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Personality traits and eating habits: the assessment of food preferences in a large community sample

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Abstract

The 48 dietary items from three popular eating surveys (the Kristal Food Habits Questionnaire, Block Fiber Screener, and Block Fat Screener) were administered concurrently to a large community sample. To provide evidence of the hierarchical structure of these eating practices, both orthogonal and oblique factor rotations of from one to five factors are compared. Also provided are the relations between dietary factors and gender, age, and education, as well as a broad set of personality attributes. Although self-reported eating practices were not associated with educational level, intelligence, nor various indices of psychopathology, they were related to the demographic variables of gender and age: older participants reported eating more fiber in their diets than did younger ones, and women reported more avoidance of fats from meats than did men. When these demographic associations were statistically controlled, we found an intriguing pattern of association with measures of other health-related practices, vocational interests, and such personality attributes as Openness to Experience and Conscientiousness.

Keywords: Personality traits; Eating habits; Food preferences

1. Introduction

Modern Western society is in the midst of a major revolution in thinking about the causes of good health and longevity: for the first time in recent history, behavioral practices, rather than demons or germs, are increasingly being viewed as at least partially responsible for many human

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ills, including AIDS and other sexually transmitted diseases, cardiovascular diseases, cancer, and diabetes. Among the behavioral practices implicated in the avoidance of such disease states, some of the most important are smoking cessation, safe sex, regular physical activity, and healthful eating practices. Because coronary heart disease is the leading cause of death in the United States (Becker & Gore, 1991) and because it is so costly in terms of human suffering and medical-care expenditures, researchers have recently focused their attention on behavioral strategies, including dietary change, to prevent and treat heart disease (e.g. Ornish et al., 1998). A chief impediment to such research, both from the standpoints of assessment and intervention, has been the lack of quick and accurate methods for assessing eating habits. Thus, the development of reliable and accurate indicators of dietary practices has become increasingly important (Block, 1989; MacFie & Thomson, 1994).

Nutritional scientists have provided measures of caloric intake, and the proportion of fats, fibers, and other nutrients in the diet (e.g. 24-h and four-day food records), but a total dietary assessment is costly, cumbersome, intrusive, and labor-intensive (Block, Hartman & Naughton, 1990; Kristal, Shattuck, Henry & Fowler, 1990). For many research purposes, including virtually all large-scale epidemiological surveys, simpler, faster, and less expensive instruments are needed. In response to this need, a number of questionnaire measures of dietary practices have recently been developed. Among the most popular of these instruments are: (1) the Kristal Food Habits Questionnaire (Kristal, Shattuck & Henry, 1990), a 20-item measure of eating practices related to the selection of low-fat diets; (2) the Block Fat Screener (Block, Clifford, Naughton, Henderson & McAdams, 1989), a 17-item measure of total fat intake; and (3) the Block Fiber Screener, an 8-item measure of fiber intake from such sources as fruits, vegetables, potatoes, cereals, and breads. Scores from each of these three instruments have been shown to relate highly to more burdensome measures of dietary intake (Glasgow, Perry, Toobert & Hollis, 1996). Because of their ease of use, these questionnaires have become increasingly valuable as dietary assessment tools in health-related research studies. To the best of our knowledge, however, no one has yet included all three instruments in an assessment of their conjoint factor structure. That is one major goal of the present study.

Despite the gains that have been made in developing brief dietary assessment instruments, researchers and practitioners continue to struggle with the development of effective intervention strategies to change eating practices. For many people, old eating habits die hard, even when the individuals are aware of the health consequences of a poor diet (Foreyt & Goodrick, 1992). Dietary interventions may stand a better chance of success when they are tailored to the individual, rather than being presented in a "one size fits all" fashion. Tailored interventions may take into account basic demographic characteristics such as sex and age, cultural health beliefs and eating practices, and, of primary interest here, personality attributes. A few studies have examined the links between personality attributes and eating practices (e.g. Falconer, Baghurst & Rump, 1993; Shepherd & Farleigh, 1986; Yeo, Treloar, Marks, Heath & Martin, 1997), suggesting that some personality dimensions are related to some food choices. These studies have been limited to relatively few personality measures and/or to restricted samples of research participants. In the present study of a community sample, for whom a diverse collection of information is already available, it is possible to relate dietary habits to such demographic indices as gender, age, and education, as well as to a wide array of measures of personality attributes. This is the second major goal of the present study.

2. Method

2.1. Participants

All participants were members of the Eugene-Springfield Community Sample, which was recruited by a mail solicitation in 1993 from lists of local homeowners; all participants had initially agreed to complete various mailed questionnaires for pay for at least 5–10 years. Participants are remarkably heterogeneous on most variables other than racial/ethnic status (virtually all of them are Caucasian), ranging in age from 22 to 90. All levels of educational attainment are represented in the sample, the average participant having completed two years of post-secondary schooling. The present Community Sample includes about 470 women and 380 men. For further details about this sample, see Goldberg (1999a,b, 2000).

Over the past four years, most of the participants have completed a wide variety of measures of personality attributes, including measures of health practices and attitudes, dissociative experiences, and depression, as well as a number of modern commercial personality inventories, including the NEO-PI-R (Costa & McCrae, 1992), Sixteen Personality Factors Questionnaire (16PF), California Psychological Inventory (CPI), Hogan Personality Inventory (HPI), Campbell Interests and Skills Survey (CISS), and Cloninger's Temperament and Character Inventory (TCI). Because one of the major goals of the present project was to discover the relations between the factors underlying eating practices and diverse measures of personality functioning, all of these diverse personality measures were used in an explicitly exploratory manner to assess their links with eating habits.

2.2. Measures of eating practices

Included in a bubble-scan questionnaire administered by mail to the Community Sample were three measures of dietary practices. The first was the complete 20-item Kristal Food Habits Questionnaire (KFHQ), which was administered with its original response options: "In the *past month*, how often did you ... (1) Usually or Always; (2) Often; (3) Sometimes; (4) Rarely or Never; (NA) Not Applicable." (Some example KFHQ items: When eating chicken, have it baked or broiled; Have a vegetarian dinner; Have only fruit for dessert; Use yogurt instead of sour cream).

The second dietary measure was a simplified 18-item version of the 17-item Block Fat Screener (Bfat), with instructions to: "Think about your eating habits over the past month or so. About how often do you eat food in each of the following categories? Fill in only one bubble for each food: (1) Never or less than once a *month*; (2) 1 to 3 times a *month*; (3) 1 to 2 times a *week*; (4) 3 to 4 times a *week;* (5) 5 times a *week* or more." (Some example Bfat items: Hamburgers or cheeseburgers; Butter; Eggs; French fries.) We included as an additional item "1% or non-fat (skim) milk" so that participants would not try to write in this item, thinking that we had left it out; we omitted this item from all of our analyses because it is redundant with the same item in the KFHQ. The Bfat was simplified by omitting the questions about portion size.

A final dietary measure was the Block Fiber Screener (Bfib), administered with the same instructions as the Bfat but with the following response options: "(1) Never or less than once a *week;* (2) About once a *week*; (3) 2 or 3 times a *week*; 4 to 6 times a *week;* (5) About once a *day* or more." (Some example Bfib items: Green salad; Potatoes; High-fiber or bran cereal.) To the original

eight Bfib items, three new ones were added: (1) brown rice, whole wheat pasta, or bulgar; (2) oat bran or wheat germ; and (3) fiber supplements.

Of the roughly 850 persons now participating in the Community Sample, 778 returned the questionnaire in which the three eating surveys were included. Because of the large initial sample size, all participants who omitted any responses to the 49 items were omitted from the present analyses; in addition, six participants who gave seven or more "Not Applicable" responses to the 20 KFHQ items were omitted. Of the remaining 637 persons who were included in all analyses, approximately 58% were women.

2.3. Analyses

We first examined the frequency distributions of responses to each of the 48 items. Based on experience with structural analyses of other item pools (e.g. Saucier, 1997), both orthogonal (varimax) and oblique (promax) rotations of two, three, four, and five factors were analyzed, in the total sample and in the subsamples of men and women. The intercorrelations among the factors are used to illustrate the hierarchical structure of these reported dietary behaviors. Each of the factors was correlated with gender, age, and educational level, and with the entire set of available measures of other individual differences. Because our sample is quite large in size, we focus on size of effect rather than statistical significance level.

3. Results

3.1. Characteristics of each of the dietary items

Table 1 lists the 48 items, with the relative frequencies of persons who used each of the five response options. The items are grouped by the survey in which they were included; within each survey, they are ordered by the mean frequency with which participants reported that particular dietary practice. Listed in the top portion of the table are the 20 KFHQ items, varying in mean frequency from "Eat boiled or baked potatoes without butter or margarine" (lowest frequency) to "When eating red meat, trim all visible fat" (highest frequency). Of the 20 KFHQ items, 18 are phrased so that the more healthy response is a lower number than the less healthy response, and two of the items (10 and 13) are phrased in the opposite direction. The 18 items were reverse keyed in all subsequent analyses, so that the more healthy response was always the higher number.

Listed in the middle section of Table 1 are the 17 Bfat items, which varied in their response frequencies from "Whole milk" (lowest frequency) to "Margarine" (highest frequency). Listed in the bottom section of the table are the 11 Bfib items, which varied in their response frequencies from "Fiber supplements" (a new item, of quite low frequency) to "Vegetables, not counting potatoes or salad" (highest frequency).

3.2. Factor structure of the dietary items

The first 10 eigenvalues of the matrix of correlations among the 48 items in the total sample, expressed as percentages of total variance, were 17.0, 6.1, 4.9, 4.0, 3.7, 3.2, 3.0, 2.8, 2.6, and 2.5 —

Table 1
The 48 dietary items, ordered by their response frequencies

In the PAST MONTH, how often did you ...	Usually	Often	Sometimes	Rarely	N/A
4 When eating red meat, trim all visible fat.	0.52	0.20	0.13	0.08	0.06
1 When eating chicken, have it baked or broiled.	0.43	0.28	0.19	0.06	0.04
8 Use very low fat (1%) or non-fat milk.	0.63	0.07	0.07	0.21	0.02
2 When eating chicken, take off the skin.	0.47	0.19	0.17	0.13	0.04
6 Eat fish or chicken instead of red meat.	0.18	0.48	0.28	0.04	0.02
3 When eating red meat, eat only small portions.	0.26	0.22	0.32	0.13	0.06
19 Use a no calorie, non-stick spray when cooking.	0.29	0.26	0.21	0.19	0.05
20 Eat ice milk, frozen yogurt, low-fat ice cream, or sherbet instead of regular ice cream.	0.22	0.18	0.31	0.25	0.04
12 Use low-calorie instead of regular salad dressing.	0.24	0.22	0.28	0.25	0.01
10 Put butter or margarine on cooked vegetables.	0.16	0.24	0.31	0.29	0.01
16 Snack on raw vegetables instead of ... chips.	0.05	0.22	0.49	0.21	0.04
17 Eat breads, rolls, or muffins without butter or margarine.	0.15	0.20	0.28	0.36	0.01
7 Use a meatless tomato sauce on spaghetti or noodles.	0.15	0.18	0.31	0.35	0.02
15 Eat at least two vegetables (not green salad) at dinner.	0.07	0.25	0.44	0.24	0.00
18 Use yogurt instead of sour cream.	0.09	0.12	0.24	0.44	0.11
14 Have only fruit for dessert.	0.03	0.17	0.50	0.27	0.03
5 Have a vegetarian dinner.	0.06	0.20	0.38	0.34	0.02
13 Put sour cream, cheese, or other sauces on vegetables and potatoes.	0.08	0.17	0.38	0.36	0.01
9 Eat special, low-fat, diet cheeses.	0.10	0.14	0.26	0.48	0.02
11 Eat boiled or baked potatoes without butter or margarine.	0.10	0.11	0.22	0.56	0.01
How often did you eat PER MONTH ...	Never	1–3	4–8	12–16	20+
7 Margarine.	0.25	0.12	0.16	0.20	0.27
11 Cheese or cheese spread.	0.08	0.25	0.36	0.22	0.09
6 Salad dressings (not diet), mayonnaise.	0.20	0.28	0.29	0.19	0.05
17 Doughnuts, pastries, cake, pie, cookies.	0.14	0.35	0.31	0.13	0.06
9 Eggs.	0.11	0.36	0.41	0.09	0.03
18 Potato chips, corn chips, popcorn (not air popped).	0.20	0.40	0.28	0.09	0.03
8 Butter.	0.43	0.19	0.13	0.12	0.13
5 Cold cuts, lunch meat, ham, etc.	0.31	0.40	0.18	0.08	0.03
2 Beef, such as steaks or roasts.	0.24	0.47	0.25	0.04	0.00
13 2% milk.	0.62	0.12	0.06	0.06	0.14
16 Ice cream (not low fat).	0.43	0.37	0.14	0.05	0.01
1 Hamburgers or cheeseburgers.	0.34	0.50	0.14	0.02	0.00
15 French fries.	0.38	0.48	0.13	0.01	0.00
10 Bacon or sausage.	0.45	0.39	0.14	0.02	0.00
4 Hot dogs, franks.	0.65	0.32	0.02	0.01	0.01
3 Fried chicken with skin.	0.68	0.24	0.08	0.00	0.00
12 Whole milk.	0.93	0.04	0.01	0.01	0.02
How often did you eat PER WEEK ...	0	1	2–3	4–6	7+
2 Vegetables, not counting potatoes or salad.	0.02	0.04	0.19	0.32	0.43
1 Fruit, not counting juice.	0.06	0.13	0.22	0.23	0.36
3 Green salad.	0.07	0.16	0.34	0.29	0.14
7 Dark whole grain bread such as whole wheat or rye.	0.17	0.16	0.22	0.23	0.22
8 Juice, such as orange or grapefruit juice.	0.18	0.17	0.21	0.18	0.26
4 Potatoes.	0.06	0.25	0.47	0.17	0.05
6 High-fiber or bran cereal.	0.36	0.16	0.20	0.15	0.13
5 Beans (baked beans, pintos, kidney beans, or in chili).	0.28	0.41	0.25	0.05	0.01
9 Brown rice, whole wheat pasta, or bulgar.	0.51	0.28	0.13	0.06	0.02
10 Oat bran or wheat germ.	0.71	0.15	0.07	0.04	0.03
11 Fiber supplements.	0.83	0.06	0.04	0.01	0.06

reflecting a large first factor relative to any of the others. Fig. 1, which presents the complete plot for all 48 eigenvalues, shows the sharp drop from the first to the second factor, with some possible small dips after two, three, four, or five factors, but no equally clear break between any other pair of factors.[1]

The large first unrotated principal component (FUPC), which expresses the common core of content associated with all 48 items, reflects a general "less healthy" versus "more healthy" pattern of dietary practices.[2] The congruence coefficient between the factor loadings from the male and female subsamples on this component was 0.98. Table 2 presents the factor loadings of each of the 48 items on this first component in the total sample of research participants. The items that load most highly at the less healthy pole of this factor (e.g. frequently eating hamburgers or cheeseburgers) contrast sharply with those at the other pole (e.g. eating breads, rolls, or muffins without butter or margarine). Items with extremely low loadings on this general factor (frequency of eating potatoes and frequency of drinking juices) reflect other dietary features beyond the main one.

In the two-factor varimax rotations of these 48 items, again there were essentially no differences between the male and female subsamples; the congruence coefficients for the two sets of factor loadings were 0.94 and 0.92. When the factors were rotated by an oblique (promax) algorithm, the correlation between the factors was 0.36. Because the two-factor structure was remarkably stable across methods (e.g. components versus factors) and across samples of participants (e.g.

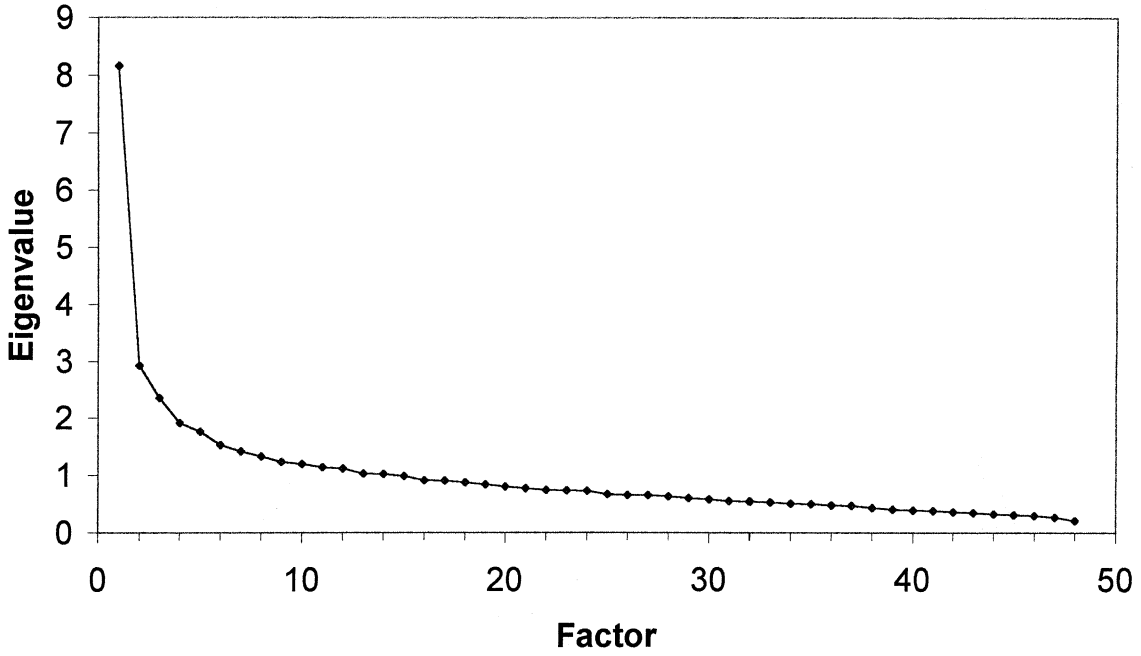

Fig. 1. Eigenvalues for the 48 dietary items.

[1] Analyses were carried out using both principal factors and principal components procedures. The two types of analyses produced virtually identical findings for the first eight unrotated factors and for the first four varimax-rotated factors. For example, each of the three corresponding factor scores derived from varimax rotations of three factors using the two procedures correlated 0.99 with each other. Consequently, only the findings based on principal components will be reported here.

[2] Factor scores on this first unrotated component correlated 0.998 with those from the first unrotated factor.

Table 2
The four-factor structure of the 48 dietary items, plus the first unrotated principal component (FUPC)

	FUPC	4/1	4/2	4/3	4/4
When eating red meat, eat only small portions.	0.55	0.67	0.09	0.02	0.21
When eating red meat, trim all visible fat.	0.53	0.64	0.04	0.12	0.13
Eat fish or chicken instead of red meat.	0.54	0.61	0.07	0.12	0.17
Have vegetarian dinners.	0.45	0.61	0.04	−0.04	0.19
Use a meatless tomato sauce on spaghetti or noodles.	0.49	0.57	0.16	0.02	0.12
When eating chicken, take off the skin.	0.55	0.54	0.14	0.21	0.09
When eating chicken, have it baked or broiled.	0.38	0.39	0.05	0.17	0.06
Frequently eat beef, such as steaks or roasts.	−0.54	−0.67	−0.05	−0.17	−0.01
Frequently eat hamburgers or cheeseburgers.	−0.60	−0.55	−0.33	−0.10	−0.09
Frequently eat bacon or sausage.	−0.48	−0.50	−0.10	−0.28	0.10
Frequently eat fried chicken with skin.	−0.48	−0.50	−0.13	−0.19	0.01
Frequently eat hot dogs, franks.	−0.43	−0.41	−0.32	0.03	−01
Frequently eat cold cuts, lunch meat, ham, etc.	−0.40	−0.37	−0.34	0.00	0.05
Eat breads, rolls, or muffins without butter or margarine.	0.58	0.28	0.56	0.17	0.11
Eat boiled or baked potatoes without butter or margarine.	0.54	0.20	0.51	0.27	0.07
Snack on raw vegetables instead of potato ... chips.	0.44	0.10	0.46	0.09	0.32
Have only fruit for dessert.	0.40	0.11	0.41	0.05	0.30
Use yogurt instead of sour cream.	0.40	0.11	0.37	0.19	0.16
Frequently eat margarine.	−0.24	−0.06	−0.68	0.29	0.07
Frequently eat doughnuts, pastries, cake, pie, or cookies.	−0.33	−0.04	−0.45	−0.21	0.08
Put butter or margarine on cooked vegetables.	−0.42	−0.15	−0.44	−0.19	0.00
Put sour cream, cheese, etc. on vegetables and potatoes.	−0.38	−0.06	−0.41	−0.23	−0.07
Frequently eat French fries.	−0.52	−0.32	−0.41	−0.13	−0.13
Frequently eat potato chips, corn chips, popcorn.	−0.40	−0.07	−0.40	−0.24	−0.10
Use low-calorie instead of regular salad dressing.	0.50	0.09	0.24	0.58	0.14
Eat ice milk, etc. instead of regular ice cream.	0.55	0.23	0.23	0.57	0.05
Eat special, low-fat, diet cheeses.	0.49	0.10	0.23	0.52	0.22
Use very low fat (1%) or non-fat milk.	0.36	0.06	0.11	0.49	0.13
Use a no calorie, non-stick spray when cooking.	0.36	0.09	0.14	0.43	0.10
Frequently eat butter.	−0.25	−0.06	0.17	−0.67	0.03
Frequently eat salad dressings (not diet) or mayonnaise.	−0.54	−0.29	−0.30	−0.49	0.09
Frequently drink 2% milk.	−0.30	−0.06	−0.08	−0.46	−0.03
Frequently eat ice cream (not low fat).	−0.47	−0.24	−0.26	−0.41	0.06
Frequently eat cheese or cheese spread.	−0.27	0.01	−0.32	−0.36	0.17
Frequently eat eggs.	−0.29	−0.25	−0.11	−0.35	0.27
Frequently drink whole milk.	−0.21	−0.11	−0.17	−0.18	0.10
Eat vegetables, not counting potatoes or salad.	0.37	0.10	0.24	−0.03	0.62
Eat fruit, not counting juice.	0.42	0.12	0.26	0.08	0.56
Eat green salads.	0.23	−0.07	0.21	−0.01	0.56
Eat at least two vegetables (not green salad) at dinner.	0.34	0.09	0.19	0.05	0.54
Eat oat bran or wheat germ.	0.30	0.15	−0.01	0.15	0.47
Eat high-fiber or bran cereal.	0.32	0.12	−0.01	0.24	0.47
Eat potatoes.	−0.10	−0.22	−0.15	−0.03	0.45
Drink juice, such as orange or grapefruit juice.	0.10	0.04	−0.05	−0.08	0.44
Eat dark whole grain bread such as whole wheat or rye.	0.30	0.16	0.01	0.15	0.39
Eat beans (baked beans, pintos, etc. or in chili).	0.15	0.14	−0.04	−0.08	0.38
Eat brown rice, whole wheat pasta, or bulgar.	0.33	0.27	0.13	−0.06	0.38
Take fiber supplements.	0.14	−0.02	−0.09	0.23	0.30

men versus women), that structure may provide a useful representation for some purposes. On the other hand, there was a substantial imbalance in the number of items loading most highly on the two factors (34 versus 14). The larger of these two dimensions (2/1) reflects total fat consumption, whereas the smaller one (2/2) reflects total fiber intake.[3] Would a three-factor rotation break up the larger total fat factor into components reflecting, say, saturated versus unsaturated fats?

Both the two-factor and the three-factor structures are available from the authors. The third factor in the latter solution was virtually identical ($r = 0.96$) to the second (Fiber) factor in the two-factor solution, whereas the large fat factor in that solution did indeed separate into two components of roughly equal size; the number of items loading most highly on the three factors were 15, 19, and 14. The items that loaded most highly on Factor 3/1 (Avoidance of meat fats) involve the frequency of eating beef, such as steaks and roasts, and the frequency of eating large versus small portions of red meat. The most prototypical items for Factor 3/2 (Avoidance of other kinds of fats) involve salad dressings (e.g. the use of low-calorie instead of regular salad dressings). And, the most highly loading items on Factor 3/3 (Fiber) reflect the frequencies of eating vegetables (not counting potatoes or salad), fruits, and green salads. In the oblique (promax) rotation of these three factors, the two factors involving fat correlated 0.52, whereas the Fiber factor was relatively independent (0.28 and −0.21) of them both.

Factor 3/1 (Avoidance of meat fats) and Factor 3/3 (Consumption of fiber) retained their identity upon rotation of four and five factors, whereas Factor 3/2 (Avoidance of other fats) broke apart in rotations of more than three factors. Table 2 presents the four-factor representation; there were roughly equal numbers of items loading most highly on each of the four factors (13, 11, 12, and 12). Of the four factors, the first three are bipolar, whereas the last (Fiber) factor includes no negatively loading items. Factors 4/1 (Avoidance of meat fats) and Factor 4/4 (Consumption of fiber) are virtually identical to their counterparts in the higher-level representations. The two additional fat-avoidance factors might be labeled Avoidance of foods flavored with fat (Factor 4/2) and Substitution of low-fat equivalents for high-fat foods (Factor 4/3).

The correlations among the factor scores derived from rotations of different numbers of factors were used to provide a hierarchical representation of the 48 dietary items, as displayed in Fig. 2. Translating the relations displayed in Fig. 2 into words, one could say that a large undifferentiated factor reflecting a General Healthy Diet (FUPC) subdivides into two lower-level mega-components reflecting the Avoidance of Fat (2/1) and the Consumption of Fiber (2/2). The Total Fat factor (2/1) in turn subdivides into two components, reflecting the Avoidance of Meat-related Fats (3/1) and the Avoidance of Fats of Other Kinds (3/2). Finally, the latter fat factor (3/2) subdivides into components reflecting the Avoidance of Foods Flavored with Fat (4/2) and the Substitution of Low-fat for High-fat Foods (4/3).[4]

[3] Throughout this article, we will refer to the rotated factors by their hierarchical level (the first number listed) and by their size (the second number). Thus, the label "2/1" refers to the largest factor in the two-factor solution; the label "4/4" refers to the smallest factor in the four-factor solution.

[4] Readers may wonder how this factor structure corresponds to that proposed by Kristal, Shattuck and Henry (1990). Those investigators developed items reflecting four types of eating practices: (1) avoiding high-fat foods ("Exclusion"); (2) altering foods to make them lower in fat ("Modification"); (3) using new lower-fat equivalents of older foods ("Substitution"); and (4) using alternative cooking techniques or ingredients ("Replacement"). In their analyses of these items, they extracted five small factors: (1) avoiding fat as seasoning; (2) avoiding meat; (3) modifying high-fat foods; (4) substituting special low-fat foods; and (5) replacing high-fat foods with low-fat equivalents. In our analyses of a more complete set of eating practices, their item clusters bear only a modest similarity to the present factors.

3.3. Correlates of the dietary factors

The factor scores from the first unrotated component and from orthogonal (varimax) rotations of two, three, and four factors (10 factor scores in all) were correlated with all available demographic, personality, and interest variables. Table 3 presents the correlations between the dietary factors and the demographic variables of age, gender, and education. Given that factors 3/3 and 4/4 were virtually identical to factor 2/2 (Consumption of Fiber), only the correlations with the higher-level factor are included in this and subsequent tables. And given that factors 3/1 and 4/1 (Avoidance of Fat from Meats) were virtually identical, only the former has been included in the tables.

Although none of the dietary factors was highly related to educational level in this sample, there were some significant associations with both age and gender. Older participants reported eating more fiber in their diets than did younger ones ($r = 0.37$), and women reported more avoidance of fats from meats than did men ($r = 0.34$). To control for these associations between the dietary factors and demographic variables, we used multiple regression analysis to predict each of the dietary factors from the three demographic variables, and then obtained residual

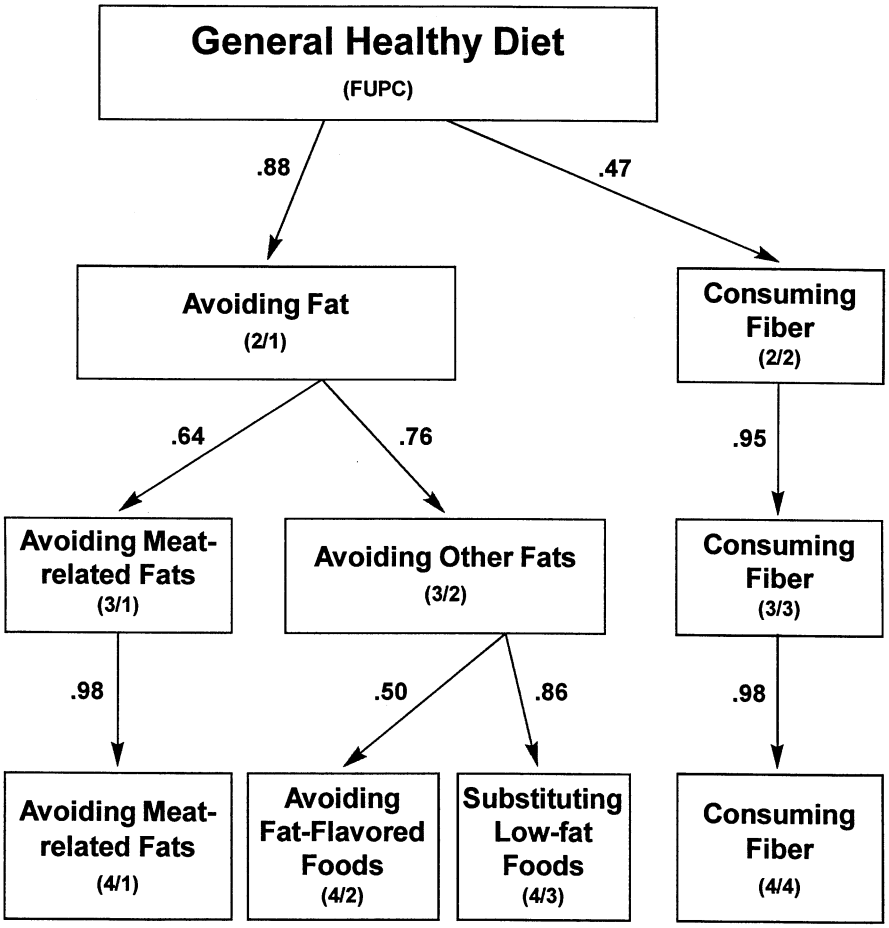

Fig. 2. The hierarchical structure of the 48 dietary items.

factor scores with gender, age, and education partialed out. Table 4 provides the correlations between the residual dietary factors (with the demographic variables partialed out) and scores from selected personality and interest scales. Because in this large sample correlations as low as 0.10 and 0.13 are significantly different from zero at the 0.05 and 0.01 levels respectively, only the highest correlations and those with attributes of theoretical interest (such as intelligence and measures of psychopathology) are highlighted.

In the top section of the table are the correlations of each of the seven dietary factors with a short intelligence test that is included as a measure of Factor B in the 16PF.[5] Also included there are the correlations with three measures of psychopathology: The Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977), the Neuroticism domain score from the NEO-PI-R (Costa & McCrae, 1992), and a newly revised version of the Dissociative Experiences Scale (Bernstein & Putnam, 1986; Goldberg, 1999b). None of these correlations was as large as 0.20, indicating that in this sample there were no substantial associations of any of the dietary factors with measures of intelligence or psychopathology.

Roughly a year before the administration of the present eating surveys, participants in this sample had completed a 39-item questionnaire measuring a wide variety of health attitudes and behaviors; this health survey had been adapted from a similar instrument developed by Vickers, Conway and Hervig (1990). Analyses of responses to the health-related items uncovered three basic health factors: (1) *Risk Avoidance* (e.g. "I carefully obey traffic rules"; "I do not drink" versus "I cross busy streets in the middle of the block"; "I take more chances doing things than the average person"); (2) *Good Health Practices* ("I exercise to stay healthy"; "I see a dentist for regular checkups"; "I don't smoke"); and (3) *Health Concerns* ("I gather information on things that affect my health"; "I discuss health with friends, neighbors, and relatives"; "I avoid areas with high pollution"). Orthogonal factor scores for each of these three health dimensions were correlated with the dietary factors, and these correlations are included near the top of Table 4. Although none of the dietary factors was highly associated with the health dimension of Risk Avoidance, there were moderate relations with Health Concerns and substantial relations with

Table 3
Correlations between the dietary factors and the demographic variables of age, gender, and education[a]

	Age	Gender ($M=1;F=2$)	Educational level
General Healthy Diet (FUPC)	0.14	**0.27**	0.10
Avoidance of Fats (2/1)	0.00	**0.25**	0.04
Consumption of Fiber (2/2)	***0.30***	0.11	0.13
Avoidance of Meat Fat (3/1)	−0.12	***0.34***	0.06
Avoidance of Other Fats (3/2)	0.14	0.04	0.02
Avoidance of Foods Flavored with Fat (4/2)	0.06	0.16	0.08
Substitution of Low-Fat for High-Fat Foods (4/3)	0.16	−0.03	−0.01

[a] Note: Correlations over 0.20 are listed in bold; those over 0.30 are also italic.

[5] Although the other 15 16PF factors are measured by personality-descriptive statements, Factor B ("Reasoning") is measured by objective (maximum-performance) "problem-solving questions" (e.g. Which should come next at the end of this series of numbers: 1, 2, 0, 3,−1 [5, 4,−3]).

Table 4
Correlations between the residual dietary factors (with the demographic variables partialed out) and selected personality and interest variables[a]

Variable	General Healthy Diet (FUPC)	Avoidance of fats (2/1)	Consumption of fiber (2/2)	Avoidance of		Avoidance of fat flavor (4/2)	Substitution of low fats (4/3)
				Meat Fats (3/1)	Other Fats (3/2)		
Intelligence (16PF)	0.08	0.07	0.05	0.08	0.02	0.12	−0.04
Depression (CES-D)	−0.09	−0.06	−0.08	−0.01	−0.08	−0.11	−0.03
Neuroticism (NEO-lPI-R)	−0.06	−0.03	−0.07	0.00	−0.05	−0.12	0.01
Dissociation (DES)	−0.08	−0.11	0.03	0.04	−0.17	−0.08	−0.15
Good Health Practices	***0.34***	**0.26**	**0.23**	**0.27**	0.14	0.15	0.10
Health Concerns	0.19	0.10	**0.20**	0.11	0.06	−0.02	0.11
Risk-Avoidance	−0.02	0.01	−0.05	−0.06	0.06	−0.03	0.08
NEO-PI-R							
Openness (O)	0.14	0.01	**0.27**	0.16	−0.08	0.15	−0.16
Aesthetics (O2)	0.15	0.02	**0.28**	**0.20**	−0.11	0.10	−0.15
Actions (O4)	**0.20**	**0**.08	**0.27**	0.19	−0.02	0.17	−0.09
Ideas (O5)	0.06	−0.03	0.19	0.06	−0.07	0.13	−0.14
Feelings (O3)	0.09	0.00	0.19	0.07	−0.04	0.09	−0.09
Values (O6)	0.09	0.04	0.10	0.15	−0.06	0.08	−0.11
Fantasy (O1)	0.02	−0.04	0.12	0.00	−0.04	0.08	−0.08
Tender-Mindedness (A6)	0.14	0.08	0.13	**0.23**	−0.07	−0.02	−0.05
Agreeableness (A)	0.10	0.09	0.05	0.11	0.02	0.03	0.02
Conscientiousness (C)	0.11	0.12	0.01	0.03	0.14	0.02	0.15
Extraversion (E)	0.02	−0.02	0.09	−0.07	0.03	0.01	0.04
16PF							
Openness to Change (Q1)	0.13	0.04	0.19	0.19	−0.08	0.13	−0.16
TCI							
Transpersonal Ident. (ST2)	0.09	−0.01	**0.23**	0.14	−0.11	0.00	−0.10
Self-Forgetful (ST1)	0.01	−0.10	**0.22**	0.05	−0.15	0.02	−0.17
CISS							
Liberal Arts Professor	0.11	0.07	0.10	**0.23**	−0.10	0.07	−0.14
Teacher: K- 12	0.13	0.12	0.05	**0.23**	−0.03	0.03	−0.05
Physician	0.16	0.16	0.03	**0.22**	0.03	0.12	−0.03
Commercial Artist	0.06	0.03	0.07	**0.21**	−0.13	0.03	−0.16
Retail Store Manager	−0.16	−0.14	−0.06	**−0.26**	0.03	−0.12	0.09
Hotel Manager	−0.15	−0.16	−0.02	**−0.24**	−0.01	−0.11	0.05
Marketing Director	−0.16	−0.16	−0.03	**−0.23**	−0.02	−0.08	0.02
CEO/President	−0.14	−0.13	−0.05	**−0.23**	0.01	−0.03	0.02
Financial Planner	−0.15	−0.14	−0.04	**−0.22**	0.00	−0.09	0.05
Realtor	−0.14	−0.13	−0.06	**−0.22**	0.01	−0.10	0.07

[a] Correlations over 0.20 are listed in bold; those over 0.30 are also in italic. 16PF, Sixteen Personality Factors Questionnaire; TCI, Temperament and Character Inventory; CISS, Campbell Interests and Skills Survey; CES-D, Center for Epidemiologic Studies Depression Scale; DES, Dissociative Experiences Scale.

Good Health Practices. The highest correlation in the table is that between Good Health Practices and the first unrotated component of the dietary items ($r = 0.34$).

The correlations displayed in Table 4 suggest that the two lowest level factors (Avoidance of Foods Flavored with Fat and Substitution of Low-fat for High-fat Foods) do not elicit as strong correlations with the personality and interest variables as do the higher-level factors, probably because the lower-level factors include fewer items and thus are substantially less reliable. At higher levels in the hierarchy, it appears that the factor measuring Avoidance of Meat Fats tends to be more highly associated with measures of personality and interests than the factors measuring the Avoidance of Other Kinds of Fats and Avoidance of All Types of Fats, suggesting that it is the consumption versus avoidance of meat fat per se that is the most crucial component in these correlational patterns.

Those variables that turned out to be most highly associated with the avoidance of meat fats include the Good-health-practices factor from the Health Questionnaire, the Tender-mindedness (A6) facet of the Agreeableness domain in the NEO-PI-R, and a strong pattern of vocational interests measured by the CISS: Meat avoiders tend to have interests similar to those of liberal arts professors, elementary and high school teachers, physicians, and commercial artists, whereas meat consumers tend to have interests similar to those of managers (store and hotel), marketing directors, corporate CEO/presidents, financial planners, and realtors. In more stereotypical language, the contrast might be described as that between the quasi-vegetarian, liberal, intellectual, service-oriented person and the red-meat-eating, pragmatic, business- and action-oriented power broker. Remarkably, this strong pattern of associations emerged even after gender differences were taken into account.

In contrast to the meat-eater syndrome just described, the highest correlates of fiber consumption (factors 2/2, 3/3, and 4/4) were in the domain of Openness to Experience of the NEO-PI-R, including Openness to Aesthetics (O2), Actions (O4), Ideas (O5), and to a lesser extent Feelings (O3) and Values (O6). Also associated with high fiber consumption were two scales from the Self-Transcendence domain of the TCI, labeled Transpersonal identification versus Self-differentiation (ST2) and Self-forgetful versus Self-conscious experience (ST1); the corresponding IPIP[6] (Goldberg, 1999a) versions of the constructs measured by these TCI scales are labeled Romanticism and Imagination. Those persons who report higher fiber consumption tend to be more open to experience, romantic, and imaginative than those who report lower fiber intake.

To better understand the *combined* impact of the major personality dimensions on dietary selections, the five domain scores from the NEO-PI-R were used as predictors in multiple regression analyses to predict each of the residualized dietary factors. The standardized regression coefficients from these analyses are reported in Table 5, along with the multiple correlations (R). The most consistent predictor of eating practices across all seven factors was Openness to

[6] Goldberg (1999a) has used an item format developed by De Raad and Hendriks (1997) to construct new scales measuring each of the constructs in the NEO-PI-R, CPI, 16PF, HPI, and TCI inventories, as well as to develop 45 bipolar AB5C scales. The scales are scored from subsets of 1412 items, dubbed the International Personality Item Pool (IPIP). The IPIP items are all phrased as short verbal expressions (e.g. Accept challenging tasks, Act as I please, Am afraid of many things, Avoid crowds, Believe kids need tough love, Can keep a secret, Can't stand rude people). Participants in the present community sample have completed all of the IPIP items (administered in three subsets), and thus their scores are available on the new IPIP scales. Characteristics of these new scales, and their scoring keys, are available from the author.

Experience, with statistically significant positive regression weights in predictions of fiber consumption, avoidance of meat fats, avoidance of foods flavored by fat, and general healthy dietary practices, and a significant negative weight in the prediction of the substitution of low-fat for high-fat foods. In addition, Conscientiousness played a significant role in the predictions of general healthy dietary practices, including the avoidance of fats, substitution of low-fat for high-fat foods, and the avoidance of non-meat fats. Extraversion was negatively associated with the avoidance of meat fats, whereas Neuroticism was negatively associated with the avoidance of foods flavored with fat. Agreeableness was generally not significantly involved in these predictions.

A more fine-grained way to understand these relations is by using the Abridged Big-Five dimensional Circumplex (AB5C) model of Hofstee, De Raad, and Goldberg (1992), which classifies personality traits into 10 subsets by their two highest Big-Five factor loadings, and then maps the circular relations among the traits within each of the circumplex structures formed by the 10 factor pairs. Each circumplex is divided into 12 equal-sized segments, and the segments are labeled by their circular locations as on a compass (e.g. the I+/II+ segment includes all traits with their highest loadings on the positive pole of Extraversion [Factor I] and their secondary loading on the positive pole of Agreeableness [Factor II]). In total, there are 90 such ''facets,'' and since each facet can be paired with the one located directly opposite it on the circle, there are 45 bipolar dimensions in the AB5C model. Using the 100 unipolar Big-Five factor markers developed by Goldberg (1992) to map the Big-Five factor locations, IPIP scales were developed to measure each of the 45 bipolar AB5C dimensions; these 45 new IPIP scales are described in Goldberg (1999a). The AB5C scales that correlated most highly with one or more of the dietary factors are presented in Table 6.

In contrast to the findings displayed in Table 4, all of the lower-level dietary factors are now each associated with a somewhat different pattern of personality dimensions: (1) individuals who substitute low-fat for high-fat foods described themselves in terms that reflect Dutifulness, Orderliness, and Conscientiousness; (2) persons who particularly avoid foods flavored with fat described themselves in ways that reflect Quickness/Alertness and high Intellect; (3) those who try to avoid non-meat types of fat described themselves in ways that reflect Morality and Cooperativeness, as well as Dutifulness and Purposefulness; (4) individuals who tend to avoid meat fats

Table 5
Relations between the residualized dietary factors (demographic variables partialed out) and the five-factor model: standardized regression coefficients from multiple regression analyses of the domain scores from the NEO-PI-R[a]

Dietary factor	N	E	O	A	C	R
General Healthy Diet (FUPC)	0.01	−0.06	0.18*	0.08	0.15*	0.22
Avoidance of Fats (2/1)	0.04	−0.06	0.06	0.07	0.15*	0.16
Total Fiber Consumption (2/2)	−0.05	−0.02	0.28*	0.03	0.03	0.28
Avoidance of Meat Fats (3/1)	0.03	−0.15*	0.22*	0.11	0.09	0.24
Avoidance of Other Fats (3/2)	0.01	0.04	−0.08	0.01	0.12	0.15
Avoidance of Foods Flavored with Fat (4/2)	−0.14*	−0.08	0.18*	−0.01	0.01	0.21
Substitution of Low-Fat for High-Fat Foods (4/3)	0.09	0.09	−0.17*	0.02	0.14*	0.23

[a] N, Neuroticism; E, Extraversion; O, Openness to Experience; A, Agreeableness; C, Conscientiousness; R, Multiple Correlation.

*$P < 0.01$.

Table 6
Correlations between the residual dietary factors (with the demographic variables partialed out) and selected AB5C facets[a]

AB5C Facet Label		General Healthy Diet (FUPC)	Avoidance of fats (2/1)	Consumption of fiber (2/2)	Avoidance of		Avoidance of fat flavour (4/2)	Substitution of low fats (4/3)
					Meat Fats (3/1)	Other Fats (3/2)		
I+/IV+	Poise	0.04	−0.04	0.16*	0.00	−0.03	0.05	−0.05
I+/IV−	Talkativeness	−0.16*	−0.16*	−0.04	−0.14*	−0.09	0.02	−13*
I+/V-	Sociability	−0.05	−0.05	−0.02	−0.14*	0.05	−0.04	0.09
II+/III+	Morality	0.07	0.13	−0.10	−0.01	0.16*	0.00	0.18*
II+/V+	Empathy	0.15*	0.10	0.14*	0.14*	0 .03	0 .09	−0.01
II+/I-	Cooperation	0.15*	0.17*	−0.03	0.08	0.16*	0.05	0.16*
III+/III+	Conscientiousness	0.11	0.11	0.02	−0.02	0.15*	−0.01	0.19*
III+/I+	Efficiency	0.16*	0.14*	0.07	0.06	0.14*	0.03	0.17*
III+/II+	Dutifulness	0.10	0.14*	−0.06	−0.01	0.18*	−0.03	**0.23***
III+/IV+	Purposefulness	0.15*	0.14*	0.05	0.03	0.16*	0.04	0.17*
III+/V+	Organization	0.16*	0.14*	0.08	0.10	0.10	0.07	0.09
III+/I-	Cautiousness	0.09	0.13*	−0.06	0.05	0.12	−0.05	0.17*
III+/II-	Rationality	0.01	0.09	−0.16*	−0.07	0.16*	0.02	0.16*
III+/V-	Orderliness	0.04	0.05	−0.02	−0.11	0.15*	−0.05	**0.2**1*
IV+/III+	Moderation	0.15*	0.16*	0.00	0.08	0.14*	0.10	0.10
IV+/V+	Toughness	0.07	0.05	0.05	0.02	0.05	0.14*	−0.02
IV+/III-	Cool-headedness	0.08	0.06	0.06	0.05	0.04	0.15*	−0.04
V+/V+	Intellect	0.09	0.02	0.15*	0.05	0.00	0.15*	−0.08
V+/I+	Ingenuity	0.06	−0.01	0.14*	0.04	−0.03	0.08	−0.07
V+/II+	Reflection	0.13	0.04	**0.20***	0.19*	−0.08	0.03	−0.09
V+/IV+	Quickness	0.13	0.06	0.16*	0.07	0.04	**0.20***	−0.06
V+/II-	Creativity	0.08	0.03	0.11	0.04	0.02	0.14*	−0.05
V+/III-	Imagination	0.12	0.01	**0.24***	0.15*	−0.08	0.06	−0.10
V+/IV-	Depth	0.09	0.02	0.16*	0.06	−0.01	0.06	−0.04

[a] AB5C, Abridged Big Five-dimensional Circumplex model (Hofstee et al. 1992). Correlations above 0.20 are listed in bold.

*$P < 0.01$.

described themselves in ways that reflect Reflection and Imagination, as opposed to Talkativeness and Sociability; and (5) persons who report particularly high consumption of fiber described themselves in ways that reflect Imagination, Reflection, Quickness, Poise, and Intellect.

4. Discussion

When compared to the few previous large-scale investigations of the links between dietary practices and personality attributes (e.g. Falconer et al. 1993; Yeo et al., 1997), our study is unique. Because we had access to a far wider range of measures of personality attributes than other investigators, we are able to provide a more fine-grained assessment of personality-dietary

associations than has been obtained in the past. For example, both the studies by Falconer et al. (1993) and Yeo et al. (1997) relied on the Eysenck Personality Questionnaire (EPQ) as their primary measure of personality traits. However, the scales in the EPQ include only two direct counterparts (Extraversion and Neuroticism) of the five domains in the Five-Factor model, with the third scale of the EPQ (Psychoticism) being a blend of the orthogonal factors of Agreeableness and Conscientiousness (Goldberg & Rosolack, 1994). Consequently, although any associations between Psychoticism and dietary factors (Falconer et al., 1993) are ambiguous, our findings suggest that in this context it is Conscientiousness, not Agreeableness, that is the most important of these two personality attributes.

Among our other findings, we showed that self-reported eating practices were *not* highly associated with either educational level or intelligence, nor were they related to various indices of psychopathology. On the other hand, dietary factors were related to the demographic variables of gender and age: older (but not necessarily elderly) participants reported eating more fiber-rich foods in their diets than did younger ones, and women reported more avoidance of fats from meats than did men.

When age and gender associations were statistically controlled, we found an intriguing pattern of associations with measures of other health-related practices, vocational interests, and personality traits. For example, in analyses of the 45 facets in the AB5C model, we were able to show that: (1) individuals who substitute low-fat for high-fat foods tended to describe themselves in terms that reflect Dutifulness, Orderliness, and Conscientiousness; (2) persons who particularly avoid foods flavored with fat tended to describe themselves in ways that reflect Quickness/Alertness and other aspects of Intellect; (3) those who try to avoid non-meat types of fat tended to describe themselves in ways that reflect Morality and Cooperativeness, as well as Dutifulness and Purposefulness; (4) individuals who tended to avoid meat fats tend to describe themselves in ways that reflect Imagination and Reflection, as opposed to Talkativeness and Sociability; and (5) persons who report particularly high consumption of fiber tended to describe themselves in ways that reflect Openness to Experience, including Imagination, Reflection, Quickness, and Poise.

Obviously the link between the personality trait of Openness to Experience and various eating practices must be understood as limited to the present American historical context. It is unlikely that particularly open individuals would have espoused the same dietary habits 50 years ago, or in some other cultural context, or indeed that they will do so 50 years from now. One important task for future investigators is to discover the ways in which personality influences food selections in cross-cultural analyses.

As is now widely appreciated, the consumption of fat and fiber are important in dietary assessments. Brief and validated instruments for assessing these eating practices (e.g. KFHQ, Bfat, Bfib) are available, but until now have not been combined. In the present study, we investigated the conjoint structure of these three instruments, which yielded a four-factor solution. Our results indicate that a more global, but still relatively brief, measure of fat and fiber eating practices could be developed by combining the best items from the three instruments. Such an instrument, viewed as one survey with one scoring system instead of three, could prove useful to busy practitioners (including medical professionals, nutrition counselors, and worksite health-promotion coordinators) seeking convenient ways to assess diet and intervene appropriately.

Finally, it is important to keep in mind that all of our findings stem from self-reports, both self-reported food choices and self-report measures of personality and interests. Self-administered diet

questionnaires have been shown to produce valid results in a number of other studies (e.g. Block, Woods, Potosky & Clifford, 1990). Although we have no reason to suspect that the paid volunteer participants in our community sample had any reason to distort the reports of either their dietary habits or their personality traits, future studies might profit from the inclusion of additional methods for measuring both diet and personality.

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References

Becker, R. C., & Gore, J. M. (1991). Cardiovascular therapies in the 1990s: an overview. *Drugs, 41*, 345.

Bernstein, E. M., & Putnam, F. W. (1986). Development, reliability, and validity of a dissociation scale. *Journal of Nervous and Mental Disease, 174*, 727–735.

Block, G. (1989). Human dietary assessment: methods and issues. *Preventive Medicine, 18*, 653–660.

Block, G., Clifford, C., Naughton, M. D., Henderson, M., & McAdams, X. (1989). A brief dietary screen for high fat intake. *Journal of Nutrition Education, 21*, 199–207.

Block, G., Hartman, A., & Naughton, D. (1990). A reduced dietary questionnaire: development and validation. *Epidemiology, 1*, 58–64.

Block, G., Woods, M., Potosky, A., & Clifford, C. (1990). Validation of a self-administered diet history questionnaire using multiple diet records. *Journal of Clinical Epidemiology, 43*, 1327–1335.

Costa, Jr., P. T., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI) manual*. Odessa, FL: Psychological Assessment Resources.

De Raad, B., & Hendriks, A. A. J. (1997). A psycholexical route to content coverage in personality assessment. *European Journal of Psychological Assessment, 13*, 85–98.

Falconer, H., Baghurst, K., & Rump, E. (1993). Nutrient intakes in relation to health-related aspects of personality. *Journal of Nutrition Education, 25*, 307–318.

Foreyt, J. P., & Goodrick, G. K. (1992). *Living without dieting*. Houston, TX: Harrison Publishing.

Glasgow, R. E., Perry, J. D., Toobert, D. J., & Hollis, J. F. (1996). Brief assessments of dietary behavior in field settings. *Addictive Behaviors, 21*, 239–247.

Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure. *Psychological Assessment, 4*, 26–42.

Goldberg, L. R. (1999a). A broad-bandwidth, public-domain, personality inventory measuring the lower-level facets of several five-factor models. In I. Mervielde, I. Deary, F. De Fruyt, & F. Ostendorf (Eds.) *Personality psychology in Europe: vol. 7* (pp. 7–28). Tilburg, The Netherlands: Tilburg University Press.

Goldberg, L. R. (1999b). The Curious Experiences Survey, a revised version of the Dissociative Experiences Scale: Factor structure, reliability, and relations to demographic and personality variables. *Psychological Assessment, 11*, 134–145.

Goldberg, L. R. (in press). The comparative validity of adult personality inventories: applications of a consumer-testing framework. In S. R. Briggs, J. M. Cheek & E. M. Donahue (Eds.), Handbook of adult personality inventories. New York: Plenum.

Goldberg, L. R., & Rosolack, T. K. (1994). The Big Five factor structure as an integrative framework: an empirical comparison with Eysenck's P-E-N model. In C. F., Jr. Halverson, G. A. Kohnstamm, & R. P. Martin (Eds.) *The developing structure of temperament and personality from infancy to adulthood* (pp. 7–35). New York, NY: Erlbaum.

Hofstee, W. K. B., de Raad, B., & Goldberg, L. R. (1992). Integration of the Big-Five and circumplex approaches to trait structure. *Journal of Personality and Social Psychology, 63*, 146–163.

Kristal, A. R., Shattuck, A. L., & Henry, H. J. (1990). Patterns of dietary behavior associated with selecting diets low in fat: reliability and validity of a behavioral approach to dietary assessment. *Journal of the American Dietetic Association, 90*, 214–220.

Kristal, A. R., Shattuck, A. L., Henry, H. J., & Fowler, A. S. (1990). Rapid assessment of dietary intake of fat, fiber, and saturated fat: validity of an instrument suitable for community intervention research and nutritional surveillance. *American Journal of Health Promotion, 4*, 288–295.

MacFie, H., & Thomson, D. (Eds.) (1994). *Measurement of food preferences*. London: Blackie.

Ornish, D., Scherwitz, L. W., Billings, J. H., Gould, K. L., Merritt, T. A., Sparler, S., Armstrong, W. T., Ports, T. A., Kirkeeide, R. L., Hogeboom, C., & Brand, R. J. (1998). Intensive lifestyle changes for reversal of coronary heart disease. *Journal of the American Medical Association, 280*, 2001–2007.

Radloff, L. S. (1977). The CES-D Scale: a self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*, 385–401.

Saucier, G. (1997). Effects of variable selection on the factor structure of person descriptors. *Journal of Personality and Social Psychology, 73*, 1296–1312.

Shepherd, R., & Farleigh, C. A. (1986). Attitudes and personality related to salt intake. *Appetite, 7*, 343–354.

Vickers, R. R., Jr., Conway, T. L., & Hervig, L. K. (1990). Demonstration of replicable dimensions of health behaviors. *Preventive Medicine, 19*, 377–401.

Yeo, M. A., Treloar, S. A., Marks, G. C., Heath, A. C., & Martin, N. G. (1997). What are the causes of individual differences in food consumption and are they modified by personality? *Personality and Individual Differences, 23*, 535–542.