



Attitudes to Food and the Role of Food in Life in the U.S.A., Japan, Flemish Belgium and France: Possible Implications for the Diet–Health Debate

P. ROZIN

University of Pennsylvania

C. FISCHLER

C.N.R.S. (Paris)

S. IMADA

Hiroshima-Shudo University

A. SARUBIN

University of Pennsylvania

A. WRZESNIEWSKI

University of Michigan

For human beings, food is a critical contributor to physical well being, a major source of pleasure, worry and stress, a major occupant of waking time and, across the world, the single greatest category of expenditures. This is a first study of the way food functions in the minds and lives of people from four cultures. Adults and college students from Flemish Belgium, France, U.S.A. and Japan were surveyed with questions dealing with beliefs about the diet–health link, worry about food, the degree of consumption of foods modified to be “healthier” (e.g. reduced in salt or fat), the importance of food as a positive force in life, the tendency to associate foods with nutritional vs. culinary contexts, and satisfaction with the healthiness of one’s own diet. In all domains except beliefs about the importance of diet for health, there are substantial country (and usually gender) differences. Generally, the group associating food most with health and least with pleasure is the Americans, and the group most food–pleasure-oriented and least food–health-oriented is the French. In all four countries, females, as opposed to males, show a pattern of attitudes that is more like the American pattern, and less like the French pattern. In either gender, French and Belgians tend to occupy the pleasure extreme, Americans the health extreme, with the Japanese in between. Ironically, the Americans, who do the most to alter their diet in the service of health, are the least likely to classify themselves as healthy eaters. We conclude that there are substantial cross-cultural differences in the extent to which food functions as a stressor vs. a pleasure. These differences may influence health and may partially account for national differences in rates of cardiovascular diseases (the “French paradox”).

© 1999 Academic Press

This research was supported by a grant to Paul Rozin from the Whitehall Foundation.

Address correspondence to: Paul Rozin, Department of Psychology, University of Pennsylvania, 3815 Walnut St., Philadelphia, PA 19104-6196, U.S.A.

INTRODUCTION

This paper is a first attempt at a systematic analysis of the psychology of food in the context of daily life. This issue has, surprisingly, received very little attention from psychologists (Rozin, 1996), although the relations of humans to their food has received a rich and insightful treatment from the point of view of other disciplines (see, e.g. Fischler, 1990; Kass, 1994). Our study is motivated by four aims: (1) furthering understanding of the psychology of food, as one of the central activities/concerns of human beings; (2) more particularly, analysing the interplay of the “negative” (worry, fear, dread) and “positive” (pleasure, anticipation, social facilitation) aspects of food; (3) clarifying the ways in which people think about the relation between food/diet and health; (4) identifying ways in which these issues vary in importance and expression in different cultural settings.

The target of most work in psychology is Americans, who make up about 5% of the world’s population. A broader cultural sample promises to provide a better base for generalising about the human condition. It may also highlight differences that may have importance for understanding important issues, such as the incidence of pathological concerns about body weight and the evaluation of the importance of diet and behavior in health.

Our motivation for beginning this research can be traced to concerns about the developing role of food in American life. There is a sense among many Americans that food is as much a poison as it is a nutrient, and that eating is almost as dangerous as not eating (Rozin, 1989, 1996). This great concern, or perhaps epidemic, of food worrying (Becker, 1986), is believed to be supported by cross-cultural data, such as the supposed longer life of the people in Southern Europe who live on the “Mediterranean diet”. In fact, overall, people in the countries of central and northern Europe live longer than those of the south, and these central/northern people eat a diet relatively high in fat (Samuelson, 1990). It seems reasonable to explore aspects of diet and health in a broad framework and in a number of different countries with an open mind. In particular, there has been a presumption in the medical literature that the critical aspect of food that might influence longevity has to do with the composition of foods (e.g. fat and sodium levels) rather than attitudes to food.

The American attitude to food contrasts with what seems to be a much more relaxed, pleasure-oriented attitude to food among the French (Stearns, 1997). This attitudinal difference is accompanied by relatively high consumption of high-fat foods by the French; for example, only 4% of a sample of French adults consumed a diet that met U.S. dietary recommendations for percent of calories (<10%) from saturated fats (Drewnowski *et al.*, 1996). Many Americans believe fats to be harmful to health at even trace levels (Rozin *et al.*, 1996). From the American standpoint, “excess” fat intake in France should manifest itself in health. To the contrary, cardiovascular disease occurs at much lower rates in France than in the U.S.A. [The French “paradox” (Richard *et al.*, 1981; Renaud & de Lorgeril, 1992)].

In line with what seems to be an American expectation that most health differences can be traced to diet, searches for an “answer” to the French “paradox” have focused almost entirely on finding protective elements (e.g. red wine) in the French diet (e.g. Renaud & de Lorgeril, 1992; Criqui & Ringel, 1994). Little if any attention has been paid to alternative accounts, such as different patterns of food intake or physical activity, differences in stress in relation to eating, or genetic differences in metabolism.

While it is true that red wine is much more characteristic of the French diet than the American diet, it is also probably true that attitudes to food in France are very different from those in the United States, where food often seems to be more a focus for worry than for pleasure. We wish to raise the hypothesis that different attitudes to food (principally along the pleasure to stress/worry "axis") may contribute to overall health. The hypothesis seems reasonable because (a) there seems to be cultural differences in food attitudes, and (b) generally, pleasure/contentment seems to be a health-promoter, and worry/stress a health-reducer. However, there is little substantial evidence on food attitudes, broadly conceived, in a cross-cultural context. It is the aim of this study to provide evidence for such cultural differences. The existence of such differences is a *pre-condition* for testing the hypothesis that such differences have health implications.

In this study, we examine attitudes to food and the role of food in life in four different countries. We selected the U.S.A. as perhaps the premier example of great concern about changing diet to improve health. We selected Japan because the Japanese have the longest life expectancy in the world (Samuelson, 1990). We selected France because of the French paradox and because of the dominant role of food in French culture. And we selected Flemish Belgium because it shares some, but only some, of French cuisine and French attitudes.

METHOD

Questionnaire

A questionnaire was constructed to explore the role of food in life for Americans. As it was being piloted, it became clear that the instrument being developed could be a basis for a cross-country survey. The American questionnaire served as the basis for composition of Flemish, French and Japanese versions. Questions were translated as literally as possible, and were then back-translated by fluent bilinguals, to ascertain that the original meaning was preserved. Of an original 52 questions (not including demographic items), 27 had to be eliminated because some of the back translations suggested a different meaning in at least one of the countries, because the original questions were too closely tied to specific aspects of the American diet, or because of ambiguity of interpretation of the questions within and/or between cultures. Even in the items retained, some minor changes were made in specific wording of the questions and in the cultural exemplars used; these are specified in the notes to Table 1. Items in the questionnaire were all framed with multiple choices. On the actual questionnaire, the items were organised by format of question (true/false; frequency of an activity, etc.). In Table 1, we present the 25 items reported on in this study. Table 1 is organised conceptually, with items presented in accordance with the seven factors derived from the results.

Participants

Brief, one page (two-sided) questionnaires were distributed to two groups of people: college students and a range of adults. The college/university students were from psychology classes in Japan (Hiroshima-Shudo University), U.S.A. (University of Pennsylvania) and Belgium (University of Leuven) and a sociology class in Paris,

TABLE 1.
*Questionnaire items, arranged conceptually, in terms of the scores derived from factor analysis**

Factor/ITEM (Factor loading)	Item
<u>FAT/SALT REDUCED DIET</u>	EATING DIETS MODIFIED TO BE HEALTHIER
LOWCHOL ^a (0.82)	Eat low-cholesterol foods (foods from which cholesterol has been removed)
LOWSALT ^a (0.80)	Eat reduced salt products (in which salt is removed)
LOWFATFD ^a (0.59)	Eat low-fat foods (foods in which some of the fat has been removed, or substitutes for high-fat foods)
<u>CONCERN</u>	CONCERN FOR HEALTHINESS OF FOOD HABITS OF SELF AND OTHERS
FRIEND ^b (0.64)	I am concerned with the health of friends/family who eat poorly
LONGTERM ^{b,c} (0.62)	I rarely think about the long-term effects of my diet on health
LOOKS ^b (0.60)	I am concerned about what I eat and how it will affect my appearance
<u>WORRY</u>	EXTENT OF WORRY ABOUT AS OPPOSED TO SAVORING OF FOOD (WORRY ABOUT WEIGHT)
ICECREAM ^d (0.67)	Ice-cream belongs best with: delicious ^c fattening
CHOC ^d (0.63)	Chocolate cake belongs best with: guilt celebration ^e
DIET ^{b,c} (0.57)	I am usually dieting
CREAM ^d (0.56)	Heavy cream belongs best with: whipped ^e unhealthy
<u>DIET-HEALTH LINK</u>	EFFECTIVENESS OF FOOD ON HEALTH
CHD ^f (0.75)	On a scale of 1-4 ^f , how much of an effect do you believe diet has on the following? Heart disease
OBESITY ^f (0.70)	On a scale of 1-4 ^f , how much of an effect do you believe diet has on the following? Obesity
HEALTH ^f (0.65)	On a scale of 1-4 ^f , how much of an effect do you believe diet has on the following? Good health
CANCER ^f (0.52)	On a scale of 1-4 ^f , how much of an effect do you believe diet has on the following? Cancer
<u>PLEASURE/ IMPORTANCE</u>	THE IMPORTANCE OF FOOD IN LIFE
ENJOY ^b (0.68)	Enjoying food is one of the most important pleasures in my life
FOODTV ^b (0.64)	I would rather eat my favorite meal than watch my favorite television show
FOOD POSITIVE ^b (0.56)	I think about food in a positive anticipatory way
MONEY ^b (0.52)	Money spent on food is money well spent
MEMORY ^b (0.49)	I have fond memories of family food occasions
HOTEL (0.48)	Choice between a gourmet and a luxurious hotel (see ^h for full text)
PILL ^{b,g} (0.27)	If I could satisfy my nutritional needs safely, cheaply and without hunger by taking a daily pill, I would do this
<u>CULINARY ASSOCIATIONS</u>	CULINARY AS OPPOSED TO NUTRITIONAL ASSOCIATIONS TO FOOD
BREAD ⁱ (0.75)	Circle the word that you think is most different from the other two: bread ^c pasta sauce
CHO ⁱ (0.64)	Circle the word that you think is most different from the other two: carbohydrate ^e bread butter
FREGG ^{d,j} (0.28)	Fried egg belongs best with: breakfast ^e cholesterol

continued

TABLE 1.
Questionnaire items, arranged conceptually, in terms of the scores derived from factor analysis—continued*

Factor/ITEM (Factor loading)	Item
<u>HEALTHY EATER</u> ^k	SELF-PERCEPTION AS A HEALTHY EATER
EATHLTH ^b	I am a healthy eater

* All scores were converted to a 0-1 scale, with 1 meaning highest possible score on the general factor described.

^a Scale: 1=every day, 2=a few times a week, 3=once a week, 4=once or twice a month, 5=rarely/never.

^b Scale: true/false.

^c Reverse scored.

^d Actual wording of item: for 3 items below, circle one of the two words at the right that belongs best with the underlined word at the left. Scoring is one point for the culinary-related choice, footnoted as ^e and zero points for the health/nutrition other choice.

^e Choice credited with one point.

^f Scale: 1=no effect, 2=little effect, 3=some effect, 4=strong effect.

^g PILL shows a higher loading (0.36) on the CWORRY factor, but we included it in its second highest loading factor because it seems like a prime example of willingness to forgo eating, hence lack of importance of food in life.

^h The full wording of HOTEL is as follows: If you were vacationing and had to choose between the following hotels including meals, which one would you pick? Assume that you must eat at the hotel and there is no price difference. (Circle one)

luxury hotel with average food

an average hotel with excellent food.

ⁱ Culinary item with 5 scored as 1.

^j FREGG shows a higher loading (0.39) with EATHLTH. However, we used the second highest loading (CULINARY) because it seems like a pure example of a culinary vs. nutritional orientation. In the French version, the word "breakfast" was replaced by "quick snack" ("repas sur le pouce").

^k This is a single item that has been isolated in the analysis.

France (University of Paris). High return rates were obtained at all locations, because questionnaires were filled out in class. A sample more representative of adults in general was obtained by approaching people at railroad stations in Leuven, Paris and Hiroshima, and at Philadelphia International Airport. (We believe that U.S. airport users would be more comparable to European/Japanese train users than to European airport users.) This sample no doubt has some bias, because not all people agreed to fill out the survey, and because the distributors of surveys did not approach people engaged in conversation or other social interactions, so the sample is primarily people travelling alone.

The sample sizes and demographic features are described at the top of Table 2. The Japanese adult sample is by far the smallest and the only group with fewer than 40 subjects in any country/gender/age (student) category.

RESULTS

Data Reduction and Analysis

Factor analysis (PCA, Varimax rotation) of the 25 items, using the full sample, resolved into seven factors with Eigenvalues greater than 1.0. Assignment of items

TABLE 2.
Summary of data on selected variables by country and gender (scores on combined and individual questionnaire variables multiplied by 100)

Item	U.S.A.						Belgium						France						Japan					
	Adult			Stud			Adult			Stud			Adult			Stud			Adult			Stud		
	M	F	N	M	F	N	M	F	N	M	F	N	M	F	N	M	F	N	M	F	N	M	F	N
N	44	57		73	102		52	49		87	250		134	135		32	72		23	15		78	78	
Age (years)	36.3	36.5		19.2	19.2		33.3	34.4		19.4	19.1		37.3	36.9		23.4	23.1		38.5	39.5		19.4	19.2	
HGT (cm)	178	165		178	164		182	168		182	170		178	164		180	165		170	155		171	159	
WGT (kg)	79.3	65.2		71.9	57.4		76.2	60.0		68.5	58.5		75.2	59.9		73.3	55.1		63.8	54.5		61.0	50.3	
BMI	24.9	23.9		22.7	21.4		23.1	21.1		20.6	20.2		23.8	22.2		22.7	20.2		22.2	22.7		20.8	19.9	
FAT/SALT REDUCED DIET CONCERN	52	63		33	55		31	42		18	33		14	21		14	20		39	60		29	40	
WORRY	70	79		53	77		40	66		35	54		46	63		55	59		47	73		54	69	
DIET-HEALTH LINK	27	40		19	40		16	33		16	27		14	26		17	18		17	38		09	13	
PLEASURE/IMPORTANCE	82	86		76	80		82	86		81	84		74	80		75	78		79	87		77	79	
CULINARY ASSOCIATIONS	66	61		59	56		78	66		69	68		84	76		79	82		62	75		60	60	
HEALTHY EATER (% yes)	26	21		31	17		38	28		43	38		45	39		51	32		61	66		56	50	
	33	23		45	37		66	64		63	77		71	73		69	82		59	60		47	51	

NOTE: The mean scores for the questions composing each factor in this table are to be compared across each row. Vertical comparisons (across factors) have no meaning.

to factors was extremely clear, so that in all but two cases, an item's loading on its principal factor is greater than 0.47. These loadings are indicated in Table 1. Two problematic items, which did not show high (>0.40) loading on any single factor, PILL and FRIEDEGG (Table 1), were assigned to factors in accordance with both results of the factor analysis and some conceptual considerations (see footnote to Table 1). The interpretation of each factor will be discussed in conjunction with the presentation of results on that factor.

Factor scores were created by combining results from those items loading highest on each factor (Table 1). They were always calculated with equal weight for each question, and with scoring reversed whenever necessary, so that higher scores always indicated more of the characteristic that named the factor (e.g. worry, culinary thinking). The responses to all questions were converted to a 0 to 1 scale, such that 1 corresponds to the extreme response in the direction of the name of the factor. Thus, the item "I am usually dieting" as a component of the Worry factor, was scored as "1" for "true" and "0" for "false". The item "How frequently do you eat reduced salt products?", a component of the "Eating diets modified to be healthier" factor, was scored as "1" for "every day", "0.75" for "a few times a week", "0.50" for "once a week", "0.25" for "once or twice a month" and "0" for "rarely/never". Each mean that combines data from more than one subgroup that is presented in the figures and the text involves equal weighting of the mean from each relevant subsample, even though the samples may have very different *NS*. Hence, the total French score is the mean of the four means representing both genders and ages (students and adults).

The basic results for factors (major variables) are presented in Table 2, and Figs 1 and 2. Analyses of variance were carried out on the scores for each major variable (factor), separately for the adult and student samples (Table 3). (The adult/student sample difference should not be considered a dichotomy for the ANOVA, since there are overlaps in age, and differences but overlaps in a number of demographic factors. For convenience, we describe the difference in these two samples as "age".) Two limitations on data analysis are the small size of the Japanese adult sample, and the difficulty in making appropriate translations or uncertainty about subject construals of a few of the culinary items in different countries.

Country and Gender Differences

There is a distinct general pattern of results, essentially the same for the student and adult samples (Table 3). For all seven factors (including the single component, "healthy eater" item) (Tables 1–3; Fig. 1), there is a substantial and significant (meaning here and subsequently, $p < 0.001$) effect of country. Scores for each group on each factor were the mean of the 0 to 1 mean scores on each of the items that constituted that factor. Hence, the maximum possible group difference would be 1 point. Maximum differences across the eight groups (four countries by two genders) in both the adult and student samples range from 0.23 to 0.50 points on the 1-point scale, except for the effectiveness of food on health (DIET-HEALTH LINK) variable (Table 3). Here, the significant but much smaller maximum group differences are only 0.09 for students and 0.13 for adults. We will leave this less differentiating factor aside for the summary in the following paragraph.

There is a consistent ordering of results. Of the 12 comparisons (six factors, two samples), in all cases, one of the American female samples (adult or student) shows

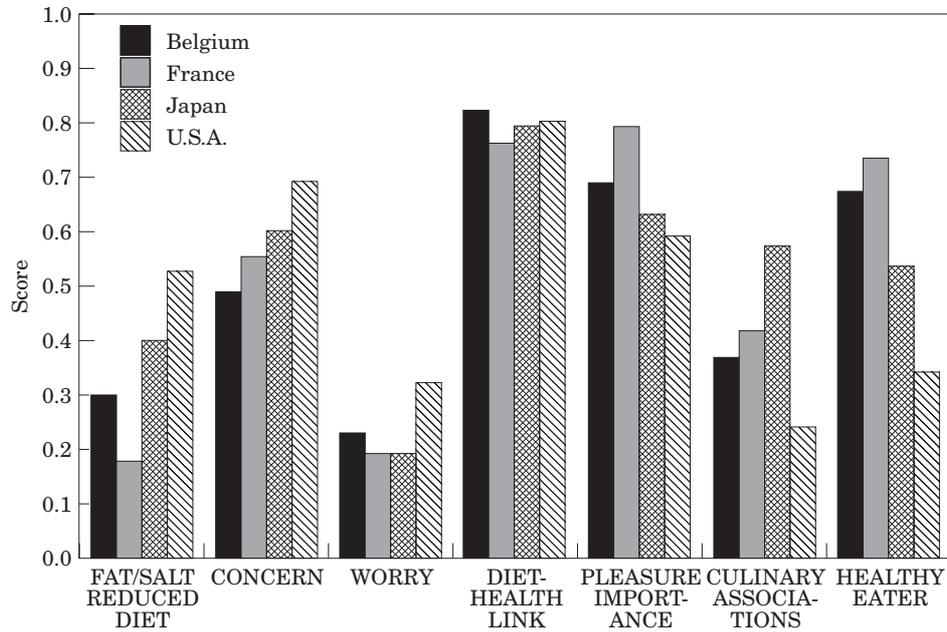


FIGURE 1. Country effects (combined across gender and age) on major variables. The means represent equal weighting of the means of each subsample (e.g. male Belgian adults, female American students).

the most extreme scores on the food worry/aversion/dissatisfaction side. On the food positive side, in seven of 12 cases, the extreme score is achieved by French or Belgian males (Table 2). The American group stands out as most distinctly different among the four countries.

There are *no* significant gender by country interactions in the ANOVA analysis for any of the seven factors (Table 3). Significant overall gender effects, sometimes larger than the country effects, appear for four of the seven factors (Table 3). In all of these cases, the gender effects align with the country effects, in that females are more like Americans (negative/health oriented) and males are more like French (pleasure/culinary oriented). For two variables (in both samples) concern and worry about food, gender effects are bigger than country effects. The gender effects are displayed, in general, in Fig. 2. The combined effects of gender and country cause French males to be the most food/pleasure/culinary oriented group, and American females to show the same orientation in the lowest degree.

An ANOVA including "age" (adult vs. student) as a third variable indicated modest sized effects, considerably smaller than country or gender effects, but significant on three of the seven factors. For purposes of simplification of data presentation in Figs 1–3, we combine the adult and student samples for each country and gender, giving equal weight to each sample.

We now discuss each of the factors in turn, following a brief discussion of the meaning of the variable with a summary of the effects of country and gender. The results described are presented in more detail in Tables 2 and 3, and Figs 1 and 2.

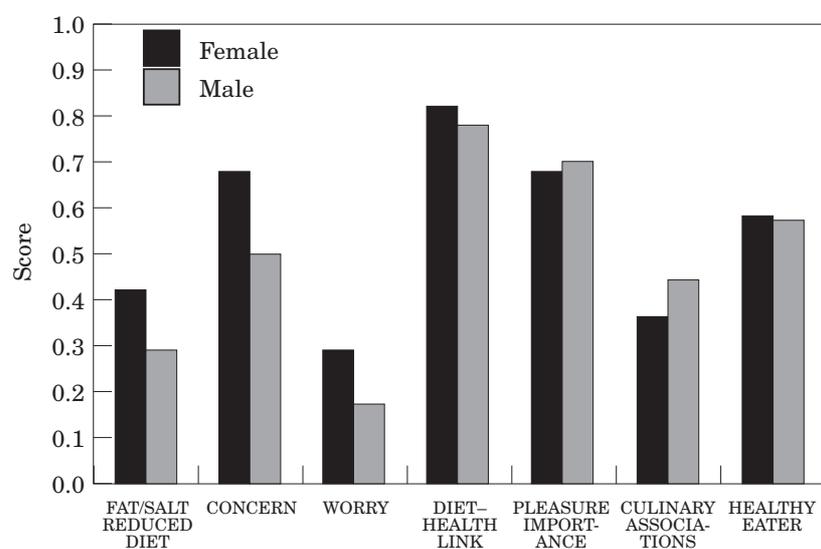


FIGURE 2. Gender effects (combined across country and age) across major variables. The means represent equal weighting of the means of each subsample (e.g. male Belgian adults, female American students).

TABLE 3.

Summary of results of ANOVA on major variables (*Sex* × *Country*, separately for adult and student samples)

Variable	Sample	N	F (sex)	F (country)	F (s × c)	Mult R
FAT/SALT REDUCED DIET	Student	772	37.358*	26.712*	2.289	0.39
	Adult	504	18.249*	66.880*	0.883	0.56
CONCERN	Student	772	30.446*	16.323*	1.798	0.32
	Adult	508	27.763*	9.829*	1.354	0.36
WORRY	Student	772	23.704*	17.253*	5.028	0.37
	Adult	509	35.467*	8.131*	0.591	0.36
DIET-HEALTH LINK	Student	771	4.966	5.866*	0.017	0.20
	Adult	508	9.145	8.337*	0.163	0.27
PLEASURE/IMPORTANCE	Student	772	0.019	22.241*	0.336	0.31
	Adult	509	1.404	14.443*	2.669	0.34
CULINARY ASSOCIATIONS	Student	771	25.109*	34.533*	2.153	0.39
	Adult	509	1.758	24.753*	0.698	0.38
HEALTHY EATER	Student	765	2.121	19.591*	2.228	0.33
	Adult	498	0.218	22.314*	0.444	0.36

* $p < 0.001$.

Consumption of "healthy" (fat/salt reduced) foods: FAT/SALT REDUCED DIET

This factor groups the three items that specifically ask about eating behavior; frequency of consumption of foods with reduced levels of fat, cholesterol or salt. This very distinct factor (mean inter-item correlation is 0.48) shows one of the largest differences in scores across countries. The 1–5 frequency scale (Table 1) was inverted

and reduced to a 0–1 scale. In this one point range, the American adult females showed the highest frequency score (0.63) in comparison to the lowest scores for French adult and student males (0.14). Females engage in greater consumption of reduced fat/salt foods more than males in all four countries, and in both “age” groups. This factor shows the largest “age” effect, with students engaging less in consumption of these foods than adults.

To provide a specific example of one of the items in this factor, consider the frequency with which low-fat (fat removed) food is eaten. The American females anchor one end of response, with 84 or 78% answering at least a few times a week; at the other extreme, Belgian male students answer 17%, and French males from both samples answer 22%.

Concern for the healthiness of food habits of self and others: CONCERN

These three items, all dealing with concerns about the effects of food on one’s own or other’s health/appearance, emerge as a very distinct factor, with no other items even closely related; the lowest loading on this factor for these three items was 0.60, and the highest loading for any other item was 0.27. The three items show a mean inter-correlation of 0.24. The adult American female scores highest (0.79) and the Belgian student males lowest (0.35). On this combined variable, the largest effect, accounting for most of the variance in both samples, is gender. In all eight of the country/age subgroups, females achieve higher scores than males, over 50% higher in some cases. Overall, as with consumption of fat/salt reduced foods, the Americans stand out above the three other groups.

This factor is illustrated, specifically, by response (true or false) to the statement “I rarely think about the long-term effects of my diet on health”. The highest agreement with this statement, indicating little thinking about long-term health consequences of diet, was from French adult males (64% agreement) and Belgian adult males (51%). The greatest concern about long-term effects was displayed by Japanese student and adult females (13 and 20%, respectively) and American adult males and females (both 23%).

Extent of worry about fattening effects of food as opposed to savoring of food: WORRY

These four items are heterogeneous: three deal with feelings about high-fat foods, with respect to whether they give rise to thoughts about pleasure and enjoyment, or about health effects and/or guilt. The fourth item is behavior-oriented, involving the occurrence of dieting. The four items emerge as a clear factor, with the minimal loading of 0.56, in comparison to a next highest loading of 0.39. Although, on conceptual grounds, we would have been inclined to group DIET with the other items on consuming reduced fat/salt foods, the correlation pattern linked DIET more with these worry/anti-pleasure items. The four items that constitute this factor all have to do with worry about high energy intake, and hence, the factor could well be construed as “worry about weight”. The highest worry score was achieved, once again, by American adult and student females (both 0.40), with the lowest scores by Japanese student males (0.09). As with the related CONCERN item above, the gender effect is biggest, with females in all eight subgroups scoring higher than corresponding males. Again, Americans show the highest scores, with the roughly additive combination of “femaleness” and “American” producing the most worry.

In all subgroups, at least half of the subjects associate chocolate cake more with celebration than guilt. However, the two groups that report guilt most frequently are the American student females (39%) and the Japanese adult females (50%). (On account of the very small sample of Japanese adults, confidence intervals for the Japanese adult females are much wider than for other scores.)

Perceived importance of diet for health: DIET-HEALTH LINK

The four items, probing beliefs about the diet-health link in general, and in cancer, cardiovascular disease and obesity, formed a very distinct factor, with a lowest factor loading of 0.52 for the four items, and a next highest loading of 0.12. The mean inter-item correlation was 0.26.

Although there are significant country, gender and age effects for this variable, effects are by far the smallest on any factor. Consequently, the multiple Rs of 0.20 for students and 0.27 for adults are considerably lower than for any factor. The maximum score, that is belief for the strongest diet-health link, is achieved by the Japanese adult females (0.87) compared to the weakest link belief by the French adult males (0.74), only 0.13 less than the maximum. In general, people in all groups believe in a strong diet-health link. There is a small but consistent (across-country) tendency for females and adults to hold to stronger diet-health links than males or students.

Importance of food in life in a positive context: PLEASURE/IMPORTANCE

This factor includes seven items. Six directly deal with the issue of food importance and pleasure derived from food (ENJOYED, FOODTV, FOODPOSITIVE, MONEY, HOTEL and MEMORY) and emerge as a well defined factor with a minimum loading of 0.48 (Table 1). The seventh item, PILL, shows the next highest loading, but it is much lower (0.27) than the others. Nevertheless, we include PILL in this factor, because it seems, on the face of it, that willingness to trade the experience of eating for taking pills quintessentially expresses the importance and pleasure associated with food. The mean inter-item correlation is 0.19. Not surprisingly, the French adult males achieved the highest score (0.84) with the American student females (0.56) lowest. There is a modest sized effect indicating greater focus on foods in adults than students, no significant gender difference, and a large country effect; the most striking component to this is the higher importance of food for the French sample.

The food importance variable is illustrated by results from the HOTEL item. While 70–90% of French and Belgians prefer the gourmet hotel, only 27–57% of Americans do. The Japanese lie in between.

Extent of culinary as opposed to nutritional associations to food: CULINARY ASSOCIATIONS

All three of these items measure whether the subject associates a food term preferentially with a culinary term (pasta-sauce; bread-butter; fried egg-breakfast) as opposed to a nutritional term (pasta-bread; bread-carbohydrate; fried egg-cholesterol). The PASTA and CHO items load highly and uniquely on one factor (minimal loading, 0.64). FRIED EGG, with a 0.28 loading, has the next highest loading, and showed virtually identical loadings on CULINARY ASSOCIATIONS, FAT/SALT REDUCED DIET and WORRY. The decision to assign FRIED EGG

to the CULINARY factor was made on conceptual grounds. The mean inter-item r for the three culinary items is 0.14.

The principal statistical effect (Table 3) is a difference in culinary associations across countries. The Americans show the smallest tendency to culinary associations, with the Japanese most "culinary", followed by the French. The country differences are very large, ranging from 0.66 for Japanese adult females to 0.17 for American student females. Although these items survived back translation quite well, there may be some problems in interpretation since specific foods and combinations were at issue (see notes on one item in Table 1). This is especially of concern for the Japanese sample, since Japanese cuisine and food customs are most different from those of the three other countries. Aside from the Japanese groups, the highest scoring group, French student males (0.51), scores 0.34 higher than the lowest scoring American group.

There is a modest gender effect (Fig. 2), reliably in the direction of more culinary associations among males (in seven of the eight comparisons, all excepting Japanese adults). There is not a significant difference between students and adults.

The results for one item, CHO (circle the word that you think is most different from the other two: carbohydrate, bread, butter), illustrates the basic results for the CULINARY ASSOCIATIONS factor (Table 2). While only 16% of Americans selected "carbohydrate" (keeping together the culinary combination, bread and butter), 28% of Belgians, 24% of French and 36% of Japanese made the "culinary" choices. (Note that in keeping with our assigning high scores to non-pleasure/health/nutritional selections, the results displayed in Table 2 are the inverse of these numbers.) Females show fewer culinary associations than males in all (seven) groups except Japanese adults.

Self-perception as being a healthy eater: HEALTHY EATER

Given the much greater health orientation, worry about weight, concern and diet modification in the Americans, it is sobering that Americans consider themselves much lower in their own sense of being healthy eaters (HEALTHY EATER "factor": Tables 2 and 3); only 23–45% of Americans (across the four subgroups) claim to be healthy eaters, in comparison to 47–60% for the Japanese, 63–77% for the Belgians and 69–82% for the French. There are no significant gender (or age) effects, and there is not a significant gender by country interaction.

Summary

We have reported substantial country effects for six of the seven factors and gender differences for many. Each gender and ethnic group has a profile, determined by the value on each of the six factors (excluding DIET-HEALTH LINK, for which effects were in the same direction as others, but much smaller). Since pleasure is an issue, directly or indirectly, in every one of the six factors, it seems particularly appropriate to summarise the profiles in terms of facial expressions, with worried expressions at one end of a continuum and pleasure expressions at the other. Chernoff's faces (Chernoff, 1973) are designed to display multivariate data by mapping each variable onto a particular facial feature (or set of facial features), each of which can be represented as continuum with 16 levels. For example, scores on one measure can be plotted in terms of degree of upward or downward curvature of the mouth. After assignment by the authors of each of our factors to a particular facial feature (or set of facial features), and designation of one "end" of the feature

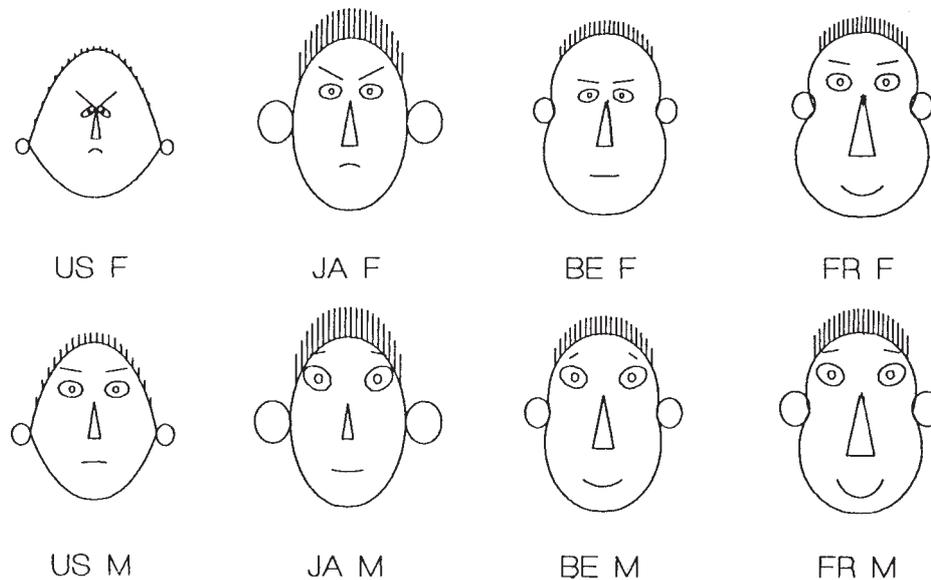


FIGURE 3. Chernoff face representation of HEALTHY EATER and all factors but DIET-HEALTH LINK. Scores of each of the eight groups (combining student and adult samples) were ordered such that a high score always represented the worry/food negative direction. One coherent feature set was assigned to each of the six variables, such that the highest score would represent one extreme of the feature (each feature has 16 values) and the lowest score the other, with intermediate scores placed appropriately. Feature assignments were as follows: CONCERN: brow: angle, height, length; WORRY: eye: separation, height, slant, eccentricity, half-length; PLEASURE/IMPORTANCE: nose: width, length; CULINARY ASSOCIATIONS: ear radius, hair length; FAT/SALT REDUCED DIET: mouth: length, center height, curvature; HEALTHY EATER: face height: upper face eccentricity, lower face eccentricity, ear level.

continuum to represent high scores, the Chernoff program “draws” faces depicting each group’s (e.g. French males) standing on each of the factors. We have used Chernoff’s faces to “express” the profile of each of the eight subgroups (combining means from students and adults). The resulting display, generated in SYSTAT, is in Fig. 3, with assignment of factors to features described in the figure legend. The more pleasure/culinary orientation of each factor is assigned to the more positive/expressive extreme of each feature. The display clearly indicates the more positive attitude to food among French and Belgians, and as well, among males as opposed to females in all countries.

Body Mass Index (BMI)

Physical aspects of the body, such as “fatness” or body mass index (BMI) vary significantly across gender and culture, as well (Tables 2 and 3). Body mass index is higher for males in all groups, except for the Japanese adults (but note the small sample size for Japanese adults). By country (Table 2) (averaging across the four subgroups, with equal weight to each gender and age sample), Americans show the highest mean BMI (23.2), followed by the French (22.2), Japanese (21.4) and Belgians

(21·2). Country and gender effects for BMI are highly significant (Table 3). It is possible that these differences could have both a causal influence on the major variables of this study, and be a consequence of them, as well.

However, there are surprisingly small correlations among either the females or males in the sample, between BMI and the seven factors. Only for WORRY is the correlation with BMI substantial (0·23 across all females, 0·24 across all males). None of the other 12 correlations (six other factors by two genders) is above 0·15 (or below $-0·15$). The role of BMI as a confounding variable was formally assessed with ANCOVAS, using BMI as the covariate. Separate ANCOVAS were carried out for each of the seven factors, separately by gender and "age" group. For the 28 ANCOVAS (seven factors, two genders, two age samples), 22 country comparisons were significant ($p < 0·01$) with or without the BMI covariate. With the exception of WORRY, the multiple R taking BMI into account was rarely 10% higher than the same R using only the COUNTRY variable. Substantial BMI effects were only observed for the WORRY variable, especially for student males.

DISCUSSION

We report substantial country differences in attitudes to food and health. With the large sample sizes that we have employed, it is not surprising that the results are highly significant. More critically, the size of effects is substantial on many of the measures; the difference between, at the extremes, French males and American females is very large. However, it is also true that the variables we have explored (gender and country) do *not* account for most of the variation in the various diet/health/food scores (multiple Rs, taking into account country and gender, vary from 0·20 to 0·56, see Table 3). Variables such as SES and religion, which vary both within and between cultures, may account for additional variance, along with a number of unspecified within-country sources.

In the course of carrying out this study, we have learned how to frame some of the items in better ways, and intend to use this knowledge to carry out a more comprehensive analysis of food and life. This will include information on knowledge of foods and nutrition, knowledge about cuisine, the linkage between food and moral issues, and the extent of worrying about, socialising around and enjoying of foods. Patterns of eating, time spent eating, money spent eating, etc. could also be usefully explored. For example, it is likely that in comparison to Americans, the French eat fewer calories, a greater variety of foods (Drewnowski *et al.*, 1996), fewer snacks and longer meals.

Our study is just a beginning. The samples we have selected are not random, though they should be moderately representative. However, our samples include only prosperous, developed countries. In future work, we intend to include less prosperous countries such as Mexico and India.

In general, the country differences capture the intuition of people familiar with the countries in question. Perhaps the most surprising results are the consistent gender differences on our various measures, and the absence of substantial interactions between gender and country. Females score notably higher than males on worry, concern, modification of diet with reduced salt/fat foods and non-culinary associations. Gender differences are small on the extent of the diet–health link and the importance of food in life in a positive context. A greater concern by women than

men in the United States with weight and appearance has been noted and evidenced by many authors (e.g. Rodin *et al.*, 1985; Rozin & Fallon, 1988). However, the extension of these greater female concerns into the more general domain of health and food is less widely appreciated. Prior work has suggested greater concern by British women than men in the areas of weight and health control (Steptoe *et al.*, 1995), and greater frequency of most health-related behaviors in women (Wardle & Steptoe, 1991). McFarlane and Pliner [1997; personal communication (data not reported in the original paper)] found that Canadian women had significantly higher scores than men on the importance of health subscale of the Food Motivation Scale (Martins & Pliner, 1998). The generality of this greater health concern among women across some Western cultures (Belgium, Britain, Canada, U.S.A. and France) and one developed Eastern culture (Japan) is striking.

The higher scores for females across issues of worries/concerns about food and nutritional as opposed to culinary associations may derive from a number of sources. First, it may be derivative of the well-documented greater concern among Western women about weight, body shape and appearance (Rodin *et al.*, 1985; Rozin & Fallon, 1988). In another portion of this survey, we obtained information indicating that in all four countries, females, unlike males, felt that their current body appearance was fatter than the ideal. Female concerns about weight could directly encourage consumption of low-fat foods, dieting and worrying about high-calorie foods such as chocolate and ice-cream, and these features could generate lower food/pleasure scores on some variables. However, this account is not sufficient to explain the gender differences. For example, it cannot explain the greater use of low salt diet by females or their greater concern about the diet of others.

A second account of the gender difference might relate to the generally acknowledged greater concern for issues of nurturance in females. The greater female health concern, with respect to food, may be related to the fact that in most countries, females bear a disproportionate responsibility for selecting and preparing food for their families.

Finally, the lack of substantial differences on the food effectiveness variables suggest that it is *not* gender or country differences in beliefs about food and health that is primarily responsible for the substantial differences in other attitudes.

It is ironic that the Americans worry most about their diet, modify their diet in the direction of what they perceive as healthy more than any other group, but are *least* inclined to consider themselves "healthy eaters". Americans seem to have the worst of both worry worlds, the greater concern and the greater dissatisfaction. So the virtue which the Americans seek continues to elude them. One is reminded of the documented male-female difference in body image concerns, where women do much more to control their weight, and at the same time end up much more dissatisfied with it (Rozin & Fallon, 1988). Perhaps if it was easier to change diet and/or lose weight, the greater efforts of women and Americans would result in more satisfaction.

We note two other ironies. One is the greater concern of females about consuming low cholesterol foods and their greater association of fried eggs with cholesterol. Women are less vulnerable to the cardiovascular risk of high blood cholesterol, yet are more concerned about it. Second, considering that women presumably still do more cooking than men, it is surprising that they are *less* likely than men to make culinary (as opposed to nutritional) associations to foods.

In general the effects of "age" (student vs. adult) are rather small in this study. The two samples serve primarily to allow more confidence in the other conclusions we have drawn about country and gender, since these conclusions are supported by the data from both student and adult samples.

We believe this is the first cross-cultural empirical study on the role of food in life. The substantial differences we report constitute a first step, both in studying cultural differences and food, and in constructing an argument for the importance of food attitudes in the diet health debate.

It is not unreasonable to assume that when a major aspect of life becomes a stress and source of substantial worry, as opposed to a pleasure, effects might be seen in both the cardiovascular and immune systems. There are numerous studies that show links between pleasure experiences and good health, and between stress and poor health (Netter, 1996). Of course, in this paper we present no such evidence. We merely identify some psychological variables which *may* covary with health. Country (and gender) differences in health may be attributable to any or all of genetic differences, diet, other environmental differences, quality of medical care and psychological variables. We provide here the beginning of some psychological measures that might be added to existing psychological measures (such as attributional style) in the greater concern for the role of psychological factors in physical health.

We suggest that it is conceivable that American worries and obsessions about healthy foods may be counter-productive, producing substantial reductions in the quality of life, and perhaps having no or even negative effects on the length of life. It is extremely hard to change body weight or food habits. Therapy for obesity has had only modest success (French & Jeffrey, 1994), and we have all seen what a massive effort has been required to reduce smoking levels. Before encouraging dietary practices of much less (if any) health benefits, we should consider not only the benefit of the change, if accomplished, but the costs of trying to accomplish this, and the costs of likely failure [see Seligman's (1994) discussion of weight loss regimes in this regard, and Atrens, 1994, on lowering dietary cholesterol].

The contrast in French vs. American attitudes to food that we report may, to some extent, represent a contrast between Americans and Western Europeans. The recent survey of food choice and attitudes to food and health in the European Union (Institute of European Food Studies, 1996) locates the French among the least concerned about diet and health, least inclined to change diet for health reasons, and least concerned with dietary fat among the European countries. Among the Europeans, the French are inclined to define healthy eating more in terms of balance, variety and freshness. However, as suggested by our results with the Flemish Belgians, there are other countries in Europe that show a similar pattern to the French on the diet-health dimensions, including the Italians (Institute of European Food Studies, 1996). Furthermore, a study comparing health-related behaviors and beliefs about the relations between behaviors and health in many European countries (not including France) revealed that Belgians (Flemish and Walloons combined) were less concerned than the other countries, especially in matters related to fat and cholesterol (Steptoe & Wardle, 1992).

Stearns (1997) has recently addressed the historical causes of the French-American differences in attitudes to food and weight. French traditional aesthetic concerns, culinary focus and leadership in the fashion industry might be expected to enhance French concerns about body appearance. One account of the French-American contemporary differences has to do with different traditional eating patterns in the

two countries, with a French emphasis on moderation and high quality, and an American emphasis on high quantity (Stearns, 1997).

There are other French–American differences that might have causal effects (also recognised by Stearns). One is American individualism, and the American emphasis on individual causes and cures for problems, as opposed to a more societal emphasis in France. A second has to do with religion; Catholicism is the dominant religion in France, as opposed to Protestantism in the U.S.A. Protestantism may encourage Americans to attach moral dimensions to eating (responsibility for health and body shape) more than the French (Rozin, 1997; Thomas, 1997). It is notable, for example, that prohibition was enacted only in Protestant countries. Recent evidence from American college students indicates that people who consume “junk” foods are considered to be morally inferior to those who consume principally fruits, grains and vegetables (Stein & Nemeroff, 1995). A third difference has to do with beliefs about the causes of illness. Generally, Americans and American medicine tends to attribute illness to external causes, such as germs, toxins and diet, while French and French medicine is more inclined to accounts in terms of internal imbalances (Payer, 1988). This naturally leads to a greater American concern about health and diet links.

Our findings support the idea that there are substantial differences in concern about diet and health, and hence presumably food-related stress, in different countries. Although it is well documented that stress (however defined) contributes to morbidity and mortality, we have presented no evidence that directly links diet–health concerns with health outcome measures. Our claim at this point is simply that diet–health and food concerns do differ across cultures, and *may* be a negative influence on health. Therefore, food/health attitudes and patterns of food intake should properly be considered along with measures of actual diet and other environmental factors as a candidate for accounts of the “French paradox” and other major health differences across countries. We suggest that on the psychological level, Americans may have something to learn from the French.

REFERENCES

- Atrens, D. M. (1994). The questionable wisdom of a low-fat diet and cholesterol reduction. *Social Science and Medicine*, 3, 433–447.
- Becker, M. H. (1986). The tyranny of health promotion. *Public Health Reviews*, 14, 15–23.
- Chernoff, H. (1973). Using faces to represent points in k-dimensional space graphically. *Journal of the American Statistical Association*, 68, 361–368.
- Cirqui, M. H. & Ringel, B. L. (1994). Does diet or alcohol explain the French paradox? *Lancet*, 344, 1719–1723.
- Drewnowski, A., Henderson, S. A., Shore, A. B., Fischler, C., Preziosi, P. & Hercberg, S. (1996). Diet quality and dietary diversity in France: implications for the French paradox. *Journal of the American Dietetic Association*, 96, 663–669.
- Fischler, C. (1990). *L'Homnivore*. Paris: Editions Odile Jacob.
- French, S. A. & Jeffrey, R. W. (1994). Consequences of dieting to lose weight: effects on physical and mental health. *Health Psychology*, 13, 195–212.
- Institute of European Food Studies (1996). *A pan-EU survey of consumer attitudes to food, nutrition, and health*. Dublin, Ireland: Institute of European Food Studies.
- Kass, L. (1994). *The hungry soul*. New York: Free Press.
- Martins, Y. & Pliner, P. (1998). The development of the Food Motivation Scale. *Appetite*, 30, 94.

- McFarlane, T. & Pliner, P. (1997). Increasing willingness to taste novel foods: effects of nutrition and taste information. *Appetite*, 28, 227–238.
- Netter, P. (1996). Health and pleasure. In D. M. Warburton & N. Sherwood (Eds), *Pleasure and quality of life*, pp. 81–89. Chichester, U.K.: John Wiley.
- Payer, L. (1988). *Medicine and culture*. New York: Henry Holt.
- Renaud, S. & de Lorgeril, M. (1992). Wine, alcohol, platelets, and the French paradox for coronary heart disease. *Lancet*, 339, 1523–1526.
- Richard, J., Cambien, F. & Ducimetiere, P. (1981). Particularité épidémiologiques de la maladie coronarienne en France. *Presse Medicale*, 10, 1114–1114.
- Rodin, J., Silberstein, L. & Striegel-Moore, R. (1985). Women and weight: a normative discontent. In T. B. Sonderegger (Ed.), *Psychology and Gender. Nebraska Symposium on Motivation*, pp. 267–307. Lincoln, Nebraska: University of Nebraska Press.
- Rozin, P. (1996). Towards a psychology of food and eating: from motivation to model to meaning, morality and metaphor. *Current Directions in Psychological Science*, 5, 1–7.
- Rozin, P. (1989). Disorders of food selection: the compromise of pleasure. *Annals of the New York Academy of Sciences*, 575, 376–385.
- Rozin, P. (1997). Moralization. In A. Brandt & P. Rozin (Eds), *Morality and health*, pp. 379–401. New York: Routledge.
- Rozin, P. & Fallon, A. E. (1988). Body image, attitudes to weight, and misperceptions of figure preferences of the opposite sex: a comparison of males and females in two generations. *Journal of Abnormal Psychology*, 97, 342–345.
- Rozin, P., Ashmore, M. B. & Markwith, M. (1996). Lay American conceptions of nutrition: dose insensitivity, categorical thinking, contagion, and the monotonic mind. *Health Psychology*, 15, 438–447.
- Samuelson, R. J. (1990). *The economist book of vital world statistics*. New York: Random House.
- Seligman, M. E. P. (1994). *What you can change and what you can't*. New York: Alfred Knopf.
- Stearns, P. (1997). *Fat history*. New York: New York University Press.
- Stein, R. L. & Nemeroff, C. J. (1995). Moral overtones of food: judgments of others based on what they eat. *Personality & Social Psychology Bulletin*, 21, 480–490.
- Stephens, A., Pollard, T. M. & Wardle, J. (1995). Development of a measure of the motives underlying the selection of food: the Food Choice Questionnaire. *Appetite*, 25, 267–284.
- Stephens, A. & Wardle, J. (1992). Cognitive predictors of health behaviour in contrasting regions of Europe. *British Journal of Clinical Psychology*, 31, 485–502.
- Thomas, K. (1997). Health and morality in early modern England. In A. Brandt & P. Rozin (Eds), *Morality and health*, pp. 15–34. New York: Routledge.
- Wardle, J. & Stephens, A. (1991). The European health and behaviour survey: rationale, methods and initial results from the United Kingdom. *Social Science & Medicine*, 33, 925–936.

Received 7 October 1998, revision 18 November 1998, accepted in revised form 24 March 1999