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Beyond affect and cognition: Identification of the informational bases of food attitudes

Shelley N Aikman, *Syracuse University*
Stephen L Crites, *University of Texas at El Paso*
Leandre R Fabrigar, *Queen's University - Kingston, Ontario*

Beyond Affect and Cognition: Identification of the Informational Bases of Food Attitudes[1]

Shelley N. Aikman[2]
Syracuse University

Stephen L. Crites, Jr.[2]
University of Texas at El Paso

Leandre R. Fabrigar
Queen's University

Two studies were conducted to identify the informational bases of food attitudes. Study 1 was an exploratory study in which participants indicated the importance of food characteristics and emotional reactions for determining their attitudes toward a variety of foods. On the basis of a series of exploratory factor analyses, 5 informational bases of food attitudes were identified: positive affect, negative affect, specific sensory qualities, abstract cognitive qualities, and general sensory qualities. A second confirmatory study corroborated the appropriateness of this 5-factor structure. Furthermore, the food-specific attitude structure model was found to have better fit than a more traditional attitude structure model. The implications of these findings for attitude theory, understanding eating behavior, and changing food selection are discussed.

Food selection is a necessary part of everyday life that can have many important consequences. A diet that contains adequate amounts of certain types of foods such as fruits and vegetables can help reduce the risk of developing many life-threatening conditions, such as certain types of cancer, cardiovascular disease, stroke, and diabetes (U.S. Department of Health and Human Services, 2001). On the other hand, other types of diets can lead to obesity and contribute to the development of conditions such as certain types of cancer, cardiovascular disease, stroke, and diabetes. In fact, it is estimated that 300,000 people a year die from obesity-related causes (U.S. Department of Health and Human Services, 2001), making obesity the

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[2]Correspondence concerning this article should be addressed to Shelley N. Aikman, Department of Psychology, Syracuse University, Syracuse, NY 13244. E-mail: saikman@syr.edu. Stephen L. Crites, Jr., Department of Psychology, University of Texas at El Paso, El Paso, TX 79968. E-mail: scrites@utep.edu

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second leading preventable cause of death in the United States after smoking. The economic costs of obesity are also very high, at an estimated $117 billion in 2000 as a result of medical claims and lost productivity, wages, and future earnings due to premature deaths (U.S. Department of Health and Human Services, 2001). In the United States, 34 percent of U.S. adults are considered overweight, and an additional 31 percent are considered obese (U.S. Department of Health and Human Services, 2001). Thus, approximately 65 percent of adults in the United States are either overweight or obese and are at higher risk of developing the various health problems associated with obesity. Because the foods we eat can have such dramatic effects on health, understanding the mechanisms that guide people to select certain foods is an important step in helping people make healthier food selections.

One means of exploring the factors that guide food selection is examining food attitudes. Attitudes are evaluative (positive/negative) judgments about objects that guide behavior toward those objects (for reviews see Olson & Zanna, 1993; Petty, Wegener, & Fabrigar, 1997). Research investigating the utility of food attitudes for predicting food-related behavior (e.g., consumption and purchases) has focused on the Ajzen and Fishbein theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) and Ajzen's (1988) theory of planned behavior, which suggest that attitudes affect behavioral intentions, which in turn influence behavior (e.g., Arvola, Lähteenmäki, & Tuorila, 1999; Raats, Shepherd, & Sparks, 1993; Richardson, Shepherd, & Elliman, 1993). Recent research, which has primarily examined nonfood attitudes, has demonstrated that attitudes can influence behavior via mechanisms other than just behavioral intentions (e.g., see Bargh, Chaiken, Govender, & Pratto, 1992; Chen & Bargh, 1999; Fazio, 1990, 1995). For instance, behavior toward an object may change due to perceptual or judgment changes that can occur when an attitude is automatically activated by the presence of the object (e.g., see Fazio, 1995). One important aspect of this research is that it demonstrates that attitude characteristics other than the valence of the attitude can influence the relation between attitudes and behavior.

An attitude characteristic that has received considerable research attention is the informational base of the attitude. That is, attitudes are conceptualized as summary evaluative judgments, and these summary evaluations can be comprised of different types of information, which might even differ in their evaluative implications (e.g., see Cacioppo & Berntson, 1994; Crites, Fabrigar, & Petty, 1994; Fazio, 1986; Zanna & Rempel, 1988). For example, a slightly positive attitude toward bacon (e.g., +1 on a bipolar scale ranging from -4 to +4) might reflect a very positive evaluation of its taste (e.g., +3) and a negative evaluation of its healthiness (e.g., 2).

Research suggests that informational bases can be measured and that attitudes can be better understood by examining their informational bases (e.g., see Crites et al., 1994; Fabrigar & Petty, 1999). For example, attitudes are more predictive of behavior when the salient informational base of the attitude matches the nature of the behavior (e.g., Millar & Tesser, 1986, 1989). Thus, the informational bases of food attitudes (i.e., the type of information that contributes to food likes and dislikes) are one attitude characteristic that might help explain the relation between food attitudes and food-related behavior.

There is a long history of research examining the informational bases of attitudes that has focused on attitudes in general and not specifically on attitudes toward foods. This research has revealed that there are at least two general types of information, affective and cognitive, underlying attitudes (e.g., see Abelson, Kinder, Peters, & Fiske, 1982; Breckler & Wiggins, 1989; Cacioppo, Petty, & Geen, 1989; Zanna & Rempel, 1988). This idea has also been extended to food attitudes as research suggests that food attitudes also have affective and cognitive bases (e.g., Letarte, Dubé, & Troche, 1997).[3] An appealing aspect of the affective and cognitive distinction is that these informational bases reflect broad categories that can be meaningfully applied to nearly any type of attitude object (e.g., foods, people, social issues, movies, etc.). The affective/cognitive distinction, however, does not preclude the possibility that there might be other informational bases and/or subcategories of affective/cognitive information that might be important for certain classes of attitude objects. Food attitudes, for example, might be based on additional types of information that are not as relevant for nonfood attitudes (e.g., people, social issues, etc.) because of food's biological significance and its close ties with specific sensory systems.

Research investigating factors that influence individuals' orientations toward foods offers some suggestive evidence that types of information other than affective and cognitive might underlie food attitudes. Steptoe, Pollard, and Wardle (1995), for example, identified nine food-related dimensions that people believe to be important (health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity, and ethical concern) and developed a measure for assessing the importance of these dimensions for individuals. Similarly, Roininen, Lähteenmäki, and Tuorila (1999) identified health-related (general health interest, light product

[3]Research has also examined the affective and cognitive bases of attitudes toward beverages (e.g., Cantin & Dubé, 1999; Edwards, 1990; Millar & Millar, 1990; Tuorila, Pangborn, & Schutz, 1990). Research in our laboratory, however, suggests that attitudes toward foods and beverages may not be equivalent; for instance, we have found that hunger influences food attitudes but does not influence attitudes toward beverages. Thus, we focus on research that specifically examines foods.

interest, and natural product interest) and taste-related (craving for sweet foods, using food as a reward, and pleasure) dimensions and developed a Health and Taste Attitudes Questionnaire that assesses the importance of these dimensions for a person's orientation towards food in general. Although the Steptoe et al. (1995) and Roininen et al. (1999) studies suggest that multiple types of information might be important for food judgments/behavior, the purpose of these studies was to develop a way of categorizing individuals based on the factors that they chronically use to guide their food selections/behaviors and not to develop a way of identifying informational bases that comprise attitudes toward specific foods. Thus, for example, an individual may generally view healthiness as important for determining his or her food preferences and behaviors but also have a very positive attitude toward a food such as ice cream that is not based on how healthy it is. Furthermore, theory and research on attitudes demonstrate that attitudes are one important predictor of behavior (i.e., food selection) but also demonstrate that factors can affect behavior independently of attitudes (e.g., see Ajzen, 1988; Fazio, 1990, 1995). Thus, certain factors might influence food selection (e.g., categories that individuals chronically use to guide their eating behavior) but not impact food attitudes. So it is important to carefully examine the mechanisms through which different types of information affect food judgments and decisions because some types of information may influence food attitudes whereas others may influence other constructs that guide behavior.

Study 1

The purpose of Study 1 is to expand upon previous research examining food selection by exploring the informational bases of food attitudes and more specifically to investigate whether an affective/cognitive informational distinction is sufficient for food attitudes. Letarte et al. (1997), for instance, asked participants to record their reasons for liking or disliking a certain food using open-ended questions to identify informational bases that comprise food attitudes. There is an ongoing debate as to the merit of open-ended and closed-ended questions, and clearly both methods have advantages and disadvantages (e.g., see Petty, Fabrigar, & Wegener, 2002). Although open-ended questions such as those used by Letarte et al. can be very useful for identifying specific factors that contribute to food attitudes, they are not as good at identifying underlying dimensions that tie multiple specific factors together. For example, anger and fear are distinct emotions, but both are components of the affective dimension that underlies attitudes (Crites et al., 1994). Furthermore, open-ended questionnaires are also very

useful for obtaining specific information about a given item, but they are not as good for making comparisons across different items. For instance, if a participant does not mention that smell is important for a particular attitude, it may be because smell is not important for that attitude or because the participant just neglected to mention its importance. Finally, coding open-ended questions is labor intensive and open to interpretation, whereas closed-ended questions offer readily coded responses that can be uniformly interpreted. For these reasons, we developed a set of specific questions for assessing information that may be important for determining food attitudes by examining factors that have been postulated as important for determining food likes/dislikes and food selection. We then used exploratory factor analyses to investigate whether there were general factors that tied this underlying information together.

Methods

Item selection. We began by reviewing literature and research examining (a) food preferences/selection to identify factors that researchers have proposed as important for determining why people like or do not like certain foods and (b) the informational bases of attitudes in general (e.g., Crites et al., 1994; Letarte et al., 1997; Rappoport, Peters, Downey, McCann, & Huff-Corzine, 1993; Roininen et al., 1999; Rozin, 1988; Rozin & Fallon, 1980; Shepherd & Farleigh, 1989; Steptoe et al., 1995). From this literature review, we identified general principles that have been proposed for explaining food preferences specifically and attitudes generally. These principles included general sensory dimensions that people use to evaluate foods (e.g., taste, smell), specific sensory qualities of foods (e.g., oily, salty), cognitive descriptive qualities of foods (e.g., health, safety), consequences of eating foods (e.g., nauseated, refreshed), and emotions that might be elicited by eating foods (e.g., happy, depressed). We then compiled a list of 95 items that might contribute to a person's food attitudes by selecting items from previous research and by generating new items using the above principles as a guide. We then reduced the list from 95 to 61 items because we believed that 95 items would be too many for participants to rate. We used multiple criteria to try to reduce the number of items, such as eliminating items that were comparable or similar to other items and eliminating items that had little evaluative content.

Participants. Participants were 315 (95 male, 210 female, and 10 who did not report their gender) undergraduate introductory psychology students from the University of Texas at El Paso who participated as partial fulfillment of a course requirement. Participants ranged in age from 17 to 52 years ($M = 19.42$ years, $SD = 3.03$). The sample consisted primarily of

Latinos (82.2% indicated that they were Latino, 8.3% Anglo American, 1.6% African American, 1% Asian American, 3.5% listed their ethnicity as "Other," and 3.5% did not indicate their ethnicity).

Materials. The food attitude questionnaire consisted of three sections. The first section consisted of two scales for rating overall attitude toward a food. These two attitude scales were bipolar and were labeled *dislike extremely, dislike very much, dislike moderately, dislike slightly, neither like nor dislike, like slightly, like moderately, like very much, like extremely* and *extremely bad, very bad, moderately bad, neither bad nor good, slightly good, moderately good, very good, extremely good.* The instructions asked participants to "please rate your overall evaluation of (attitude toward) this food on the following 2 scales by putting an 'X' next to the phrase that best describes your overall attitude toward this food." The second section of the questionnaire consisted of 39 scales for rating food characteristics that might contribute to food attitudes. These 39 food characteristic scales were 5-point bipolar scales (-2 to 2) with the endpoints labeled *negative* and *positive*. These scales were preceded by the following instructions:

> Many different factors may contribute to your overall evaluation of (attitude toward) a food. We would like you to consider each of the following factors separately by rating the extent to which each factor contributes either positively or negatively to your overall evaluation of the food listed above. For example, if the factor you are rating is "Healthy," consider the extent to which healthiness contributes to your overall evaluation of the food either positively or negatively, independent of how positive or negative you consider other factors such as the greasiness of the food, the sweetness of the food, etc.

The 39 food characteristic scales were presented in one of six different random orders. The third section of the food attitude questionnaire consisted of 22 scales for rating affective reactions that might be associated with foods. These 22 affect scales were 5-point unipolar scales (1 to 5) with endpoints labeled *not at all* and *extremely*. The instructions asked participants to "rate how you typically feel when you eat the food listed previously by circling the appropriate number on the scales provided." The scales were presented in one of six different random orders.

In addition to the food attitude questionnaire, there were ancillary measures for assessing demographic information, current physiological state, and mood. The demographic measures assessed age, gender, and ethnicity. The current physiological state measures consisted of three scales for assessing how hungry, thirsty, and full participants were when they completed

the food attitude questionnaire. Each of these three dimensions was assessed using a single 5-point unipolar scale (1 to 5) with endpoints labeled *not at all* and *very*. Finally, participants' mood was assessed using the Positive Affect Negative Affect Scale (Watson, Clark, & Tellegen, 1988).[4]

Procedure. During the fall of 2000, the food attitude questionnaire and ancillary measures were administered to participants in groups ranging in size from 1 to 19. The experimenter told participants that the purpose of the experiment was to explore reasons why people like or dislike foods and explained that the participants would be asked to rate six foods on various characteristics that may or may not contribute to their food attitudes. After participants gave their informed consent, the experimenter distributed the questionnaires.

Participants rated six foods on the food attitude questionnaire and then completed the ancillary measures (i.e., demographic information, physiological state, and mood). Participants first rated one food on all three sections of the food attitude questionnaire and then proceeded to the next food, which they then rated on all three sections, etc. Instructions preceding each of the six food attitude questionnaires provided information about what food the participants should rate. Instructions for three of the six attitude questionnaires asked participants to write down a specific food in a provided space and then complete the questionnaire for that food; participants were required to provide one food that they liked, one that they disliked, and one that they neither liked nor disliked. Instructions for the other three attitude questionnaires listed a specific food (i.e., one provided by the experimenter) and asked participants to complete the questionnaire for that food. The three listed foods were foods common to this region and consisted of one food high in carbohydrates (spaghetti, rice, or sopapillas), one high in fat (beef brisket, guacamole, or potato chips), and one high in protein (chicken, cottage cheese, or beef jerky). Furthermore, one food in each of the above macronutrient categories is frequently eaten as a main course item (first item in each of the above groupings), as a side dish (second item), or as a snack (third item) in the local region. The exact foods that each participant rated varied, with the only constraint being that each participant rated one carbohydrate, one fat, and one protein and rated one main course item, one side dish, and one snack.[5]

[4]We performed exploratory analyses to examine these variables and found that inclusion of these variables did not significantly change any of the primary findings, nor did these variables significantly add to the findings. Therefore, these variables will not be mentioned further.

[5]We chose to select foods based on macronutrient type (fat, protein, carbohydrate) and dish type (main dish, side dish, snack) because we have been investigating whether these factors might affect food changes that occur when people are hungry (e.g., see Lozano, Crites, & Aikman, 1999). We recognize that there are multiple ways of categorizing foods (e.g., savory vs. sweet) and believe that it will be important to investigate other food types in the future.

Thus, for example, one participant might rate spaghetti (carbohydrate main dish item), guacamole (fat side dish item), and beef jerky (protein snack item), whereas another might rate sopapillas (carbohydrate snack item), beef brisket (fat main dish item), and cottage cheese (protein side dish item). The order of the six foods (i.e., three selected by participant and three selected by experimenter) was randomly varied across participants. Furthermore, the order of the 39 food characteristic scales and the 22 affect scales within each food attitude questionnaire was different for each of the six foods rated by a given participant. After participants finished rating the six foods, they completed the ancillary measures that assessed demographic information, physiological state, and mood. The experimenter then debriefed participants and answered any questions they had.

Analyses and Results

Exploratory factor analyses. We first conducted exploratory factor analyses on the liked, disliked, and neutral foods because these three valence food types allowed us to investigate whether the underlying bases of food attitudes were comparable across the positive/negative evaluative dimension. Additionally, because each participant used a food that he or she personally liked, disliked, or was neutral toward, these three valence food types included a wide range of specific foods, which helps to establish that the scales can be used for a variety of different foods. Exploratory factor analyses (principal axis factoring, direct oblimin rotation) were conducted on the 39 food characteristic and 22 affect scales for each of the three valence food types.[6] Examination of the scree plots of the eigenvalues from the reduced correlation matrix suggested that a five-factor solution was appropriate for each of the three food types.[7] Because this was a first attempt to identify the underlying bases of food attitudes, we were concerned about excluding relevant items and thus examined items that had factor loadings of at least 0.30. This examination suggested that the factors could be described as (a) a positive affect factor, PAF; (b) a negative affect factor, NAF; (c) a general sensory qualities factor, GSQ; (d) an abstract

[6]The skewness and kurtosis of all of the items were examined prior to conducting the factor analyses, and a number of items (primarily negative emotion items) were found to have unsatisfactory skewness and/or kurtosis. Therefore, principal axis factoring was used because it does not make distributional assumptions (Fabrigar, Wegener, MacCallum, & Strahan, 1999).

[7]Because examination of scree plots is open to interpretation, we also examined the four- and six-factor solutions. The four-factor solution was not easily interpretable. The six-factor solution resulted in a factor from the five-factor solution being split into two factors. The factor split varied depending on the food; for example, the negative emotion factor was split into two factors for the disliked food, but the specific sensory quality was split for the liked food. Because the four- and six-factor solutions were not easily interpretable or consistent across foods, the five-factor solution was chosen as the most reasonable solution.

cognitive qualities factor, ACQ; and (e) a specific sensory qualities factor, SSQ (see Tables 1, 2, and 3).

To investigate whether these five factors were replicable, comparable exploratory factor analyses were conducted on the protein, fat, and carbohydrate foods. The scree plots of the eigenvalues from the reduced correlation matrix again suggested that a five-factor solution was appropriate for each of the three food types. Our examination of items that had factor loadings of at least 0.30 suggested the same five factor descriptions as in the previous analyses (see Tables 4, 5, and 6).[8]

Although all six factor analyses revealed comparable five-factor solutions for each food type, the individual items that had high loadings on each of the factors varied slightly across the six attitude types. In fact, every one of the 39 food characteristic and 22 affect scales had a high loading on a factor at least once. Because the primary purpose of this study was to identify informational bases of many different food attitudes, we identified scale items that consistently loaded on the same factor across the six different food types. Because this was a first attempt to develop a scale for assessing the dimensions that underlie food attitudes, we opted to be inclusive for this item-selection process. Thus, for an item to be included on the final scale, it had to have a factor loading of at least 0.30 on two of the three valence food types and on two of the three macronutrient food types. This selection process resulted in 10 items being retained for the positive affect scale (joyful, happy, lively, comforted, relaxed, refreshed, content, warm, aroused, and satisfied), 9 items for the negative affect scale (depressed, disturbed, nauseated, disgusted, sick, guilty, concerned, ashamed, and bored), 10 items for the specific sensory qualities scale (oily, greasy, fattening, messy, sour, slimy, creamy, wet, salty, and heavy), 5 items for the abstract cognitive qualities scale (nutrition, healthy, lean, safety, and light), and 9 items for the general sensory qualities scale (smell, appearance, flavor, taste, odor, texture, color, temperature, and preparation).

Internal consistencies. The internal consistency of each of the five identified scales was examined next. To explore the internal consistency both for categories of foods (e.g., liked, neutral) and for specific foods (e.g., sopapillas, beef brisket), the internal consistency was computed both for the valence food categories and for the individual foods. As can be seen in Table 7, the Cronbach's alpha scores were fairly high for each scale across the food categories and across the specific foods. The median Cronbach's

[8]The protein, fat, and carbohydrate items were recategorized into main dish, side dish, and snack items, and exploratory factor analyses were again performed, yielding similar results. This categorization is not independent from the fat/protein/carbohydrate categorization because the same foods are used in both analyses, just grouped differently in the two analyses.

Table 1

Results of the Exploratory Factor Analysis for the Liked Food

Factor and item	1	2	3	4	5
Positive affect					
Aroused	**0.59**	0.05	-0.01	-0.05	-0.04
Comforted	**0.70**	0.01	-0.02	0.01	-0.03
Content	**0.61**	-0.07	-0.03	-0.03	0.15
Happy	**0.72**	-0.13	0.06	-0.05	0.03
Joyful	**0.79**	-0.07	-0.02	-0.01	-0.02
Lively	**0.80**	-0.06	-0.07	0.07	-0.14
Refreshed	**0.72**	-0.03	-0.17	0.16	0.00
Relaxed	**0.75**	-0.02	-0.06	-0.07	-0.05
Satisfied	**0.52**	-0.07	0.05	-0.01	0.26
Warm	**0.57**	0.01	0.04	-0.15	0.16
Negative affect					
Ashamed	-0.01	**0.60**	0.06	-0.11	0.02
Bored	0.06	**0.35**	-0.11	0.02	0.03
Concerned	-0.04	**0.61**	0.13	0.00	-0.01
Depressed	-0.08	**0.78**	0.02	0.07	-0.01
Disgusted	-0.08	**0.70**	-0.09	0.09	-0.10
Disturbed	-0.08	**0.76**	0.00	0.03	0.06
Guilty	0.04	**0.66**	0.04	-0.19	-0.03
Nauseated	-0.08	**0.71**	-0.04	0.07	-0.06
Sick	-0.04	**0.68**	0.00	0.10	-0.01
Specific sensory qualities					
Creamy	0.21	-0.01	**0.37**	0.08	-0.27
Fattening	-0.01	-0.06	**0.52**	-0.17	0.08
Greasy	-0.14	0.00	**0.63**	-0.20	0.06
Heavy	0.13	-0.04	**0.42**	-0.12	0.04
Messy	0.05	-0.04	**0.49**	-0.20	0.11
Oily	-0.12	0.10	**0.68**	-0.16	-0.01
Salty	-0.08	0.01	**0.47**	0.03	-0.02
Slimy	-0.03	-0.02	**0.39**	0.08	-0.22
Sour	0.00	-0.10	**0.41**	0.29	**-0.51**
Wet	0.01	-0.01	**0.34**	**0.34**	-0.17

Table 1. Continued

Factor and item	1	2	3	4	5
Abstract cognitive qualities					
Healthy	-0.01	-0.10	-0.19	**0.68**	0.07
Lean	-0.10	-0.01	-0.04	**0.51**	0.10
Light	-0.04	0.07	-0.16	**0.66**	-0.07
Nutrition	-0.02	-0.16	-0.23	**0.71**	0.06
Safety	0.03	0.03	0.00	**0.44**	0.09
General sensory qualities					
Appearance	0.18	0.11	0.04	0.14	**0.41**
Color	0.18	0.06	0.08	0.16	0.28
Flavor	0.08	-0.09	0.08	0.11	**0.37**
Odor	0.04	0.02	0.26	-0.05	0.18
Preparation	0.09	-0.10	0.16	0.19	**0.33**
Smell	0.01	0.01	0.22	-0.04	**0.46**
Taste	0.03	-0.05	-0.06	0.07	0.19
Temperature	0.00	-0.01	0.07	-0.02	**0.49**
Texture	0.29	-0.03	0.14	0.25	0.18
Inconsistent across foods					
Available	0.07	-0.03	0.10	-0.02	**0.33**
Bitter	-0.01	-0.18	**0.36**	0.19	**-0.51**
Bland	-0.04	0.02	**0.30**	**0.36**	-0.29
Chewy	0.05	0.07	**0.30**	0.11	0.09
Complex	0.13	0.12	**0.34**	0.18	0.08
Convenient	0.04	0.01	0.06	0.11	**0.30**
Cost	-0.03	0.04	0.06	0.06	**0.32**
Different	0.16	0.05	0.15	**0.32**	0.05
Dry	-0.03	0.04	0.22	0.16	-0.28
Exotic	0.23	0.01	0.18	**0.43**	0.02
Fresh	0.15	-0.07	-0.18	**0.34**	0.27
Lazy	0.24	0.28	0.07	-0.28	0.07
Nostalgic	**0.33**	0.20	-0.15	0.00	-0.05
Novel	0.18	0.03	0.22	0.18	0.09
Routine	0.15	0.03	0.22	0.18	0.11
Sleepy	0.13	0.23	0.10	-0.20	0.15
Spicy	-0.14	-0.01	**0.35**	0.04	0.12
Sweet	0.13	0.05	0.11	0.29	**-0.34**

Note. The first five categories reflect groupings of items consistent across foods. Factor loadings greater than .30 are in boldface.

Table 2

Results of the Exploratory Factor Analysis for the Neutral Food

Factor and item	1	2	3	4	5
Positive affect					
Aroused	**0.56**	0.13	0.12	-0.02	-0.05
Comforted	**0.75**	0.01	0.01	0.00	0.04
Content	**0.71**	0.03	-0.09	0.03	0.09
Happy	**0.79**	-0.07	-0.04	-0.04	0.11
Joyful	**0.83**	-0.02	0.10	-0.01	-0.07
Lively	**0.72**	0.10	0.10	0.03	-0.11
Refreshed	**0.71**	-0.05	0.14	0.13	-0.03
Relaxed	**0.71**	0.08	0.02	0.03	0.01
Satisfied	**0.69**	-0.17	-0.02	-0.07	0.09
Warm	**0.57**	0.22	-0.07	-0.05	0.10
Negative affect					
Ashamed	0.11	**0.71**	-0.03	-0.06	0.04
Bored	0.00	**0.48**	-0.08	0.06	0.07
Concerned	0.11	**0.68**	-0.02	-0.07	0.04
Depressed	0.00	**0.69**	0.01	0.01	0.00
Disgusted	-0.09	**0.70**	0.09	0.08	-0.21
Disturbed	0.06	**0.70**	0.06	-0.07	-0.01
Guilty	0.11	**0.64**	-0.06	-0.17	0.07
Nauseated	-0.18	**0.70**	0.09	0.06	-0.16
Sick	-0.10	**0.66**	0.09	0.12	-0.21
Specific sensory qualities					
Creamy	-0.01	-0.02	**0.44**	0.04	0.02
Fattening	-0.13	0.02	**0.39**	-0.38	0.11
Greasy	-0.14	0.06	**0.39**	-0.40	0.10
Heavy	-0.04	-0.02	**0.41**	-0.25	0.14
Messy	-0.12	0.08	**0.32**	-0.17	0.17
Oily	-0.01	0.13	**0.49**	**-0.36**	0.11
Salty	-0.06	0.07	**0.30**	-0.17	0.24
Slimy	-0.03	-0.06	**0.46**	0.14	-0.04
Sour	-0.07	-0.07	**0.67**	-0.04	-0.05
Wet	0.05	0.03	**0.36**	0.09	0.06

Table 2. Continued

Factor and item	1	2	3	4	5
Abstract cognitive qualities					
Healthy	-0.01	-0.07	0.07	**0.73**	0.12
Lean	0.00	0.03	0.17	**0.45**	0.06
Light	-0.09	-0.04	0.09	**0.52**	0.13
Nutrition	0.01	0.01	0.03	**0.71**	0.14
Safety	0.00	0.10	0.08	**0.35**	**0.30**
General sensory qualities					
Appearance	0.13	-0.24	0.02	-0.07	**0.54**
Color	0.13	-0.14	0.12	0.05	**0.34**
Flavor	0.19	-0.24	-0.04	-0.10	**0.59**
Odor	0.11	-0.17	0.16	-0.19	**0.42**
Preparation	-0.07	0.00	-0.07	0.17	**0.58**
Smell	0.16	-0.10	0.10	-0.26	**0.58**
Taste	0.20	-0.20	0.03	-0.09	**0.61**
Temperature	0.18	-0.11	0.06	-0.05	**0.32**
Texture	0.14	-0.16	0.23	0.02	**0.38**
Inconsistent across foods					
Available	-0.06	0.12	-0.03	0.19	**0.46**
Bitter	0.03	-0.13	**0.62**	0.01	-0.13
Bland	-0.05	-0.03	**0.32**	0.04	0.06
Chewy	0.08	0.06	**0.49**	-0.01	0.01
Complex	0.01	0.05	**0.40**	0.11	0.21
Convenient	-0.10	0.15	0.01	0.18	**0.51**
Cost	0.04	-0.01	0.09	0.12	0.25
Different	0.16	-0.01	**0.47**	0.15	-0.08
Dry	0.01	0.05	**0.35**	-0.06	-0.05
Exotic	0.11	-0.01	**0.46**	0.09	0.02
Fresh	0.12	-0.11	0.08	0.23	0.26
Lazy	0.28	**0.48**	-0.15	-0.14	0.16
Nostalgic	**0.30**	**0.36**	-0.01	0.09	-0.13
Novel	0.10	0.00	**0.42**	0.13	0.17
Routine	-0.01	0.14	0.11	0.05	0.27
Sleepy	**0.33**	**0.36**	-0.12	-0.08	0.11
Spicy	0.11	0.01	**0.38**	-0.21	0.09
Sweet	0.05	-0.03	**0.48**	0.11	-0.02

Note. The first five categories reflect groupings of items consistent across foods. Factor loadings greater than .30 are in boldface.

Table 3

Results of the Exploratory Factor Analysis for the Disliked Food

Factor and item	1	2	3	4	5
Positive affect					
Aroused	-0.01	**0.60**	-0.01	-0.04	-0.02
Comforted	0.05	**0.79**	-0.07	0.02	-0.01
Content	0.04	**0.65**	0.15	-0.08	-0.04
Happy	0.02	**0.84**	-0.14	0.00	0.00
Joyful	-0.01	**0.84**	-0.09	-0.01	0.00
Lively	0.01	**0.82**	0.00	0.06	-0.04
Refreshed	0.03	**0.79**	-0.04	0.05	-0.02
Relaxed	0.15	**0.70**	-0.03	0.02	0.05
Satisfied	0.01	**0.78**	-0.16	0.07	-0.01
Warm	-0.04	**0.58**	0.23	0.05	0.00
Negative affect					
Ashamed	-0.01	0.16	**0.63**	0.06	0.19
Bored	-0.16	0.16	**0.35**	0.00	-0.09
Concerned	-0.01	0.11	**0.58**	0.08	0.14
Depressed	-0.06	0.06	**0.56**	0.04	0.05
Disgusted	0.00	**-0.32**	**0.63**	-0.10	-0.05
Disturbed	-0.03	-0.13	**0.61**	-0.03	0.06
Guilty	-0.06	0.15	**0.51**	0.11	0.11
Nauseated	0.05	-0.21	**0.64**	-0.11	-0.02
Sick	0.09	-0.20	**0.74**	-0.11	-0.02
Specific sensory qualities					
Creamy	**0.37**	0.05	-0.12	0.14	-0.06
Fattening	**0.65**	-0.03	-0.05	-0.17	0.08
Greasy	**0.75**	0.00	-0.04	-0.16	0.08
Heavy	**0.44**	0.07	-0.05	0.00	-0.04
Messy	**0.42**	0.07	0.01	0.14	-0.08
Oily	**0.84**	0.00	0.02	-0.12	0.11
Salty	**0.38**	0.01	0.01	0.09	-0.21
Slimy	**0.39**	-0.08	0.05	0.12	-0.05
Sour	**0.37**	0.10	-0.11	0.16	0.00
Wet	**0.44**	0.01	-0.01	0.11	-0.07

Table 3. Continued

Factor and item	1	2	3	4	5
Abstract cognitive qualities					
Healthy	-0.12	-0.07	-0.04	-0.07	**-0.73**
Lean	-0.03	0.00	-0.03	0.03	**-0.60**
Light	0.03	0.02	0.04	-0.07	**-0.65**
Nutrition	-0.02	-0.04	-0.07	-0.15	**-0.74**
Safety	-0.01	-0.01	-0.05	-0.04	**-0.62**
General sensory qualities					
Appearance	-0.09	-0.03	-0.08	**0.76**	-0.01
Color	-0.07	-0.03	-0.01	**0.60**	-0.19
Flavor	0.02	0.11	-0.04	**0.86**	0.20
Odor	0.05	0.03	0.09	**0.68**	0.02
Preparation	0.24	0.05	-0.08	0.22	-0.29
Smell	0.05	0.06	0.01	**0.79**	0.12
Taste	0.03	0.09	-0.06	**0.80**	0.18
Temperature	0.20	0.03	0.06	0.20	**-0.43**
Texture	0.11	-0.05	-0.07	**0.53**	-0.08
Inconsistent across foods					
Available	0.13	0.14	0.01	-0.06	**-0.56**
Bitter	0.23	-0.03	0.05	0.20	-0.05
Bland	0.23	-0.06	0.12	0.12	-0.20
Chewy	0.26	-0.06	0.06	**0.31**	-0.21
Complex	0.28	-0.04	0.02	0.18	-0.23
Convenient	0.07	-0.12	-0.03	0.03	**-0.54**
Cost	0.03	0.03	-0.03	-0.08	**-0.39**
Different	0.11	0.09	0.02	0.16	**-0.35**
Dry	0.29	-0.06	0.06	0.18	-0.07
Exotic	**0.33**	0.09	-0.05	0.09	-0.25
Fresh	-0.15	-0.02	-0.09	**0.30**	**-0.56**
Lazy	-0.11	**0.41**	**0.40**	0.09	-0.08
Nostalgic	0.07	0.20	**0.38**	-0.11	0.02
Novel	0.28	0.00	0.00	0.14	**-0.35**
Routine	**0.35**	0.07	-0.01	0.10	-0.22
Sleepy	-0.06	**0.45**	**0.30**	-0.01	-0.10
Spicy	**0.44**	0.12	0.01	0.07	-0.05
Sweet	0.11	0.07	-0.17	0.21	-0.09

Note. The first five categories reflect groupings of items consistent across foods. Factor loadings greater than .30 are in boldface.

Table 4

Results of the Exploratory Factor Analysis for the Carbohydrate Food

Factor and item	1	2	3	4	5
Positive affect					
Aroused	**0.62**	0.06	-0.01	-0.05	-0.04
Comforted	**0.76**	0.01	0.04	0.06	-0.06
Content	**0.65**	-0.07	-0.08	0.02	0.10
Happy	**0.82**	-0.09	-0.03	-0.01	0.00
Joyful	**0.89**	-0.12	0.06	-0.06	-0.10
Lively	**0.78**	-0.01	0.03	0.11	-0.12
Refreshed	**0.69**	0.00	0.05	0.19	-0.08
Relaxed	**0.73**	0.07	0.02	0.06	0.05
Satisfied	**0.60**	-0.04	-0.03	0.08	0.17
Warm	**0.64**	0.06	-0.11	-0.08	0.02
Negative affect					
Ashamed	0.01	**0.74**	-0.07	-0.02	0.07
Bored	0.12	**0.32**	0.02	-0.01	-0.11
Concerned	0.09	**0.72**	0.03	-0.03	0.04
Depressed	-0.04	**0.80**	-0.05	0.02	0.02
Disgusted	-0.12	**0.86**	-0.03	0.02	-0.04
Disturbed	0.06	**0.76**	0.02	0.06	-0.07
Guilty	0.03	**0.62**	-0.07	-0.21	0.22
Nauseated	-0.09	**0.72**	0.05	-0.02	-0.14
Sick	-0.14	**0.71**	0.06	0.02	-0.10
Specific sensory qualities					
Creamy	0.00	0.07	**0.50**	0.14	0.03
Fattening	0.00	-0.02	**0.38**	**-0.34**	0.18
Greasy	0.03	-0.19	**0.61**	**-0.39**	0.08
Heavy	0.11	-0.01	**0.37**	-0.20	0.19
Messy	-0.03	-0.01	**0.30**	-0.29	0.26
Oily	-0.05	-0.11	**0.53**	**-0.35**	0.15
Salty	-0.10	0.01	**0.53**	0.25	0.05
Slimy	-0.02	0.06	**0.57**	0.03	-0.03
Sour	-0.03	-0.04	**0.62**	0.07	-0.18
Wet	0.13	0.08	**0.46**	-0.03	0.02

Table 4. Continued

Factor and item	1	2	3	4	5
Abstract cognitive qualities					
Healthy	-0.02	-0.12	0.03	**0.69**	0.06
Lean	-0.03	-0.09	0.11	**0.52**	0.11
Light	0.05	-0.09	0.01	**0.50**	-0.05
Nutrition	-0.07	-0.10	0.05	**0.66**	0.18
Safety	0.07	0.06	0.15	**0.46**	0.15
General sensory qualities					
Appearance	0.00	-0.01	-0.09	0.21	**0.68**
Color	-0.02	0.07	0.05	0.21	**0.56**
Flavor	0.05	-0.06	-0.12	-0.03	**0.60**
Odor	0.00	-0.07	0.06	-0.07	**0.50**
Preparation	0.03	-0.07	0.06	0.19	**0.32**
Smell	0.02	-0.03	-0.07	-0.11	**0.66**
Taste	0.08	-0.15	-0.21	0.05	**0.62**
Temperature	0.16	-0.03	-0.07	0.11	**0.48**
Texture	0.02	0.10	0.13	0.13	**0.60**
Inconsistent across foods					
Available	0.15	-0.03	0.06	**0.45**	0.15
Bitter	-0.08	-0.02	**0.65**	0.08	-0.10
Bland	-0.04	0.07	**0.43**	0.07	-0.06
Chewy	0.04	0.05	**0.40**	-0.18	**0.30**
Complex	0.09	0.00	0.25	0.14	0.29
Convenient	0.02	-0.04	0.04	**0.47**	0.16
Cost	0.10	0.12	0.08	0.22	0.14
Different	0.17	0.06	0.22	0.03	0.27
Dry	0.07	-0.10	**0.42**	0.08	-0.10
Exotic	0.29	-0.09	0.25	0.03	0.16
Fresh	0.18	-0.05	-0.12	0.22	0.27
Lazy	**0.36**	**0.32**	0.03	-0.12	0.11
Nostalgic	**0.36**	0.05	-0.08	-0.08	0.01
Novel	**0.38**	-0.09	0.04	0.15	0.16
Routine	0.14	-0.04	0.11	**0.37**	-0.02
Sleepy	**0.35**	0.24	-0.01	-0.05	0.12
Spicy	-0.06	-0.04	**0.37**	0.20	-0.04
Sweet	0.13	0.06	0.19	-0.22	0.12

Note. The first five categories reflect groupings of items consistent across foods. Factor loadings greater than .30 are in boldface.

Table 5

Results of the Exploratory Factor Analysis for the Fat Food

Factor and item	1	2	3	4	5
Positive affect					
Aroused	0.05	**0.57**	0.02	-0.07	0.08
Comforted	-0.03	**0.82**	0.06	-0.06	0.05
Content	-0.04	**0.70**	-0.07	-0.01	-0.10
Happy	-0.07	**0.79**	-0.05	-0.09	-0.08
Joyful	-0.01	**0.80**	-0.03	-0.01	-0.01
Lively	0.06	**0.71**	0.07	-0.05	0.03
Refreshed	0.07	**0.73**	0.08	-0.03	-0.06
Relaxed	-0.06	**0.65**	-0.14	-0.02	0.10
Satisfied	-0.08	**0.62**	-0.21	-0.08	-0.23
Warm	0.08	**0.71**	0.07	-0.03	0.09
Negative affect					
Ashamed	-0.10	0.04	-0.09	0.14	**0.71**
Bored	-0.04	0.04	0.04	0.01	**0.47**
Concerned	-0.15	0.17	-0.02	0.03	**0.64**
Depressed	-0.11	-0.01	-0.12	0.06	**0.68**
Disgusted	0.18	-0.09	**0.39**	0.06	**0.67**
Disturbed	0.04	0.04	**0.32**	-0.02	**0.67**
Guilty	-0.22	0.01	-0.15	0.09	**0.64**
Nauseated	0.20	-0.10	**0.43**	0.02	**0.62**
Sick	0.14	-0.01	**0.52**	-0.03	**0.53**
Specific sensory qualities					
Creamy	**0.61**	0.01	0.23	-0.09	-0.05
Fattening	-0.06	0.10	0.01	**-0.69**	-0.09
Greasy	-0.09	0.02	-0.08	**-0.81**	-0.10
Heavy	0.23	0.04	-0.15	-0.29	-0.04
Messy	0.07	0.17	0.00	**-0.46**	-0.10
Oily	-0.06	0.03	-0.06	**-0.77**	-0.11
Salty	-0.05	-0.04	**-0.32**	-0.26	0.12
Slimy	**0.48**	-0.04	0.24	**-0.32**	0.01
Sour	**0.31**	-0.28	-0.23	-0.23	0.21
Wet	**0.55**	-0.02	0.08	-0.22	0.01

Table 5. Continued

Factor and item	1	2	3	4	5
Abstract cognitive qualities					
Healthy	**0.63**	0.02	0.06	0.24	-0.23
Lean	**0.58**	-0.07	-0.08	0.14	-0.10
Light	**0.44**	-0.07	-0.11	0.20	-0.13
Nutrition	**0.63**	0.08	0.07	0.17	-0.27
Safety	**0.45**	0.07	-0.12	0.14	-0.12
General sensory qualities					
Appearance	0.18	0.11	**-0.57**	0.11	-0.01
Color	**0.31**	0.06	**-0.44**	0.08	-0.01
Flavor	-0.02	0.17	**-0.60**	0.06	-0.16
Odor	0.13	0.00	**-0.44**	-0.07	0.02
Preparation	**0.40**	0.26	-0.07	0.08	-0.07
Smell	0.11	0.13	**-0.52**	0.08	-0.12
Taste	-0.06	0.12	**-0.65**	-0.02	-0.21
Temperature	**0.32**	0.21	-0.10	0.09	-0.08
Texture	0.29	0.08	**-0.35**	-0.06	0.08
Inconsistent across foods					
Available	-0.02	0.17	-0.26	-0.22	0.01
Bitter	**0.47**	-0.28	-0.04	-0.26	0.14
Bland	**0.37**	0.03	0.11	-0.27	-0.07
Chewy	**0.39**	0.00	-0.14	-0.18	0.01
Complex	**0.41**	0.13	-0.10	-0.13	0.15
Convenient	-0.02	0.01	**-0.38**	-0.09	-0.01
Cost	0.15	0.06	-0.18	-0.04	0.15
Different	**0.51**	0.08	-0.13	-0.01	0.07
Dry	-0.06	-0.12	**-0.34**	-0.18	0.25
Exotic	**0.52**	0.05	-0.15	0.04	0.11
Fresh	0.25	0.15	-0.27	0.16	-0.17
Lazy	-0.12	**0.35**	-0.13	0.02	**0.35**
Nostalgic	0.06	**0.37**	-0.01	-0.02	0.22
Novel	**0.31**	0.13	-0.24	0.07	-0.01
Routine	0.18	0.10	-0.27	-0.15	-0.05
Sleepy	0.01	**0.37**	-0.06	0.10	**0.31**
Spicy	0.17	-0.05	**-0.33**	-0.10	0.10
Sweet	**0.43**	-0.09	-0.09	-0.10	0.05

Note. The first five categories reflect groupings of items consistent across foods. Factor loadings greater than .30 are in boldface.

Table 6

Results of the Exploratory Factor Analysis for the Protein Food

Factor and item	1	2	3	4	5
Positive affect					
Aroused	-0.01	**0.54**	0.06	-0.06	-0.17
Comforted	-0.04	**0.83**	-0.01	-0.01	0.06
Content	0.07	**0.68**	-0.14	0.03	0.11
Happy	0.00	**0.86**	0.00	-0.06	0.14
Joyful	-0.05	**0.87**	0.02	-0.02	0.09
Lively	-0.03	**0.87**	0.08	0.10	0.04
Refreshed	-0.01	**0.80**	0.14	0.17	0.11
Relaxed	0.05	**0.78**	-0.02	0.06	0.04
Satisfied	0.21	**0.65**	-0.06	-0.03	0.19
Warm	0.06	**0.66**	0.01	-0.03	-0.09
Negative affect					
Ashamed	0.06	0.00	-0.03	0.01	**-0.76**
Bored	-0.01	0.08	-0.08	0.08	**-0.53**
Concerned	0.14	0.06	-0.04	-0.09	**-0.76**
Depressed	0.12	-0.02	-0.04	0.02	**-0.77**
Disgusted	**-0.31**	-0.16	0.22	0.12	**-0.61**
Disturbed	-0.25	-0.05	0.12	0.04	**-0.63**
Guilty	0.08	0.06	-0.08	-0.13	**-0.63**
Nauseated	-0.27	-0.14	0.23	0.18	**-0.60**
Sick	**-0.32**	-0.14	0.18	0.15	**-0.67**
Specific sensory qualities					
Creamy	0.05	0.05	**0.62**	0.29	0.10
Fattening	-0.07	0.03	0.23	**-0.44**	0.02
Greasy	-0.14	0.10	**0.37**	**-0.65**	0.11
Heavy	0.19	-0.06	0.22	**-0.33**	0.00
Messy	0.01	-0.05	**0.43**	-0.10	-0.02
Oily	-0.17	0.10	**0.34**	**-0.60**	0.12
Salty	0.24	-0.03	0.02	**-0.50**	0.00
Slimy	0.10	0.03	**0.59**	-0.06	-0.04
Sour	0.04	0.05	**0.59**	-0.08	0.03
Wet	0.07	0.01	**0.56**	0.15	0.06

Table 6. Continued

Factor and item	1	2	3	4	5
Abstract cognitive qualities					
Healthy	**0.63**	0.06	0.09	**0.40**	-0.03
Lean	**0.47**	-0.03	0.12	-0.01	0.05
Light	**0.42**	-0.01	0.15	**0.46**	0.05
Nutrition	**0.64**	0.04	0.15	**0.37**	0.04
Safety	**0.55**	0.06	0.16	0.15	-0.08
General sensory qualities					
Appearance	**0.69**	0.01	-0.10	-0.14	0.02
Color	**0.63**	-0.06	-0.14	-0.13	0.04
Flavor	**0.60**	0.23	-0.26	-0.20	0.21
Odor	**0.50**	0.05	-0.03	-0.25	0.01
Preparation	**0.42**	0.08	0.17	-0.01	0.01
Smell	**0.49**	0.16	-0.11	**-0.32**	0.01
Taste	**0.62**	0.20	-0.26	-0.19	0.21
Temperature	**0.53**	0.02	0.16	0.04	0.13
Texture	**0.53**	0.07	0.01	-0.14	0.12
Inconsistent across foods					
Available	0.22	0.25	0.07	0.00	0.10
Bitter	0.15	-0.13	**0.44**	-0.19	-0.12
Bland	0.09	0.00	**0.42**	-0.11	0.02
Chewy	0.25	0.04	0.04	**-0.50**	-0.05
Complex	**0.40**	0.01	0.17	-0.12	-0.05
Convenient	**0.33**	0.28	0.02	-0.06	0.11
Cost	0.18	0.08	0.10	0.09	0.09
Different	**0.35**	0.07	-0.01	-0.16	0.04
Dry	0.16	-0.07	-0.16	**-0.46**	-0.02
Exotic	**0.37**	0.08	0.09	-0.15	-0.06
Fresh	**0.65**	0.11	0.02	0.20	0.07
Lazy	-0.06	**0.44**	-0.06	-0.07	**-0.32**
Nostalgic	-0.04	**0.36**	-0.01	-0.01	-0.16
Novel	**0.44**	0.13	0.14	-0.01	-0.09
Routine	**0.46**	0.05	0.12	-0.05	0.01
Sleepy	0.07	**0.37**	-0.12	-0.05	-0.28
Spicy	0.21	0.07	-0.15	**-0.59**	-0.02
Sweet	0.27	-0.04	0.29	-0.17	-0.07

Note. The first five categories reflect groupings of items consistent across foods. Factor loadings greater than .30 are in boldface.

alpha score was 0.92 for positive affect, 0.87 for negative affect, 0.75 for abstract cognitive qualities, 0.78 for specific sensory qualities, and 0.84 for general sensory qualities.

Scale correlations. The correlations among the scales for each food type were also examined. Positive affect, negative affect, specific sensory qualities, abstract cognitive qualities, and general sensory qualities scores were computed by averaging the items comprising each scale for each food category (see Tables 1–6 for scale items). Correlations between these scores were then computed for each food type and can be found in (Table 8). Overall, negative affect was negatively correlated with each of the other scales across food types. Also, the general sensory qualities scale was moderately correlated to specific sensory qualities and positive affect across food types.

Regression analyses. To explore the predictive validity of these five scales, separate regression analyses were performed using the five scales as predictors of the overall attitudes toward each of the valence food categories and each of the specific foods. First, the two overall evaluation scales for each food category/specific food were averaged into one overall attitude score for each food category and each specific food. Then, positive affect, negative affect, specific sensory qualities, abstract cognitive qualities, and general sensory qualities scores were computed by averaging the items comprising each scale for each food category and each specific food (see Tables 1–6 for scale items). In each regression procedure, the specific sensory qualities score, the abstract cognitive qualities score, the general sensory qualities score, the positive affect score, and the negative affect score were entered simultaneously. For each regression procedure, the overall model accounted for a significant amount of variance in the dependent variable ($p < .001$), and as can be seen in (Table 9), the various scales were differentially predictive of attitudes. The positive affect scale was a significant predictor of each of the food attitudes, and the negative affect and general sensory qualities scales were predictive of the majority of the food attitudes. The specific sensory qualities scale was a significant predictor of attitudes toward sopapillas, and the abstract cognitive qualities scale was a marginally significant predictor of attitudes toward chicken ($p = .058$).

Discussion

The goal of this study was to identify factors common to a wide range of food attitudes. The findings consistently revealed positive affect, negative affect, specific sensory qualities, abstract cognitive qualities, and general sensory qualities factors across six food attitude types. Although previous research has not attempted to systematically examine informational bases of attitudes across a variety of foods, the factors identified in this study are somewhat consistent with previous research that has examined factors

Table 7

Internal Consistency of Each of the Five Factors Across Food Categories and Across Specific Foods

	PAF	NAF	ACQ	SSQ	GSQ
Food categories					
Liked	.90	.84	.78	.75	.66
Disliked	.93	.83	.81	.80	.88
Neutral	.91	.87	.75	.77	.85
Specific foods					
Beef jerky	.92	.88	.69	.77	.88
Chicken	.94	.90	.75	.79	.80
Cottage cheese	.93	.88	.79	.72	.88
Potato chips	.90	.85	.80	.79	.71
Beef brisket	.92	.88	.78	.79	.82
Guacamole	.92	.87	.75	.72	.85
Sopapillas	.91	.90	.74	.74	.84
Spaghetti	.91	.88	.73	.81	.84
Rice	.92	.79	.71	.79	.78

Note. Values listed are Cronbach's alpha scores.

important for an individual's general food preferences and selection (e.g., Letarte et al., 1997; Roininen et al., 1999; Shepherd & Farleigh, 1989; Steptoe et al., 1995). For example, Shepherd and Farleigh (1989) suggest that a number of sensory attributes are important determinants of food choice (e.g., appearance, color, taste, odor, saltiness, sourness, among others), and these attributes were components of either the specific or general sensory qualities factors identified in the present study. Also, health and nutritional beliefs about foods were two important components of the abstract cognitive qualities factor in the present study, and they have consistently been found to be important determinants of food selection (e.g., Letarte et al., 1997; Roininen et al., 1999; Steptoe et al., 1995).

In addition to identifying factors common to a wide range of food attitudes, this study explored the internal consistency of the items selected to comprise the scales measuring each factor and the ability of the identified scales to predict attitudes. The positive affect, negative affect, and general sensory qualities scales had consistently good internal consistencies and were

Table 8

Correlations Among the Factors for Each Valence Food Type and Macronutrient Food Type

	SSQ	GSQ	PAF	NAF
ACQ				
Liked	-.09	.10	.11*	-.16**
Neutral	.01	.16**	.05	-.06
Disliked	.29**	.23**	.07	-.18**
Carbohydrate	.02	.26**	.17**	-.26**
Fat	.16**	.38**	.08	-.32**
Protein	.21**	.49**	.30**	-.24**
SSQ				
Liked		.15**	.02	.03
Neutral		.34**	.06	-.04
Disliked		.44**	.15**	-.21**
Carbohydrate		.22**	.10	-.03
Fat		.27**	.09	-.07
Protein		.32**	.09	-.11
GSQ				
Liked			.38**	-.02
Neutral			.34**	-.27**
Disliked			.29**	-.17**
Carbohydrate			.42**	-.12**
Fat			.42**	-.28**
Protein			.46**	-.41**
PAF				
Liked				-.02
Neutral				.09
Disliked				.01
Carbohydrate				.09
Fat				-.08
Protein				-.21**

*$p < .05$. **$p < .01$.

Table 9

Results of the Simultaneous Regression Analysis for Each Food

	ACQ	SSQ	GSQ	PAF	NAF	Adjusted R^2
Liked	.04	-.05	.10^{+}	.26*	-.12*	.10
Neutral	-.04	.02	.19*	.33*	-.28*	.27
Disliked	.00	.07	.21*	.23*	-.31*	.25
Sopapillas	-.11	-.15*	.37*	.31*	-.47*	.60
Spaghetti	-.01	-.07	.45*	.21*	-.13	.30
Rice	.03	-.01	.15	.42*	-.14	.20
Potato chips	-.12	.08	.25	.35*	-.44*	.41
Beef brisket	-.10	-.06	.26*	.27*	-.48*	.47
Guacamole	.00	-.10	.36*	.37*	-.37*	.62
Beef jerky	-.09	.03	.35*	.43*	-.28*	.59
Chicken	.16^{+}	-.02	.20*	.33*	-.31*	.44
Cottage cheese	.09	-.08	.18*	.37*	-.49*	.66

Note. Values listed are beta values. *Significant predictor of the food attitude ($p < .05$). $^{+}$Marginal predictor of the food attitude ($p = .084$ for GSQ as a predictor of attitude toward the Liked food, $p = .058$ for ACQ as a predictor of attitude toward chicken).

predictive of most food attitudes, suggesting that these factors are likely important predictors of attitudes toward many foods. The abstract cognitive qualities and the specific sensory qualities scales, however, had slightly lower internal consistencies and predicted fewer attitudes.

There are a couple of reasons that may explain the relative weakness of the abstract cognitive and specific sensory scales. Because this study was designed to investigate the number and type of dimensions that underlie food attitudes and not to develop a scale for measuring these dimensions, the experimental procedures may have limited the internal consistencies and predictive validities of the scales. Specifically, it may be possible to improve the consistency and predictive ability of future scales by using different scale items and instructions. Because of the nature of this experiment, we could not include all of the potentially important items. In fact, we attempted to reduce the number of items to a manageable number by eliminating items that were similar to another item that was included. Although this strategy

allowed us to use a broad range of items, it limited the number of items for any given factor, which could limit the consistency and predictive validity of the scales identified in this study. Thus, there may be better items for assessing the underlying dimensions than the ones used in this study. It may also be possible to improve the ability of future scales to assess the underlying dimensions by changing the instructions that precede each scale. Because one set of instructions did not seem applicable for all of the items, we used separate instructions for the food characteristic items and for the affective reaction items. Two factors emerged from the affective reaction items (positive and negative affect) and three factors emerged from the food characteristic items (general sensory, abstract cognitive, and specific sensory). It is possible that the instructions contributed to the differential internal consistencies and predictive validities of the scales measuring these five factors. For instance, the instructions preceding the food characteristic items may have been more applicable to the general sensory items than to the abstract cognitive and specific sensory items.

The importance for future research to develop better scales and instructions for assessing the underlying dimensions can be seen by inspecting the pattern of regression weights for the different scales. As can be seen in Table 9, the relation between general sensory qualities, positive affect, and negative affect and attitudes is consistent across all of the foods. For instance, more positive scores on the positive affect factor lead to more positive attitudes. This is not the case, however, for the abstract cognitive qualities scale. High scores on abstract cognitive qualities (e.g., healthy, safety) lead to more negative attitudes toward potato chips, brisket, and sopapillas (foods that are relatively high in fat and therefore more likely to be perceived as unhealthy compared to the other items) and more positive attitudes toward chicken and cottage cheese (foods that are likely perceived as healthy by participants). This finding is interesting because it suggests that abstract cognitive qualities can positively or negatively impact attitudes.

A second reason why the internal consistencies and predictive validities of the cognitive qualities and specific sensory qualities scales may have been lower is that these factors may be more food specific than the other factors. This may be especially important for the specific sensory qualities factor. For example, people may expect brownies to be sweet but not potato chips or expect oysters to be slimy but not crackers. More research is needed to explore whether a single scale that measures each of these dimensions can be used for all foods or whether tailored scales are needed for different types of foods.

An interesting finding of the regression procedures is that the five scales taken together explained more variance in attitudes toward specific foods (i.e., potato chips, chicken) than in the valence categories attitudes (i.e., positive, neutral). As can be seen in Table 9, the adjusted R^2 values were

higher, though still varied, for the specific foods (range of .20–.67) than for the food categories (range of .11–.26). This finding is not surprising, given that there was likely a range restriction for the attitudes toward the valence (like/neutral/dislike) category foods, especially the positive and negative categories (e.g., liked food items, by definition, will be rated only in the positive end of the attitude scale). Visual inspection of the standard deviations of the means for each of the dependent variables in the regressions, in fact, supports this explanation (range of .91–1.29 for the valence category foods; range of 1.12–2.40 for the specific food items). We used valence categories in this initial study to ensure that the scales would be useful across the entire evaluative spectrum and could generalize to many different foods. Future research can now examine specific foods or specific types of foods (e.g., savory vs. sweet).

Study 2

The primary goal of Study 2 is to replicate the factor structure identified in Study 1 using a confirmatory factor analysis approach. Study 1 employed an exploratory factor analysis approach because the structure of food attitudes specifically had not been examined previously, and therefore no a priori predictions could be made about the factors underlying food attitudes. With a consistent factor structure having been identified using an exploratory approach, Study 2 uses a confirmatory analysis approach to provide both a replication and a statistical test of the fit of the identified food attitude structure. Furthermore, Study 2 attempts to confirm the factor structure identified in Study 1 using a different rating scale, different instructions, and different foods. In Study 1, the affect items were presented separately and with different instructions and different rating scales from the food characteristic items. It is therefore possible that the identified factor structure partially reflected methodological artifact (i.e., question structure) rather than conceptually different factors. That is, the sensory qualities may have loaded on separate factors than the affect items simply because they were assessed with different instructions and rating scales. Study 2 presents all the items intermixed with one set of instructions and one rating scale. To ensure that the factor structure identified in Study 1 replicates across various foods, a different set of foods is examined in Study 2. Specifically, foods are selected to represent categories of the food pyramid (i.e., vegetable, fruit, dairy, fat [savory], fat [sweet], and bread/grain).

A secondary goal of Study 2 is to compare the food-specific attitude structure model identified in Study 1 to a more traditional attitude model. There are two general differences between the food-specific attitude model

identified in Study 1 and more traditional attitude models. First, positive and negative affect were found to comprise separate factors while traditionally this distinction has not been made, though there is a growing consensus that the positive and negative substrates of attitudes should be considered separate (e.g., Cacioppo, Gardner, & Berntson, 1997; Eagly & Chaiken, 1998). Study 2 further examines this issue by comparing the food-specific model that separates positive and negative affect to a more traditional attitude model that does not. Second, sensory qualities were found to comprise separate factors while other research that has examined sensory factors (e.g., taste and smell) has classified such items as affective information (e.g., Edwards, 1990; Fabrigar & Petty, 1999; Shavitt & Fazio, 1991). The relationship of such items to items usually conceptualized as affective information has not yet been explicitly examined, and therefore, Study 2 attempts to elucidate whether the general sensory qualities factor should be considered a separate attitude base or should be considered part of a more general affective base.

Methods

Item revision. The items included in the food attitude questionnaire used in Study 2 differed somewhat from the items included in Study 1. A few repetitive items were excluded in Study 2, and a few items were added. First, affective items were added so that there would be a better range of affective states (see Larsen & Diener, 1992; Remington, Fabrigar, & Visser, 2000). Specifically, two high arousal (excited and enthusiastic) and two low arousal (calm and at ease) positive affect items and one low arousal negative affect item (sluggish) were added. Second, a few items that are likely important determinants of food likes and dislikes that were not included in the first study were added (natural, filling, familiar, traditional).[9]

Participants. Participants were 374 (157 males, 209 females, and 8 who did not report their gender) students from the University of Texas at El Paso who either participated as partial fulfillment of a course requirement or were paid five dollars for their participation. Participants ranged in age from 17 to 59 years ($M = 21.20$ years, $SD = 5.72$), and dietary restraint scores ranged from 0 to 21 ($M = 8.00$, $SD = 5.35$). The sample consisted primarily of Latinos (77.0%, 9.1% Anglo American, 3.7% African American, 1.1% Asian American, 5.1% listed their ethnicity as "Other," and 3.7% did not indicate their ethnicity).

[9]Items that have been proposed as important determinants of food-related behavior (i.e., available, convenient, value, cost, quality), rather than food attitudes, were also included for exploratory purposes, as were items measuring past and future intended behaviors (i.e., purchasing and eating) regarding foods. However, because the goal of this study is to confirm the factor structure of food attitudes, these items will not be discussed here.

Materials. The experimental materials packet consisted of the revised food attitude questionnaire and additional measures. The food attitude questionnaire consisted of several scales on which six food items were rated. The food items were chosen so that there would be an item from each of the food pyramid food groups: broccoli (vegetable), apple (fruit), cottage cheese (dairy), chorizo (savory fat item), chocolate cake (sweet fat item), and spaghetti with tomato sauce (bread/grain). The first section of the food attitude questionnaire consisted of three scales for rating overall attitude towards the six foods. These attitude scales were bipolar and were labeled (a) *dislike extremely, dislike, dislike slightly, neither like nor dislike, like slightly, like, like extremely,* (b) *extremely bad, bad, slightly bad, neither bad nor good, slightly good, good, extremely good,* and (c) *extremely negative, negative, slightly negative, neither negative nor positive, slightly positive, positive, extremely positive.* The instructions asked participants to "please rate your reaction to each food using the scales provided below. Place an 'X' next to the phrase that best describes your reaction toward each food." Each food was presented with the dislike/like scale, then each food was presented with the bad/good scale, and finally each food was presented with the negative/positive scale.

The next section of the food attitude questionnaire consisted of 51 food characteristic items. Each of the 51 items was embedded in one of seven possible statements. The positive and negative affective items were each presented in one of the following two statements: "I feel *lively* when I eat CHOCOLATE CAKE," or "The thought of eating CHOCOLATE CAKE makes me feel *comforted.*" The other food characteristic items were embedded in one of the following five statements: "I consider CHOCOLATE CAKE to be *healthy*," "I think CHOCOLATE CAKE is *convenient*," "I believe that CHOCOLATE CAKE is *fattening*," "I like the *texture* of CHOCOLATE CAKE," "I think the *appearance* of CHOCOLATE CAKE is positive." Each statement was presented with a 5-point bipolar scale labeled *agree strongly, agree, undecided, disagree, disagree strongly.* One food was presented with each of the 51 statements/scales, and then another food was presented with each of the 51 statements/scales, etc. The order of the presentation of the foods was varied randomly, and the 51 food characteristic statements were presented in a different random order for each of the six foods. These statements/scales were preceded by the following instructions:

> Please rate CHOCOLATE CAKE on the scales below. Indicate how true or descriptive each statement is of your beliefs about CHOCOLATE CAKE by circling the appropriate description. There are no right or wrong answers—we are interested in your beliefs about CHOCOLATE CAKE.

The packet also contained ancillary measures for assessing dietary restraint (restraint subscale of the Three Factor Eating Questionnaire; Stunkard & Messick, 1985), demographic information, and current physiological state. The demographic measures assessed gender, age, and ethnicity. The current physiological state measures consisted of four scales for assessing how tired, hungry, thirsty, and full participants were when they completed the food attitude questionnaire. Each of these three dimensions was assessed using a single 7-point unipolar scale (1 to 7) with endpoints labeled *not at all* and *extremely*.

Procedure. Data were collected during the spring, summer, and fall of 2002. For participants who took part in the study in partial fulfillment of a course requirement, the packets were administered in groups ranging in size from 2 to 19. The experimenter told participants that the purpose of the study was to explore reasons why people like or dislike foods and explained that the participants would be asked to rate six foods on various characteristics that may or may not contribute to their food attitudes. After participants gave their informed consent, the experimenter distributed the questionnaires. When participants returned the completed packet, they were given credit for their participation and were given a debriefing sheet explaining that the purpose of the questionnaire was to identify the informational components that contribute to attitudes toward foods.

Participants who were paid for their participation were recruited during lunchtime (approximately from 11 A.M. to 2 P.M.) from the Union Building at the University of Texas at El Paso. Experimenters displayed a sign inviting students to complete a questionnaire and receive five dollars for their participation. When students approached the experimenters, they were informed that the purpose of the study was to explore reasons why people like or dislike foods and that participation in the study required that they complete a questionnaire that would ask them to rate six foods on various characteristics that may or may not contribute to their food attitudes. Interested volunteers were asked to sign an informed consent and were then given the experimental packet. When participants returned the completed packet, they were paid five dollars for their participation and were given a debriefing sheet.

Analyses and Results

Confirmatory factor analyses. In order to test whether the five-factor model identified in Study 1 was a good fit for the data, six separate confirmatory factor analyses were conducted (one on each food item). Twelve items (lively, at ease, joyful, relaxed, calm, comforted, enthusiastic, excited, refreshed, content, satisfied, rewarded) were specified to comprise a

positive affect factor (PAF); 10 items (guilty, ashamed, depressed, concerned, disturbed, disgusted, sluggish, nauseated, bored, sick) were specified to comprise a negative affect factor (NAF); 8 items (taste, smell, texture, flavor, temperature, appearance, filling, preparation) were specified to comprise a general sensory qualities factor (GSQ); 8 items (healthy, lean, light, nutritious, safe, traditional, natural, familiar) were specified to comprise an abstract cognitive qualities factor (ACQ); and 8 items (sour, salty, greasy, messy, wet, heavy, fattening, creamy) were specified to comprise a specific sensory qualities factor (SSQ).[10] The results of these confirmatory factor analyses are presented in Tables 10–12.

Table 10 presents the factor loadings for each item across foods. Overall, the items had high factor loadings, but as in Study 1, the items loading most highly on any given factor varied across foods. For example, traditional and familiar did not have significant factor loadings for chocolate cake but did load significantly for each of the other foods. Also, the factor loadings for the items comprising the SSQ factor had more variability within and between foods than the items comprising any of the other factors. This further suggests that the items best indexing this factor may be food specific. The correlations among the factors by food are presented in Table 11. With the exception of correlations between the SSQ and PAF factors, the majority of correlations amongst all of the factors were moderate to high across foods.

To determine model fit, root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) values were examined because both have been found to be effective in detecting misspecified models (for descriptions of fit indices and ranges of acceptable fit, see Byrne, 1998; Hu & Bentler, 1998). RMSEA is a measure of the discrepancy between the hypothesized model and the data that takes into account the complexity of the model being tested (i.e., the number of parameters being estimated in the model). Values less than .05 indicate good fit, those less than .08 indicate acceptable fit, and those less than .10 indicate marginal fit. SRMR is a measure of average standardized residuals (discrepancy between the hypothesized model and the data), with values less than .09 indicating good fit. As can be seen in Table 12, these fit indices indicate marginal to good fit across most of the foods: The RMSEA values indicate acceptable or marginal fit for all of the foods, and the SRMR values indicate good fit for three of the six foods.

Structural equation modeling: Model comparison. A series of structural equation models were tested to determine what model best predicted global

[10]Traditional, natural, filling, and familiar were not included in Study 1 and therefore had to be assigned to factors based on how similar they were conceptually to the other items comprising the factors.

Table 10

Results of the Confirmatory Factor Analyses for each Food

	Apple	Broccoli	Chocolate cake	Chorizo	Cottage cheese	Spaghetti
PAF						
Lively	.75	.77	.81	.76	.83	.78
At ease	.62	.70	.70	.68	.74	.74
Joyful	.81	.82	.82	.82	.77	.84
Relaxed	.80	.78	.79	.79	.81	.80
Calm	.67	.78	.75	.78	.70	.79
Comforted	.68	.80	.77	.69	.70	.77
Enthusiastic	.75	.77	.75	.79	.78	.78
Excited	.73	.72	.76	.76	.77	.83
Refreshed	.63	.77	.66	.73	.80	.74
Content	.69	.70	.69	.68	.76	.71
Satisfied	.73	.76	.71	.73	.73	.73
Rewarded	.68	.58	.60	.70	.77	.78
NAF						
Guilty	.72	.71	.42	.62	.60	.66
Ashamed	.68	.60	.44	.64	.64	.54
Depressed	.67	.71	.73	.73	.58	.77
Concerned	.64	.60	.41	.55	.56	.63
Disturbed	.76	.75	.72	.78	.84	.73
Disgusted	.66	.81	.80	.78	.77	.79
Sluggish	.50	.57	.41	.62	.59	.45
Nauseated	.71	.75	.71	.71	.81	.65
Bored	.41	.61	.66	.70	.64	.71
Sick	.70	.79	.63	.73	.83	.78
ACQ						
Healthy	.57	.79	.84	.79	.79	.66
Lean	.36	.38	.60	.53	.59	.30
Light	.48	.53	.61	.53	.63	.27
Nutritious	.74	.75	.84	.78	.78	.76
Safe	.55	.61	.34	.63	.59	.66

Table 10. Continued

	Apple	Broccoli	Chocolate cake	Chorizo	Cottage cheese	Spaghetti
Traditional	.52	.28	.08^{ns}	.19	.42	.40
Natural	.68	.75	.57	.68	.58	.57
Familiar	.59	.53	.00^{ns}	.32	.55	.52
GSQ						
Taste	.62	.80	.80	.81	.86	.76
Smell	.64	.69	.76	.75	.74	.75
Texture	.57	.72	.67	.68	.80	.68
Flavor	.64	.79	.76	.84	.88	.77
Temperature	.45	.46	.63	.64	.67	.62
Appearance	.68	.70	.60	.60	.77	.76
Filling	.29	.44	.60	.55	.45	.59
Preparation	.43	.41	.19	.35	.26	.52
SSQ						
Sour	.19	.63	.80	.10^{ns}	.39	.35
Salty	.57	.52	.78	-.35	.37	.44
Greasy	.76	.80	.27	-.79	.65	.58
Messy	.56	.64	-.03^{ns}	-.52	.40	.15
Wet	.06^{ns}	-.04^{ns}	.49	-.05^{ns}	.04^{ns}	.25
Heavy	.46	.60	-.09^{ns}	-.46	.63	.42
Fattening	.69	.77	-.31	-.86	.61	.45
Creamy	.64	.52	.04^{ns}	.21	-.09^{ns}	.39

Note. Values shown are standardized factor loadings. Except where noted (by superscript ^{ns}), all loadings are significantly different from zero ($p < .05$).

attitudes: the food-specific model or a more traditional attitude model (see Figure 1). For the more traditional attitude model, the items that comprised the general sensory, positive affect, and negative affect factors in the confirmatory factor analyses reported above were specified to comprise an affective factor, and the items that comprised the abstract cognitive qualities factor were specified to comprise a cognitive factor. Because in both Study 1 and Study 2 the specific sensory qualities factor was found to correlate with the affective factors (general sensory qualities, positive affect, and negative affect) and the cognitive factor (abstract cognitive qualities), the specific

Table 11

Correlations Among the Factors for Each Food

	SSQ	GSQ	PAF	NAF
ACQ				
Apple	-.63*	.88*	.34*	-.64*
Broccoli	-.67*	.52*	.28*	-.54*
Chocolate cake	.55*	.01	.33*	-.06
Chorizo	.55*	.49*	.61*	-.34*
Cottage cheese	-.53*	.52*	.42*	-.30*
Spaghetti	-.08	.76*	.62*	-.35*
SSQ				
Apple		-.54*	-.05	.87*
Broccoli		-.25*	.03	.71*
Chocolate cake		-.47*	-.01	.55*
Chorizo		-.10	.15*	-.07
Cottage cheese		-.20*	-.05	.60*
Spaghetti		.10	.11	.45*
GSQ				
Apple			.54*	-.66*
Broccoli			.74*	-.64*
Chocolate cake			.68*	-.57*
Chorizo			.66*	-.64*
Cottage cheese			.80*	-.64*
Spaghetti			.72*	-.47*
PAF				
Apple				-.19*
Broccoli				-.30*
Chocolate cake				-.39*
Chorizo				-.30*
Cottage cheese				-.33*
Spaghetti				-.18*

*$p < .05$.

Table 12

Fit Indices Across Foods for the Confirmatory Factor Analyses

	RMSEA	SRMR
Apple	0.06	0.07
Broccoli	0.07	0.08
Chocolate cake	0.09	0.12
Chorizo	0.08	0.11
Cottage cheese	0.08	0.10
Spaghetti	0.07	0.09

sensory qualities factor was kept as a separate factor in the traditional attitude model. The paths between factors and global attitude (indicated by the like/dislike, good/bad, and positive/negative attitude scales) were then estimated. The results of these structural equation models are presented in Tables 13 and 14.

Table 13 presents the path coefficients for each of the factors predicting global attitude for each food item. As in Study 1, the factors most predictive of global attitude varied across foods in the food-specific attitude model. For example, NAF was most predictive of global attitudes toward apples, but GSQ was most predictive of attitudes toward spaghetti. In contrast, for the more traditional attitude model, affect was consistently the best predictor of global attitudes across foods, with cognition a significant predictor of global attitude towards only chocolate cake and SSQ not predictive of global attitudes toward any of the foods. The fit indices across all foods for the food-specific and more traditional attitude models are presented in Table 14. Across all foods, the food-specific model showed a better fit than the more traditional attitude model, and in fact, the traditional attitude model produced poor fit for all of the foods.

Discussion

The primary goal of Study 2 was to verify the attitude structure identified in Study 1 using a confirmatory factor analysis approach. Confirmatory factor analyses revealed that the food-specific attitude structure model had good fit for the majority of the foods. Consistent with Study 1, the item factor loadings varied across foods, especially for the specific sensory qualities factor, again suggesting that the items within this factor may be

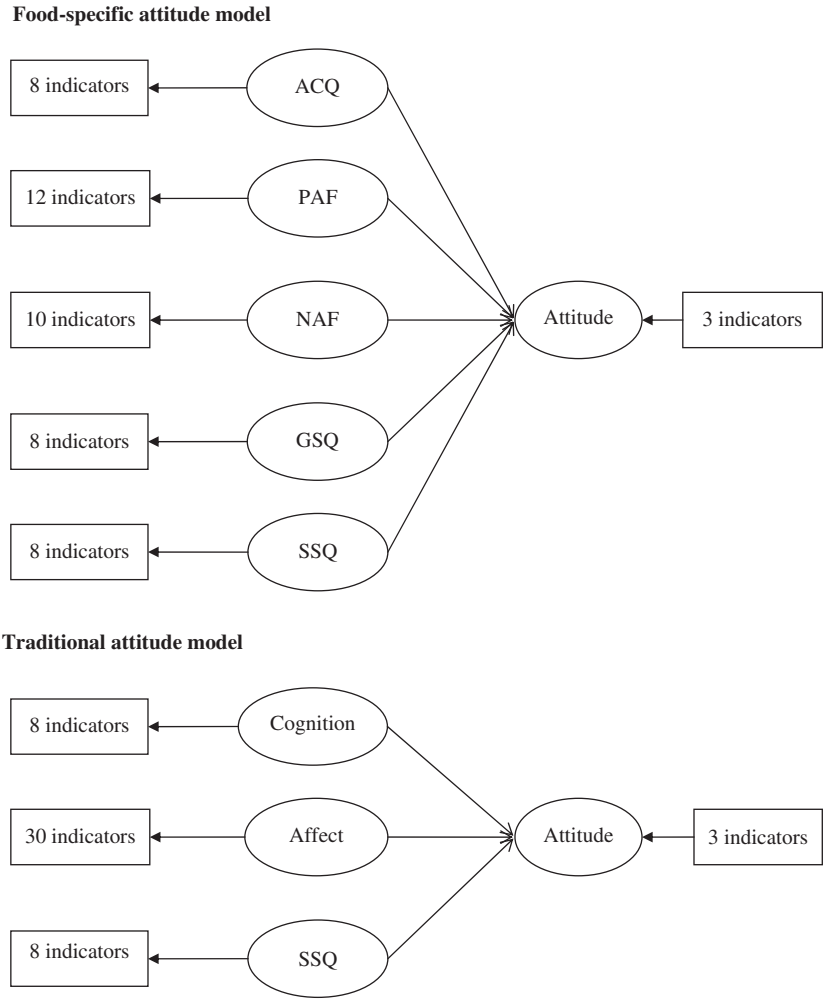

Figure 1. Food-specific and traditional attitude models compared in Study 2.

food specific. For example, sour loaded highly for chocolate cake but not for chorizo. The food-specific attitude structure model was then shown to have better fit than a more traditional attitude structure model across foods. Again, consistent with Study 1, the factors most predictive of global attitude were found to vary across foods. For example, NAF was most predictive of attitudes toward apples while attitudes toward broccoli were predicted most by GSQ.

Table 13

Path Coefficients for Factors Predicting Global Attitude Across Foods for the Food-Specific and Traditional Attitude Models

	Food-specific model					Traditional model		
	PAF	NAF	ACQ	GSQ	SSQ	AFF	COG	SSQ
Apple	-.22*	.58*	.15	-.29	-.41	-.47 *	-.02	.01
Broccoli	.16*	.16	.07	-.91*	-.05	-.68 *	-.01	.13
Chocolate cake	-.03	.26*	-.11	-.66*	-.30*	-.64 *	-.19*	.05
Chorizo	.00	.13*	-.01	-.73*	-.10	-.71 *	-.03	.03
Cottage cheese	.16	-.01	.08	-1.02*	.11	-.79 *	.01	.10
Spaghetti	.05	-.22*	.29*	-1.17*	.30*	-.57 *	-.09	.08

Note. Paths significantly different from zero are denoted with an asterisk ($p < .05$).

Although this study suggests that a food-specific model is preferable to a more traditional attitude model, future research is needed to empirically test whether the five-factor model is more appropriate than a more traditional model. For instance, if it could be demonstrated that experimental manipulations (e.g., hunger) differentially influence the positive emotions, negative emotions, and general sensory qualities components (e.g., influence general sensory qualities but not positive emotions), this would suggest that

Table 14

Fit Indices for the Food-Specific and Traditional Attitude Model Structural Equation Models for Fach Food

	Food-specific Model		Traditional model	
	RMSEA	SRMR	RMSEA	SRMR
Apple	0.06	0.07	0.14	0.14
Broccoli	0.07	0.08	0.14	0.14
Chocolate cake	0.08	0.12	0.13	0.14
Chorizo	0.08	0.10	0.15	0.13
Cottage cheese	0.07	0.10	0.15	0.13
Spaghetti	0.07	0.09	0.14	0.13

these are indeed separate, distinct factors. However, if it were found that manipulations equally influence positive emotions, negative emotions, and general sensory qualities, it would suggest that these three components are really just components of a more general affective component.

General Discussion

Taken together, the findings from both of these studies suggest that food attitudes are comprised of at least five distinct informational bases and that this food-specific attitude structure model is a more adequate description of food attitude structure than a more traditional affective/cognitive attitude structure model. Although the traditional attitude structure model has been extensively examined and applied to a wide variety of attitude objects, it is possible that, like foods, many classes of attitude objects contain more than just affective/cognitive bases and that these bases may vary from domain to domain. Because attitudes can be better understood by examining their bases, the results of these studies suggest that research in other attitude domains may benefit from identifying the bases that comprise specific classes of attitude objects.

The current findings may have important implications for the promotion of healthier eating. Food selection and subsequent eating behavior can have many drastic health consequences. Understanding the factors that contribute to food selection is a first step in changing eating behavior because food attitudes should guide eating behavior just as attitudes toward other classes of objects guide behavior toward those objects (e.g., see Fazio, 1990; Fishbein & Ajzen, 1975; Kraus, 1995). Therefore, one means of changing eating behavior may be to first change food attitudes. Research examining the affective and cognitive informational bases of attitudes has demonstrated that attitude change can be more effective if the underlying informational basis of the attitude is considered. That is, attitudes can be primarily affectively or cognitively based (e.g., Crites et al., 1994), and persuasive appeals are more effective if the content of the persuasive appeal matches the basis of the attitude (e.g., Edwards, 1990; Fabrigar & Petty, 1999). As can be seen in Table 9, positive compared to negative affect is relatively more predictive of attitudes toward rice, but the reverse is true for attitudes toward beef brisket. Thus, for example, persuasive appeals that focused on increasing positive affect should be more effective for changing attitudes toward rice than beef brisket whereas persuasive appeals that focused on decreasing negative affect should be more effective for changing attitudes toward beef brisket than rice. Based on previous research, therefore, it is likely that food attitudes, and then eating behavior, can be

more effectively changed by first identifying the factors important for a specific food attitude and then designing interventions tailored to those factors.

Although the purpose of the present research was to identify informational bases of food attitudes, it is possible that these bases could also be used to describe individuals, and the distinction between classifying a food and classifying an individual according to the informational bases identified in these studies is an issue that should be addressed in future research. Research examining the affective and cognitive bases of attitudes has found that, in addition to attitudes' being classified as affective and cognitive, individuals can also be classified as being more affectively or cognitively oriented in their attitudes (e.g., Crites et al., 1994). This would suggest that individuals could be described in terms of which food attitude base is the most important determinant of their food attitudes in general. Following from this, the role of individual differences in the importance of the informational bases of food attitudes also needs to be examined. Previous research assessing factors important for an individual's food preferences/food selection in general has shown that the importance of factors can vary across individuals (e.g., Rappoport et al., 1993; Roininen et al., 1999; Steptoe et al., 1995). For example, previous research has found that women place more importance on health than do men (Steptoe et al., 1995) and that children place less importance on health than do adults (e.g., Gummeson, Jonsson, Conner, & Svensson, 1996; Noble, Corney, Eves, Kipps, & Lumbers, 2003). It is likely that for the informational bases of food attitudes identified in this study, differences would also be found across individuals. For example, restrained eaters, those with a tendency to attempt to control their weight by controlling what they eat (Herman & Polivy, 1980), are different from unrestrained eaters in a number of ways that might imply that different food attitude bases would be important for them (see Herman & Polivy, 1980). For example, research suggests that restrained eaters are more responsive to external cues, such as the smell of foods, and therefore, the specific sensory qualities factor might be most predictive of their food attitudes (e.g., Heatherton, Polivy, & Herman, 1989; Herman & Polivy, 1980).

These studies are an important first step in identifying the underlying informational bases of food attitudes, but a variety of issues still need to be explored. Additional research is needed to explore the replicability of the identified food factors and the utility of the suggested measurement scales. Previous research developing scales to measure the affective and cognitive components of attitudes (e.g., Crites et al., 1994) had a long history of research demonstrating the utility of the affective and cognitive components of attitudes to build upon. Such a history does not exist for food attitudes, and therefore the focus of the studies presented here was, out of necessity,

more on identifying factors common to all food attitudes rather than the development of scales to measure these factors. Although the scales suggested here replicated across studies and proved to have good internal consistency and predictive validity, further research is needed to replicate their utility in general, for various samples of people (e.g., restrained individuals, various age ranges, various cultures and ethnicities), and in different situations (e.g., hunger). These studies provide a useful base for future research addressing these and other issues to build upon.

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