks of whether stress reactions have actually been aroused are typically made.

2. Stimulus-response-inferred definitions. These definitions are similar to the first, but go at least one step further. Attempts are made to link the presumably stressful situations to certain specified physiological or behavioral responses. Thus, if no physiological changes from a normal baseline are detected among individuals exposed to an earthquake, the earthquake is not considered stressful regardless

of the a priori notion that it should arouse stressful reactions. But if persons typically react with heightened autonomic activity during a taxi ride, the taxi ride is adjudged to be stressful. This type of definition, then, requires an assessment of both the stimulus and of the responses evoked by it.

3. Response-inferred definitions. At times, heightened emotional activity by individuals is apparent, but no stimulating cause can be directly linked to it. The person may be unaware of the cause -- perhaps it is some personal crisis -- and to an observer, it is not evident. Or the person may display symptoms characteristic of high activity of the sympathetic nervous system, but is unable to pinpoint the causes. Stress is inferred from the behavior but not from the conditions responsible for the behavior. Response-inferred behavior is often called -- and will be called here -- anxiety. People differ from one another in the general degree of anxiety manifested, and such differences can be measured by questionnaire methods. The main feature of response-inferred definitions is that they are almost entirely based upon persons' behavior and not necessarily or at all upon the features of the situation.

#### Purpose and scope

The purpose of this study is to explore the relationship between food preferences and stress, particularly to:

- a. Estimate the changes in preferences for specific foods and food classes during a training program which elicits varying degrees of stress.

b. Relate preferences to levels of anxiety manifested by persons at various stages of this training program.

The setting for this study was a paratrooper training course, and stress is defined in the three ways discussed above:

1. Stimulus-inferred definitions. Paratrooper training has face validity as a stressful situation, since at many points during the program risks of injury or death are apparent and since throughout the program, physical activity and forced alertness and vigilance are kept at a maximum.

2. Stimulus-response-inferred. Previous research has shown that paratrooper training is accompanied by certain behavioral and physiological manifestations typical of stressful conditions (Basowitz, Persky, Korchin, and Grinker, 1955; Hatch, Hammerman, and Haynes, 1955). To check on the stress present in this study, relevant questionnaire items were included.

3. Response-inferred. The same questionnaire items on stress were designed to permit the measurement of individual differences in stress-arousal. The set of questionnaires so used will be referred to as the anxiety scale.

This study was largely exploratory rather than definitive or exhaustive. It was designed to derive hypotheses that can be more adequately tested at a later time, to get first approximations to the relationship between stress and preference, to develop certain research methods and techniques, and to assess the potential fruitfulness of this line of research. Hence, some rigor was purposely sacrificed for breadth of results.

### Other report

The field work of this research was executed by the Quartermaster Research and Engineering Field Evaluation Agency. Much of the data were analyzed by the Agency and have been reported in a separate publication (Burt, 1962). Where appropriate, these analyses will be summarized rather than discussed in detail.

### Method

The subjects were 872 men in eight classes at the Airborne School, 83rd Airborne Division, Fort Bragg, North Carolina. The trainees reported to the school daily, but were otherwise under the administrative control of TO&E (functioning) units within the 83rd Division. The training school had no housing or messing facilities, and the trainees ate all meals at their unit messes and returned to their unit areas after each day of training.

### Training Program

A summary of the training program is shown in Table 1. Specific activities included in this study were selected from the program through conferences with the Commandant of the school and were chosen so as to include activities which would represent varying degrees of stress. Four activities -- familiarization with parachute, before 34-foot tower jump, before physical training test, and before first jump from airplane -- were chosen to represent conditions inducing stress reactions. Measurements were taken immediately prior to the time the men engaged in these activities. Four other periods -- after 34-foot tower jump, after

physical training test, after first jump from airplane, and graduation -- were considered to represent non-stress, a term which also includes the period of recovery from stress. Eight classes were assigned to complete the questionnaires, one class for each of the eight activities.

Table 1			
Training Activities Representing Stress and No-Stress Conditions			
Training Activity	Number in Class	Classification of Activity as Stress or No-Stress	Week of Training
Familiarization with parachute	120	Stress	First
Before 34-foot tower jump	144	Stress	First
After 34-foot tower jump	83	No stress	First
Before physical training test	124	Stress	Second
After physical training test	102	No stress	Second
Before first jump from airplane	140	Stress	Third
After first jump from airplane	122	No stress	Third
Graduation	37	No stress	Third

Questionnaires

Each respondent completed a three-part questionnaire:

Part 1. Food Preference Questionnaire. This part was designed to obtain preference ratings on the 9-point hedonic scale for 50 foods served in Fort Bragg mess halls during the study. The 50 foods were divided into the following food groups:

Main dishes - 9 foods  
Vegetables and salads - 9 foods  
Desserts - 9 foods  
Potatoes and starches - 9 foods  
Fruits and juices - 6 foods  
Breads - 3 foods  
Soups - 3 foods  
Beverages - 2 foods

Subjects were asked to evaluate each food on the basis of how much they would like or dislike eating it at the very next meal. This point -- and the corollary of one of not evaluating a food in terms of general like or disliking -- was repeatedly emphasized, during the briefing and on the questionnaire instruction pages. A list of the foods is shown in Appendix A.

Part 2. Personal Reaction Questionnaire. The Personal Reaction Questionnaire consisted of one question which was, in effect, a 9-item check list, plus eight other multiple-choice questions. An example of the basic questionnaire -- the one used during the first activity surveyed -- appears in Appendix B. The content of the questions was derived largely from previous stress studies among paratrooper trainees and other soldiers, and was intended to be indicative of varying degrees and aspects of stress and no-stress. Up to five additional questions were included among some classes of trainees, depending upon the specific training activity the members were undergoing at that time.

Part 3. Consumption measures. The men were asked to list the foods served at the meal preceding the questionnaire administration, to indicate whether they accepted or rejected each, and if accepted, to state how much of the food was eaten. The responses were very sketchy and unreliable. The deficiencies were in some degree due to the fact that the messes in which the men ate varied in the foods served at a given meal on a given day. The data from this part of the questionnaire were discarded and will not be further discussed in this report.

## Results

### Analysis of anxiety data

Fifteen anxiety questions were selected for analyses. Other questions were eliminated because they did not appear for all activities surveyed. One other question was discarded because over 90 percent of the men gave the same answer, and hence did not differentiate among the men or the activities.

Scoring of questions: Each respondent was asked to check whether, at the time he completed the questionnaire, he was: nervous; tired; sleepy or drowsy; joking; relaxed; eager; thirsty; hungry. Each of these eight states was considered as a separate question. An affirmative response to each state was provisionally scored as "1", a negative response as "0".

The other seven questions were of the multiple-choice type. The choices in each question represented various degrees of hypothesized anxiety states. The first multiple-choice question dealt with how much sleep the soldier felt he required, and the choices ranged from "Need much more sleep than most of my buddies" to "Need much less sleep than most of my buddies." The second question asked how nervous or jittery the soldier was on the previous night, and the third asked the soldier to compare his nervousness to the nervousness of his buddies. Whether the soldier believed he made the right decision in volunteering for paratrooper training was asked in the fourth question. Worry about failing the training course, worry about getting hurt during training, and appetite during the preceding meal were the last three multiple-choice questions.

For each item, the frequencies of responses to each multiple-choice category were examined. Choices were algebraically combined in such a way as to leave only two categories, one category representing high levels of anxiety and the other low levels of anxiety. The goal in combining choices into two categories was to have as close to 50 percent in each category as was possible.

Tetrachoric correlations (Guilford, 1950) were then calculated between every pair of questions; all subjects, regardless of time they were tested, were used in these calculations. Inspection of the correlation matrix pointed to the existence of a general anxiety factor common to all questions. Also suggested were "sleepiness" and "appetite" factors. The questions were reweighted in such a way that the correlation matrix would, as far as possible, contain only algebraically positive values.

For each individual, a total provisional anxiety score was derived by counting the number of his answers scored as "1", according to this reweighting scheme.

Then a biserial correlation was calculated between each question and the total score (Guilford, 1950, pp. 324-326; Guilford, 1954, pp. 434). These correlations, together with the percent of the men for whom each question was scored "1" are presented in Table 2. All correlations were significant at the .01 level, and only three questions had correlations lower than .40. These results confirmed the existence of the general anxiety factor and indicated that other factors, if present, were at best weakly represented.

#### Evidence of stress arousal

a. During training in general. Over 50 percent of the total number in each class wondered to some degree whether they had made the right decision in volunteering for the paratroopers, were worried about failing the program, or worried about getting hurt during training. The FEA report (Burt, 1962) contains more detailed data. The evidence is, of course, merely suggestive that most trainees were affected by the situation; but others said they were not. More definitive demonstrations of stress arousal rest upon studies cited earlier (Basowitz, et al, 1955; Hatch, et al, 1955).

Table 2

Anxiety Questions, Scoring Key, Percent Scoring "1", and  
Correlations with Total Anxiety Score

Question*	Scoring key "0" "1"	Percent scoring "1"	Correlation with total score
1. Nervous or jittery	No Yes	24	.66
2. Tired	No <sup>10</sup> Yes	24	.50
3. Sleepy or drowsy	No Yes	12	.53
4. Joking	Yes No	15	.32
5. Relaxed	Yes No	32	.50
6. Eager	Yes No	46	.42
7. Thirsty	Yes No	60	.36
8. Hungry	Yes No	38	.23
9. Amount of sleep required	a, b c, d	20	.43
10. Nervousness prior to sleep	a, b, c <sup>11</sup> d, e	42	.64
11. Nervousness compared to buddies	a, b, c d, e	70	.48
12. Wonder over decision to volunteer for paratroopers	a, b c, d, e	40	.53
13. Worry about falling	a, b, c, d e	60	.62
14. Worry about getting hurt	a, b, c, d e	63	.59
15. Appetite	b, c, d, e a	44	.52

\*See Appendix for Exact Wording of Questions

b. Differences between stress and non-stress activities.

Four activities were, on a priori grounds, considered stressful and four non-stressful. For the most part, the anxiety questions were aimed toward obtaining individual differences in stress arousal and in overall states rather than toward seeking differences in reactions among the eight activities. However, a few questions did bear directly upon the stress aroused by the immediate situation with which the individual was confronted. These questions asked the individual to estimate his present feelings of nervousness or relaxation. Among the individuals in the four stressful activities, 33.3 percent said they were nervous or jittery; but only 17.5 percent of those in the non-stressful activities so stated. This difference is highly significant ( $p < .001$ ). Similarly, 28.4 percent in the stressful conditions said they were relaxed compared to 41.6 in the non-stressful activities. This difference, too, is highly significant ( $p < .001$ ). The data from these two questions, though perhaps sketchy, provide some evidence that the four activities designated as stressful were so perceived by the subjects relative to those in the non-stressful activities. Prior studies (Basowitz, et al. 1955) as previously mentioned, support this contention.

Analyses of food preference ratings

The basic analyses of food preference ratings are described in the FEA report (Burt, 1962) and only the major results and conclusions will be presented here.

First, it appears that the average food preferences did not change consistently or considerably over the training cycle. Preferences assessed prior to the first plane jump were lower than during any other phase of training, and they were the highest after the jump from the 34-foot tower. However, since data for each phase were obtained from different groups of trainees, the differences in preference are confounded with differences in groups. In any case, the average preferences over all foods, showed relatively little variation, the range being from 6.58 to 7.18.

The difference between the over-all mean preference rating for all four stress activities was 6.85, and the mean for all four non-stress activities was 6.96. This difference of .11 scale points is not statistically significant.

For each food group, t-tests were run between the average ratings and stress and the average ratings under no-stress. The results are shown in Table 3.

Preferences for main dishes tended to be higher under the stress conditions ( $p < .02$ ). All nine main dishes had "non-stress minus stress" differences less than the median difference of .11 scale points, a result which illustrates the relatively higher ratings of main dishes under stress.

Desserts showed the opposite effects ( $p < .001$ ). Preferences for eight of the nine items were higher than the median value of .11, and the ninth item had a "non-stress minus stress" difference corresponding exactly to the median.

Table 3

Mean Ratings of Foods, by Food Group, during  
Stress and No-Stress Activities

Food Group	Number of foods	Ratings under stress	Ratings under no stress	Probability <sup>a</sup>
Main dishes	9	6.97	6.80	.02
Vegetable & salads	9	6.00	5.98	n.s.
Desserts	9	7.20	7.44	.001
Potatoes & starches	9	6.72	6.68	n.s.
Fruits and juices	6	7.08	7.24	n.s.
Breads	3	6.74	6.80	n.s.
Soups	3	5.64	5.56	n.s.
Beverages	2	7.95	8.14	.05
<sup>a</sup> n.s. - not significant				

Of the six fruits and juices, only one had higher preferences under stress. For the other five, preferences were greater under no-stress. The one exception, tomato juice, may not fit adequately into the category of fruits and fruit juices since many consumers probably perceive it as a vegetable juice. Generally, then, there appeared to be a trend of higher preferences for these items under no-stress conditions.

No consistent trends were evident for vegetables. Similarly, the results for potatoes and starches did not indicate consistent shifts in preference in one condition over the other.

All three breads were relatively more preferred under no-stress, but the small number of different foods makes a more definite conclusion impossible. Of the beverages, preferences for milk tended to remain the same; it was rated about 8.7 under all conditions, whereas preferences for iced tea were higher under no-stress, a fact which was responsible for the significant difference for beverages ( $p < .05$ ) as shown in Table 3.

#### Relation of anxiety scores to preferences

For each group of trainees, correlations were calculated between anxiety scores and mean preferences for each of the eight food classes. These 64 correlations, shown in Table 4, were generally small and only 11 attained significance at the .05 level or better. These 11 were distributed fairly evenly among the different food classes and among the groups of men. Four of these 11 were algebraically positive and seven negative.

The correlation matrix in Table 4 can be viewed in a different way, by ignoring absolute magnitudes and examining only the algebraic signs. Fifty-two of the 64 correlations were negative. This means that the higher the anxiety score, the lower the preference. But because the absolute magnitudes of the correlations were low, the relationship between anxiety and preference does not have much theoretical or practical impact.

Table 4

Correlations between Anxiety Scores and Food Preferences  
by Food Class and Group of Soldiers

Group of soldiers	Number in group <sup>a</sup>	Main dishes	Vegetables and salads	Desserts	Potatoes and starches	Fruits and juices	Breads	Soups	Beverages
1	106	-.06	-.24*	-.05	.02	-.09	.08	-.12	-.04
2	125	-.06	-.14	.02	-.04	-.13	-.13	.05	.19*
3	75	-.05	-.14	-.02	-.002	-.18	-.17	-.14	.07
4	111	-.25*	-.22*	-.06	-.14	-.12	-.24*	-.04	-.18
5	93	.13	-.12	-.13	-.08	.26*	-.12	-.04	.23*
6	130	-.17	-.03	-.18*	-.02	-.22*	-.11	-.12	-.13
7	101	-.09	-.11	-.05	-.04	-.08	-.16	-.16	-.10
8	23	-.32	.01	-.61**	.45*	-.26	.01	-.23	-.09

\*  $p < .05$

\*\*  $p < .01$

<sup>a</sup> The numbers here are smaller than those shown in Table 1 because some soldiers did not answer all questions.

## Discussion and Conclusions

Among the most interesting findings of this study was that preferences for main dishes were higher under conditions of stress than during recovery from stress, whereas the opposite was true for desserts, and to a lesser extent for fruits and juices.

The effects shown here -- both in the shifts of preferences and in anxiety responses to stressful situations -- were by no means dramatic although statistically significant differences were shown. Certainly, alterations in dietary patterns cannot be easily justified from the present results, except perhaps a little more emphasis upon desserts and fruits following stress. The rank order of preferences for each of the 50 foods remained fairly constant; the correlation ( $\rho$ ) was .98 between the stress and no-stress conditions. Thus, the changes in preferences could be considered marginal.

The absence of marked differences in preferences could be attributable to the possibilities that: (a) stress has actually little effect on preferences; (b) that even the highest amounts of stress manifested during paratrooper training activities was insufficient for demonstrating stronger relationships.

The latter alternative has some support. First, the absolute level of anxiety reported by the men was not high, although it was more for the men undergoing the more stressful activities. For example, only 24 percent of all trainees stated they were nervous or jittery. Other more subtle factors may have also been operating. As an illustration, the school was located adjacent to a heavily travelled road in Fort Bragg.

The nonchalance or even indifference by passersby was apt to make a soldier believe that the training is safe; he would think that if an accident were likely, spectators would cluster around the training area or the training area would be moved to an isolated location. Moreover, the atmosphere that the training program was routine was not conducive toward large degrees of stress arousal. The final point involved the men returning to their units for meals and housing. It is likely that their buddies who already completed paratrooper training had a calming effect.

A replicate study among paratrooper trainees is not considered worthwhile because of the impossibility of imposing rigorous controls without affecting the people being measured, and because the situation, although stressful, does not induce extremely high levels of anxiety. Nor would a laboratory approach, in which attempts are made to arouse anxiety artificially, be particularly productive. Rather, future studies should meet the following two specifications:

1. The stress arousal should arise from "natural" conditions.

This implies that the researcher must be opportunistic, to be prepared to take advantage of stressful events as they may arise. The alternative is to simulate situations which are unambiguously perceived by persons as threatening their physiological or psychological integrity. Methods of such realistic simulation are described in a report by the Human Resources Office (1959) where, for example, soldiers in a plane were led to believe that a crash was imminent. This simulation involved, among other things, feathering of an engine and the assembly of crash-equipment on the ground. Another case of real-life simulation involved

leading soldiers to believe that they had accidentally detonated an explosive charge bringing about casualties. However, such methods of stress induction are costly in time and money, and many precautions must be taken to insure that the trauma produced is quickly dissipated following the data collection and that long range harmful effects upon the individual are obviated. Other, less-natural methods of stress induction are usually perceived as harmless by subjects; and thus, the necessary conditions of the study would not be met.

2. The data-observations should be longitudinal, following-through on the same individuals over time, as well as cross-sectional, the type of observations used in the present study. The initial observations should take place far before the stress-arousal occurs, and preferably, before the individual knows he will be subjected to stress. These observations should continue until recovery from the effects of stress has been complete or nearly so. It is recognized that the very act of repeated measurements on the same individuals can lead to a lessening of stress since it would offer subtle cues to these people that someone is "looking after them." However, if proper precautions are exercised, the gains in precision may offset such disadvantages.

### Summary

Over 800 soldiers in eight phases of paratrooper training were asked to indicate their immediate preferences for each of 50 foods. Questionnaires designed to assess stress-arousal, or anxiety, were also administered. On a priori grounds, and later confirmed by the results from the anxiety questionnaires, four phases of training were classified as stressful (e.g., immediately before first jump from airplane) and four were considered non-stressful (e.g., graduation) or representing recovery from stress (e.g., after first jump from airplane). Preferences for desserts, and to a lesser extent for fruits and juices, were significantly higher during the non-stressful phases, but preferences for main dishes showed the opposite effect, higher during stress than under no-stress. The absolute shifts in preferences for any class of foods were in no case higher than .24 scale points, and the differences between stress and non-stress phases did not seem to be of much practical importance.

Suggestions for future work on the relationship between preferences and stress are stated.

## References

1. Basowitz, H., H. Persky, S. J. Korchin, and R. R. Grinker. Anxiety and Stress. New York, McGraw-Hill, 1955.
2. Brožek, J., and O. Mickelsen. "Diet," In, Committee on undersea warfare, A survey report on human factors in undersea warfare. Washington, D.C., National Research Council, pp. 311-327, 1949.
3. Burt, T. B. Exploratory study of food preferences and consumption of soldiers in stressful field situation. Technical Report T-214 (FEA 61041). Quartermaster Research and Engineering Field Evaluation Agency, Ft. Lee, Va., January, 1962.
4. Darrow, C.W., and C.E. Henry. "Psychophysiology of Stress." In, Committee on undersea warfare, A survey report on human factors in undersea warfare. Washington, D.C., National Research Council, pp. 417-439, 1949.
5. Guilford, J. P. Fundamental Statistics in Psychology and Education. (Second Edition), New York, McGraw-Hill, 1950.
6. Guilford, J. P. Psychometric Methods. (Second Edition), New York, McGraw-Hill, 1954.
7. Haggard, E.A. "Psychological Causes and Results of Stress," In, Committee on undersea warfare, A survey on human factors in undersea warfare. Washington, D.C., National Research Council, pp.441-462, 1949.
8. Hatch, F.T., D.J. Hammerman, R.C. Haynes. Biochemical Changes in Stress. I. A study of soldiers in airborne training. Report Number 153. Army Medical Nutrition Laboratory, Denver, Colorado, February, 1955.

9. Human Resources Research Office, Objective Measures of the Effects of Severe Stress. U.S. Army Leadership Research Unit. Human Resources Research Office, Monterey, Calif., March, 1959.

## Appendix A

### List of Foods Surveyed, by Food Class

#### MAIN DISHES

Liver and onions  
Baked ham  
Barbecued pork chops  
Grilled frankfurters  
Chili con carne  
Roast turkey w/gravy  
Hamburger on bun  
Roast beef w/gravy  
Veal loaf w/gravy

#### VEGETABLES AND SALADS

Buttered asparagus  
Tossed salad  
Stewed tomatoes  
Cole slaw  
Glazed carrots  
Buttered spinach  
Buttered peas  
Creamed corn  
Corn-on-the-cob

#### DESSERTS

Orange sherbet  
Devils food cake  
Raisin pie  
Spice cake  
Ice cream  
Butterscotch pudding  
Pineapple pie  
Peach pie  
Lemon meringue pie

#### POTATOES AND STARCHES

Potato chips  
Oven-baked potatoes  
Baked sweet potatoes  
French-fried potatoes  
Cold potato salad  
Hash-brown potatoes  
Mashed potatoes  
Buttered noodles  
French toast w/syrup

#### FRUITS AND JUICES

Fruit cocktail  
Orange juice  
Chilled apricots  
Tomato juice  
Grapefruit juice  
Cantaloup

#### BREADS

Hot biscuits  
Rye bread  
Corn bread

#### SOUPS

Bean soup  
Tomato soup  
Vegetable soup

#### Beverages

Iced tea  
Fresh milk

Appendix B

Section II-Personal Reaction Questions.

The following questions are somewhat more personal than those relating to your food likes and dislikes in the previous section of this questionnaire. When you answer the questions below, bear in mind that only research personnel will ever see them. Your truthful answers--no matter what they are--will not be identified with you or your organization in any way. It is of the utmost importance that your answers be completely honest in order for the results of this study to be of most use to the Army.

To answer the following questions requires only that you place a check (✓) or a double check (✓✓) beside the answer which describes how you feel.

\* \* \* \* \*

1. Which of the following describe(s) your feelings now. Check (✓) as many as apply.

- |  |  |
|--|--|
| <input type="checkbox"/> a. Nervous or jittery | <input type="checkbox"/> g. Thirsty            |
| <input type="checkbox"/> b. Tired              | <input type="checkbox"/> h. Hungry             |
| <input type="checkbox"/> c. Sleepy or drowsy   | <input type="checkbox"/> i. No appetite        |
| <input type="checkbox"/> d. Joking             | <input type="checkbox"/> j. Other. What? _____ |
| <input type="checkbox"/> e. Relaxed            | _____  |
| <input type="checkbox"/> f. Eager              | _____  |

Now, double check (✓✓) the one that best describes your feelings now.

2. Do you think you generally need more sleep or less sleep than most of your buddies? (Check one).

- a. I need much more sleep than most of my buddies.
- b. I need somewhat more sleep than most of my buddies.
- c. I need about the same amount of sleep as most of my buddies.
- d. I need somewhat less sleep than most of my buddies.
- e. I need much less sleep than most of my buddies.

Appendix B  
(continued)

3. How nervous or jittery or anxious were you last night before you went to sleep? (Check one).

- a. Very nervous or jittery or anxious.
- b. Somewhat nervous or jittery or anxious.
- c. Just a little nervous or jittery or anxious.
- d. Not at all nervous or jittery or anxious.

4. Compared to your buddies here at Fort Bragg, how nervous or jittery do you think you are in general?

- a. Much more nervous than my buddies.
- b. Somewhat more nervous than my buddies.
- c. About the same amount of nervousness.
- d. Somewhat less nervous than my buddies.
- e. Much less nervous than my buddies.

5. Have you ever wondered whether you made the right decision in volunteering for the paratroopers? (Check one).

- a. Yes, I often wonder whether I made the right decision.
- b. Yes, I sometimes wonder whether I made the right decision.
- c. Yes, but only rarely.
- d. No, I never wonder whether I made the right decision.

6. At what time of the day do you generally feel most hungry? \_\_\_\_\_  
(Clock time)

7. How worried are you that you might fail paratrooper training?

- a. Extremely worried.
- b. Very worried.

Appendix B  
(continued)

c. Somewhat worried.

d. Slightly worried.

e. Not at all worried.

8. How worried are you about getting hurt in paratrooper training?

a. Extremely worried.

b. Very worried.

c. Somewhat worried.

d. Slightly worried.

e. Not at all worried.

9. How was your appetite during the \_\_\_\_\_ meal today?

a. Very good appetite.

b. Good appetite.

c. Just a little appetite.

d. Poor appetite.

e. Very poor appetite.

**DISTRIBUTION**

Chief, Research and Engineering (1) Department of the Army The Pentagon, Washington 25, D.C.	Chief, Bureau of Supplies and Accounts (W/2)(1) Department of the Navy Washington 25, D.C.
Chief, Research Analysis Division (1) Army Research Officer Office, Chief, Research and Dev. Department of the Army Washington 25, D.C.	Commanding Officer (1) U.S. Navy Subsistence Office Naval Weapons Plant Washington 25, D.C.
Research and Engineering Division (6) Office of The Quartermaster General ATTN: Services Office Department of the Army Washington 25, D.C.	Chief, Bureau of Supplies and Accounts (O/W)(1) Department of the Navy Washington 25, D.C.
The Quartermaster General (1) ATTN: Charles N. Gardner Department of the Army Washington 25, D.C.	Officer-in-Charge (1) U. S. Naval Supply Center Naval Supply Depot Bayonne, New Jersey
Commanding General (40) ATTN: Tech. Information Branch Tech. Services Division QM R&E Command, U. S. Army QM R&E Center Natick, Mass.	Chief, Signal Corps Packaging Standards Ofc. (1) U. S. Army Signal Supply Agency Tobyhanna Signal Depot Tobyhanna, Penn. ( Container Reports)
Commanding Officer (1) Field Evaluation Agency QM R&E Command, U. S. Army Ft. Lee, Va.	Librarian (1) QM Technical Library Ft. Lee, Va.
Commanding Officer (1) U. S. Army Medical Research and Nutrition Lab., Fitzsimons Gen. Hosp. Denver Colorado (Food Reports)	Commandant (1) Hq., U. S. Marine Corps Washington 25, D.C. (O.I.C. Supply Br.)
The Library (1) U. S. Army Leadership HRU P. O. Box 787 Presidio of Monterey, Calif. (Food Reports)	(3) British Joint Services Mission (Army Staff) British Embassy Annexe Washington 8, D.C.
Defense Research Member (4) Canadian Joint Staff 2450 Massachusetts Ave, N.W. Washington, D.C.	Major L. G. Clark (3) Australian Military Mission 2001 Connecticut Ave., N.W. Box 4837 Washington 8, D.C.

**QMFCIAF**

Commandant, Assistant Commandant, Scientific Director, Deputy Scientific Director, Library, all office, division, and branch chief, Navy Liaison Officer - 1 each.  
Air Force Liaison Officer (6)

**UNCLASSIFIED**

**UNCLASSIFIED**