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## Classifying foods in contexts: How adults categorize foods for different eating settings

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### Abstract

This project examined adults' food cognitions by applying schema theory to explain how adults categorized foods for different contexts. Qualitative interviews and repeated card sort activities for different eating contexts were conducted to elicit as many food categories as possible from 42 US adults. Participants labeled card sort piles with their own words, providing 991 card sort labels. Qualitative analysis of the labels resulted in the emergence of 12 category types. Personal-experience-based types were specific to the individual (e.g. Preference). Context-based types were related to situational aspects of eating episodes (e.g. Location). Food-based types were related to intrinsic properties of the foods (e.g. Physical characteristics). Different combinations of the 12 category types were used for different eating contexts. Personal-experience and context-based types were used most frequently overall. Some category types were used more frequently for specific contexts (e.g. Convenience for work contexts). Food-based taxonomic category types were used most frequently when no context was defined. Script-oriented categories were more often used in response to specific eating contexts. These findings provide a framework to consider how individuals classify foods in real-life eating contexts. Attention to personal-experience and context-based category types may help improve understanding of relationships between knowledge and food choice behaviors.

### Keywords

Food schema; food choice; card sort; food classification; food context; nutrition knowledge

### Introduction

Foods mean different things to different people. Foods may also mean different things to the same person in different contexts. The ways people label and organize foods are important considerations in food choice (Baranowski, Cullen, & Baranowski, 1999; Falk, Connors, Sobal, Bisogni, & Devine, 2001; Furst, Connors, Sobal, Bisogni, & Falk, 2000). Scientists and clinicians often focus on chemical and health-related properties when they classify foods, while the public uses diverse considerations, such as taste, symbolism, and others (Axelson & Brinberg, 1992; Furst et al., 2000; Murcott, 1982; Sobal & Cassidy, 1993; Worsley, 1980).

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The most effective nutrition education messages may be those that are compatible with the cognitions of the target audience, including the ways that people classify foods (Baranowski et al., 1999; Shepherd & Sims, 1990; Worsley, 2002).

The categories that people use to classify foods have been examined from different perspectives (Chapman & MacLean, 1993; Lennernas & Andersson, 1999; Shepherd & Sims, 1990; Sobal & Cassidy, 1993; Worsley, 2002). Many studies have used predefined categories, typically based on food or nutrient composition, to assess participants' classification of foods (Axelson & Brinberg, 1989; Costa, Dekker, Beumer, Rombouts, & Jongen, 2001). However, people use many considerations besides food and nutrient composition to organize their thinking about food. Therefore it is important to study personally relevant food categories to understand the thinking behind individuals' food choices (Connors, Bisogni, Sobal, & Devine, 2001; Falk et al., 2001; Furst et al., 2000; Ross & Murphy, 1999; Sobal, Bisogni, Devine, & Jastran, 2006).

The food categories that people use are affected by the eating context (Murcott, 1982). Furst et al. (2000) describe how both social and physical contexts influence food classification. Although context has been identified as an important influence on food classification, the way people classify foods into categories in specific, multiple food and eating contexts has not been examined (Achterberg, 1988; Meiselman, 1992). In single context studies, food categories may only apply to that specific context. People, however, make food choices in multiple contexts. Understanding how people classify foods in multiple contexts using personally relevant descriptions may identify food categories that are more connected to people's real-life food choices than single context research.

Schema theory provides a useful framework for conceptualizing the way people classify foods in different eating contexts. Schema theory is used to explain how people store, retrieve, and use information (D'Andrade, 1991; Rumelhart, 1984; Schank & Abelson, 1977). Schemas are defined as generalized collections of knowledge constructed from past experience containing organized, related categories that guide behavior in familiar contexts (Axelson & Brinberg, 1992; Blake & Bisogni, 2003; Olson, 1981). Food schemas develop through experiences with foods that may be direct (e.g., eating, cooking) or indirect (e.g., conversation, education). Existing schemas are strengthened and modified by new experiences (Nishida, 1999). Schema development processes result in some schema categories that are unique, based on an individual's experiences, while other categories are culturally shared. For example, some investigators have emphasized the importance of understanding individuals' unique categories like "things I can chew" or "my husband likes" (Furst et al., 2000). In addition, other researchers have identified sets of socially derived food categories that are shared by individuals in a culture or social group like "organic food" (Moscovici, 2001). Schema theory has been used to explain food restraint (Neimeyer & Nermine, 1985), food novelty (Loewen & Pliner, 2000), and consumer food-choice behavior (Blake & Bisogni, 2003; Olson, 1981). However, it has not been used to explore how people classify foods in different food and eating contexts.

A complication for researchers is that food schemas are often not readily accessible to the participants being interviewed. Techniques that encourage the individual to express internal cognitions are necessary for studying schema. Card sorting is a method long used to examine cognitive structures and processes (Spradley, 1979; Weller & Romney, 1988). A card sort method assumes that the ways people sort cards into categories represent their underlying mental processes (D'Andrade, 1991; Spradley, 1979; Weller & Romney, 1988). Card sorts have been used to study schema (Evans & Arnoult, 1967; Lecacheur, Desprels-Fraysse, & Blaye, 1999) and food classification (Gittelsohn, Harris, Thorne-Lyman, Hanley, Barnie, & Zinman, 1996; Ross & Murphy, 1999). Card sorts have not been used, however, to explore how people classify foods in different food and eating contexts.

The goal of this study was to understand people's food schemas by identifying the categories people use to classify foods and understanding how they used categories for different eating contexts. Unique features of this study include having participants sort food cards multiple times for contexts representing their everyday eating and conducting qualitative interviews during the sorting task to explain their cognitive schema for different eating contexts.

## Methods

An in-depth interview was used to examine adults' food schema categories in different food and eating contexts. The data collection was part of a larger project investigating situational eating (Bisogni, Falk, Madore, Blake, Jastran, Sobal, & Devine, 2007).

## Participants

Forty-two adults living in Upstate New York were purposively sampled using community agencies, employers, advertisements in local newspapers, and personal contacts. Recruitment efforts sought participants in non-managerial, non-professional positions. Participants were also selected to vary in age, gender, and living situation. All study participants met the following criteria: employed at least part-time in a non-managerial, non-professional position, between the ages of 20 and 62, not a full-time student, and not pregnant or lactating. Participants provided information about their personal, household, and employment characteristics on self-administered questionnaires. All recruitment and data collection activities were approved by the University Committee on Human Subjects.

The 21 men and 21 women participants ranged in age from 20 to 61 years with a mean of 39. Twenty-nine percent had completed high school or less than high school, and 61% had completed some college but did not hold 4-year degrees. Eighty-six percent identified themselves as White; the others being Black, Hispanic/Latino, or multi-ethnic. Occupations included building and grounds, office and administrative, sales, personal care and service, transportation and moving, community and social services, and installation and repair. The majority lived with a spouse or partner (64%), others lived alone (26%) or with relatives or unrelated adults (10%). Half had at least one child younger than 19 years living at home. Annual household incomes ranged from less than \$10,000 (12%) to more than \$70,000 (7%), with 61% reporting household incomes less than \$40,000. Participants varied in their responsibilities for household food management.

Participants were informed that the project was a study of their eating in different situations and written informed consent was obtained prior to data collection. Three trained interviewers conducted the interviews at times and in locations chosen by participants such as their homes, workplaces, or public places including libraries, restaurants, and parks. Interviews were audiotape recorded and transcribed verbatim.

## Cards for Sorting

A set of food cards was developed to elicit as many food categories as possible from participants (Murphy & Lassaline, 1997). Cards were developed through pilot testing using member checks (verification by participants) and peer review (verification by experts) (Denzin & Lincoln, 2000). Five pilot study participants each provided 7 day, qualitative 24-hour situational recalls of all foods and drinks consumed. All 149 foods and drinks mentioned by the pilot sample were listed and ranked in descending order of frequency. This list was condensed into a final set of food cards that best represented the foods and drinks most commonly consumed by participants and foods or beverages that were of special interest to nutrition professionals. The initial set of food cards were presented to the same five pilot participants and additional foods were added based on their feedback.

The final set of 59 food cards included both foods that were familiar (e.g., cheese) and less familiar to participants (e.g., tofu) (Maurer, 1996). Food cards were designed to represent various levels of categorization, including subordinate level categories (e.g., french fries), basic level categories (e.g., potato), and superordinate level categories (e.g., vegetable), to elicit as many category labels as possible during card sort activities (Murphy & Lassaline, 1997). Additionally, during the card-sort interview participants were asked to report whether any important foods were missing from the food cards. Each set of cards was arranged alphabetically when presented to participants.

### Interview Protocol

The interview combined repeated card-sorting activities to elicit food categories with open-ended, in-depth interviewing to determine the meaning of food categories in particular contexts. A semi-structured interview guide and a card-sort protocol were developed for the interview. Participants were asked to sort food cards four separate times for four different contexts; 1) open, no context defined; 2) the non-work eating context with family or friends most common for them; 3) the work eating context most common for them; and 4) the eating alone context most common for them.

First, participants sorted the food cards in an open sort with no context defined. Participants were presented with the set of 59 food cards. They were asked to sort these cards into piles that made sense to them, and were told that there was no limit to the number of piles or the number of cards in a pile. Once they were finished sorting these cards, participants were asked to label each food-card pile using their own words (e.g., “breakfast foods”, “foods I like”, “never eat,” etc.). They were then asked if piles could be sorted into any other piles, and if so to label each of the new piles. The interviewer then removed these labeled pile sorts.

Second, starting with the participants' non-work eating context, a series of open-ended questions was asked about the context including description of the setting, people present, and related roles, food identity, feelings, and goals and objectives. The purpose of this questioning was to gain an understanding of the participant's experience of the context and to help the participant place themselves in this context before sorting the next set of food cards. Participants were then asked to sort a new set of the 59 food cards into piles that made sense to them in this non-work eating context. As in the open food card sort, participants were asked to label the card sort piles using their own words, split them into different piles if possible and label the new piles, and report any other possible categories that they thought of using. Cards were again removed. Third, this entire process of open-ended questioning and card sorting was repeated for the work context. Fourth, sorting and interviewing were preformed again for the alone context. Participants took about two hours to complete the entire card sort interview. The food card sort labels were recorded on a data management sheet following the interview and verified.

### Analysis

Data analysis used grounded theory (Strauss & Corbin, 1990) and schema analysis (D'Andrade, 1991). Grounded theory methods are systematic, inductive procedures for analyzing data to build theoretical frameworks that explain the data by focusing the analysis on the identification of emergent categories (Denzin & Lincoln, 2000). Schema analysis infers meaning from text, such as interviews, with special attention to organization of and linkages between categories (D'Andrade, 1991). Researchers compiled all participant-generated card sort labels and organized them by eating contexts. A total of 991 different labels (e.g. “breakfast foods,” “grains,” foods I like”) were used by the 42 participants for all four card sort activities. Figure 1 presents the food card sort labels used by one participant for all four card sort activities.

Researchers identified category meanings by interpreting the food card sort labels (D'Andrade, 1991; Spradley, 1979). The full interview transcripts were coded using a qualitative analysis software program (QSR, 2002) and analyzed to understand participants' use of labels (Denzin & Lincoln, 2000; Strauss & Corbin, 1990). Category meanings were not mutually exclusive, and many of the food card sort labels were included in more than one category meaning. For example, “healthy snack food” was included in both the “Healthy” meaning and the “Snack” meaning categories. A total of 124 meanings emerged from the label data.

The researchers next identified 12 category types by grouping foods, labeled by participants, with similar meanings (e.g., time, location, physical characteristics etc.). Further analysis of the 12 category types by the researchers identified three bases for classifying foods: personal-experience-based, context-based, and food-based.

In summary, the analysis grouped 991 participant food card sort labels into 124 category meanings (representing similar label meanings), 12 category types (representing similar ways of classifying), and 3 food category bases (representing foundations for classifying). The researchers then examined how category meanings, types, and bases were used for the four different eating contexts.

The use of category types for different contexts was analyzed using three perspectives. First, the number of participants who used each category type overall was examined. Second, the frequency with which each category type was used in each context was considered. Third, how individuals used different category types for different contexts was examined.

This project used qualitative methods to understand how adults conceptualize foods based on a constructivist paradigm that assumes an individuals' knowledge of the world emerges through experience and social relationships (Fosnot, 1996). Several criteria for enhancing the soundness of qualitative research were employed in this project (Lincoln and Guba, 1985; Trochim, 2001). The grounded theory approach used here allowed the perspective, experiences, and interpretations of the participants to emerge (Strauss & Corbin, 1990), strengthening the credibility of findings. Interviewers established rapport with participants through multiple contacts that occurred for other parts of the larger study. The interviewers developed a rich understanding of participants' situational eating through their prolonged engagement with participants and the field notes that they took at every data collection contact (Denzin and Lincoln, 2000; Glaser and Strauss, 1967; Strauss and Corbin, 1990). Member checking was accomplished through the presentation of preliminary analysis and interpretations to participants during a follow-up interview after the card sort interview (Lincoln and Guba, 1985). Dependability was enhanced through regular debriefing sessions of the interviewers and research team after each interview (Denzin & Lincoln, 2000). Research ideas were noted in an audit trail that recorded events and decisions (Guba, 1981) to guide sampling and analysis. Multiple researchers were involved in all aspects of this project, including development of data collection tools, collection of data, reading of transcripts, analysis of data, and interpretation of findings establishing confirmability of results (Bisogni et al., 2007). In addition, interviewers were involved in the data analysis process, providing deeper insight into the meaning of participants' statements and allowing for clarification of ambiguous passages. Finally, peer debriefing was accomplished through research groups' discussion of the findings (Trochim, 2001).

## Results

The 12 category types representing the ways that participants sorted the food cards and the ways category types were used for different contexts are described in the following sections. First, category types are presented in groups according to their classification bases – personal-

experience, context, or the food. Tables 1, 2, and 3 summarize meanings within each category type and give examples of the labels that participants used for each meaning. Next, use of category types is reported for different contexts in Table 4.

### **Personal-Experience-Based category types**

The three category types based on the personal experiences of participants included 'Routine', 'Preference', and 'Well-being' (Table 1). All of the labels and meanings in this category type referred to participants' own day-to-day experiences with food. The category type 'Routine' included meanings related to the regularity of eating specific foods, like indispensable foods that were eaten on a regular basis, or changes in routine. The category type 'Preference' included meanings related to personal food preferences, degree of preference, preferred foods used in special ways like a personal reward, likelihood to eat, or whether the participant thought these foods were compatible with their food identities. The category type 'Well-being' included meanings related to the emotional and physical consequences of eating certain foods, including personal health importance and needs (e.g. digestive issues), degree of food healthiness, healing properties of foods, foods that did or did not leave a full, heavy feeling, foods that contribute to a revitalized feeling, and foods that were craved in certain emotional states.

### **Context-Based category types**

The six category types based on the characteristics of the food and eating contexts included 'Meal/Time', 'Meal component', 'Convenience', 'Location', 'Source', and 'Person' (Table 2). The category type 'Meal/Time' included meanings related to temporal aspects of eating including specific meals or events and time of day, week, or year. The category type 'Meal component' included meanings that were used to distinguish between parts of a meal or food combinations. The category type 'Convenience' included meanings related to the ease and time involved with eating, obtaining, cooking, or transporting foods. The category type 'Location' included meanings related to specific places where food is eaten and included both general places (e.g. work, home etc.) and characteristics of places (e.g. "sit-down food" or "on the go food"). The category type 'Source' included meanings related to specific places where food is obtained, purchased, or prepared. The category type 'Person' included meanings related to a specific person, people, or group of people, and who food is eaten with.

### **Food-Based category types**

The three category types based on food characteristics included 'Food group', 'Nutrient composition', and 'Physical characteristics' (Table 3). The category type 'Food Group' included meanings that involved nutritional or commercial classifications. Participants cited government food recommendations (e.g., Basic Four Food Groups or Food Guide Pyramid) and grocery store organization as guides for this categorization. The category type 'Nutrient composition' included meanings related to specific nutrient makeup of the foods (e.g. "carbohydrates"). The category type 'Physical characteristics' included meanings based on physical properties and food states (e.g. "salty food").

### **Use of category types in contexts**

The number of participants using each category type at least once in any card sort task is presented in Table 4. For example, the 'Meal/Time' type was used by all participants, and 'Routine' type was used by nearly all. 'Preference' and 'Meal component' were the next most commonly used category types overall, and 'Person' and 'Nutrient' composition were used least.

In the open, no-context sort, 'Meal/Time,' 'Routine,' and 'Meal component' were the most commonly used category types. 'Preference,' 'Well-being,' and 'Food group' were the next

most commonly used. For the sorts occurring in contexts, 'Meal/Time' and 'Routine' category types remained the most commonly used. 'Meal component' was commonly used in the non-work context, similar to its use in the no-context sort, but this was not used as often in the alone and work contexts. 'Location' was common in the work context, more than in any other sort. 'Well-being,' 'Food group,' and 'Nutrient composition' category types were used by fewer people in the context sorts than they were in the no-context sort.

When the category types used for classifying foods were examined by bases for classifying (i.e. personal-experience-based, context-based, and food-based), personal-experienced-based and context-based category types were used by more participants overall compared to the food-based category types. However, more participants used food-based category types in the no-context sort compared to the three context sorts.

Table 4 also shows comparison of use of context-based, personal-experience-based, and food-based category types. For example, 'Meal/Time' and 'Meal component' were the most commonly used context-based category types, while 'Person' was a context-based category type that was used less often. All three of the personal-experienced-based category types were used by many participants. Of the food-based category types, 'Nutrient composition' was used by the least number of participants.

## Discussion

This study examined adults' food cognitions by applying schema theory to explain how adults categorized foods for different contexts. New approaches were used to study adults' ways of classifying foods, including repeated, context-specific card sorts that encouraged elicitation of many food categories and labels by participants, and also qualitative interviewing techniques that enhanced the understanding of the categories that participants generated.

Participants generated a rich set of categories and labels. Many of the category meanings that emerged from these labels are consistent with the findings reported by other researchers (e.g., "breakfast foods," "healthy foods," "like," "try to avoid") (Falk et al., 2001; Furst et al., 2000; Lennernas & Andersson, 1999; Murcott, 1982; Ross & Murphy, 1999; Sobal & Cassidy, 1993). Additionally, many other category meanings were generated (e.g., "refreshing and cleansing," "change of pace," "other people prepare"). The identification of different category meanings was enhanced by using the method of repeated card sorts in different contexts.

Schema theory provides a useful framework for understanding cognitions involved in food choice behaviors. Individuals' understanding of food and eating is based on cognitive constructions of past food and eating experiences (Furst et al., 1996). According to schema theory, these cognitive constructions include categories of different kinds of information organized in complex schemas and include scripts that draw on this information to guide behavior (Baldwin, 1992). Investigations of other types of complex behaviors, such as interpersonal communications, have resulted in the identification of many different kinds of schemas including fact-and-concept, person, self, role, context, goal, procedure, strategy, and emotion schemas (Baldwin, 1992; Markus, 1999; Nishida, 1999). Researchers have suggested that further study of how these schemas work together to guide behavior in various different domains is needed (Axelson and Brinberg, 1992; Baldwin, 1992; Blake and Bisogni, 2003; Cooper, 1997; Nishida, 1999; Olson, 1981). The current study depicted some of the many different categories that make up individuals' food schemas and how these categories are differentially accessed by individuals depending on the food and eating context. These findings provide insight into the breadth, depth, and situational specificity of food schemas, which are one important fact-and-concept schema involved in food choice processes.



The structure of an individual's food schema can be described in terms of hierarchy. A non-hierarchical structure is suggested if categories are not mutually exclusive and items are placed in more than one category (Ross & Murphy, 1999). The results presented here demonstrate that respondents used many food categories that were linked in non-hierarchical ways. For example, participants used labels that represented different category meanings (e.g. “healthy snack foods”) and different categories for the same foods in different contexts (Figure 1), resulting in category contents that were not mutually exclusive. The non-hierarchical nature of food cognitions has been reported by others (Furst et al., 2000; Ross & Murphy, 1999), and studies of other real-life domains have also portrayed non-hierarchical cognitive structures (Barsalou, 1982; Medin, Lynch, Coley, & Atran, 1997; Smith, Fazio, & Cejka, 1996). The current findings build on earlier work by demonstrating the influence of eating context on people's non-hierarchical classification of foods. This has important implications for research on nutrition knowledge. Many studies look at knowledge about food in only one context, the study setting (Meiselman, 1992). Current findings suggest that peoples' conceptualizations of foods vary depending on the context, and even within the same context foods can have multiple meanings. Research on food and nutrition knowledge should include attention to meanings of foods in eating contexts and multiple meanings of foods within each context.

Ross and Murphy (1999) describe how foods are cross-classified in non-hierarchical networks of categories that are either taxonomic or script oriented. Taxonomic categories are “structured around the intrinsic properties of the food itself” while script categories are based on “a time or situation in which the food is eaten.” In this study, the food-based category types had a more taxonomic organization where membership in a given category meaning was based on aspects of the food, not the eating context. The personal-experience-based and context-based category types had more script organizations, where membership was based on the eating context or aspects of the person in that context. Personal-experience-based and context-based category types were used more frequently to classify foods than food-based category types in all of the card sort activities, including the open card sort. However, the food-based categories were used most frequently in the open sort when no context was defined. These findings suggest that in real-life eating contexts script oriented categories may be more salient to individuals' conceptualization of food than taxonomic categories.

Research about nutrition knowledge and its relation to eating behavior has often focused on food-based categories of knowledge, even though people may use many other categories (Axelson & Brinberg, 1992). The current findings suggest that not only do people use different categories, but that these categories are based on aspects of eating other than food. This suggests that understanding peoples' eating contexts (e.g. people they eat with) and personal experiences with foods, both past (e.g. childhood exposure) and present (e.g. how foods make them feel physically) are important for studying relationships between what people know about food and how they eat. The study of behavioral scripts for specific eating contexts could provide valuable information for understanding how script oriented food categories guide food choice behaviors. Additionally, nutrition professionals typically use food groups or other food-based category organizations as a foundation for nutrition education efforts. The current findings provide insight into some of the personally relevant, context specific food categories that may be more meaningful to specific sub-populations (e.g. “logistically difficult” or “packable” foods for work contexts).

Context is an important influence on food classification. The ways people classify foods for specific contexts, however, had rarely been examined prior to this investigation (Achterberg, 1988; Meiselman and MacFie, 1996). The use of different category types for sorting food cards in different contexts suggests that certain categories may dominate in specific food settings. In this study, ‘Convenience’ and ‘Location’ category types were used most often in work contexts while ‘Person’ was used most often in non-work contexts. Situational variance in

dominant cognitions has also been reported by identity researchers who focus on mental self-images and identities related to eating (Bisogni, Connors, Devine, & Sobal, 2002). Individuals' cognitive assessment of contexts leads to differential access of schema categories depending on the associated roles, identities, goals, and emotions (Nishida, 1999). The origins of these differences may be based on specific cognitions that a person develops based on his/her everyday interactions with people, groups, and objects. Personality research suggests that differences between people are the function of the interaction between the person and the situation (Bem & Allen, 1974). Further study of the many kinds of food categories people use in different real-life eating situations and the identification of nutritionally significant eating environments would provide valuable information for nutrition researchers and practitioners interested in relationships between food cognitions, contexts, and choices.

An overriding theme of this investigation was the importance of attending to context in studies of food and eating. Participants' food schemas included categories that varied for different food and eating contexts. A contextual difference that warrants further study is the distinction between work versus non-work contexts. Work environments may be barriers to consumption of fruits and vegetables (Cohen, Stoddard, Saroukhhanians, & Sorensen, 1998), and work as a context for eating is understudied (Devine, Connors, Sobal, & Bisogni, 2003).

Classification of foods in contexts is an important area for further research. In today's world, many people eat in diverse settings that require them to be flexible in their thinking about food choices. The finding that participants used different categories in different contexts suggests that individuals' schemas are differentially applied as the contexts change. This parallels a prior study of food choice that identified repertoires of strategies that people use as contexts change (Falk et al., 2001). The current study examined food classification using only a few variations of some characteristics of eating contexts (people, place). In addition to these, and the food and drink being consumed, eating contexts have other characteristics, such as recurrence, activities, mental processes, social processes, and physical needs (Bisogni et al., 2007). Classification of food cards in more and different settings would generate further details about how individuals' food schemas operate in real-life eating contexts.

The results of this study suggest ways to modify nutrition education messages to be more meaningful to target audiences. Some investigators suggest that health promotion messages are typically framed using food-based categories (Axelson & Brinberg, 1992; Murcott, 1982; Sobal & Cassidy, 1993; Worsley, 2002). In this investigation, however, food-based category types were used most frequently when no eating context was defined. However, the personal-experience and context-based category types were used much more frequently when participants were asked to consider a specific eating context. These findings suggest that personal-experience and context-based category types should be used to guide the development of nutrition education programs and materials (e.g. "road food," "quick and easy," "packable" etc.) to make them more compatible with real-life eating contexts.

Many nutrition practitioners and educators already consider their clients' perspectives and experiences with food. A focus on individuals' food schemas could enhance practitioners' ability to understand clients' food-related cognitions, allowing practitioners to tailor education and counseling to their clients' schemas (Kreuter & Skinner, 2000). Assessment of population and community level food schema can provide information about important culturally shared food categories and their variations among subgroups. Such information would be valuable for targeting communication and developing programs to promote healthful food choices.

While this study extends understanding of food schemas, limitations of the study should be recognized. The findings cannot be generalized to other populations in different places or times. People living in other areas, other eras, and working in other occupations may use different

categories to label and organize foods. In addition, the food cards used here may have limited the labels that participants used in the card sort activities. The inclusion or exclusion of selected foods or the decision to represent multiple levels of categorization on the food cards may have resulted in the emphasis and inhibition of some categories (Macrae, Milne, & Bodenhausen, 1995). The order in which contexts were presented to participants may have influenced the sort results in several different ways. First, the groups and labels used in the first card sort activity may have been more likely to be used in subsequent sorts. Second, participants may have been less focused due to fatigue as the interview progressed, resulting in less thoughtful responses for the final alone context. However, presenting card sort context in the same order for all participants allowed for comparison of contexts across people. Finally, there is no perfect substitute for data collection in a real-life context. The researchers attempted to capture context specific experiences using a series of open-ended questions to frame the context, but some aspects of these experiences are likely to be lost in this abstraction. Examining food schemas in real-life, real-time settings may yield different results (Meiselman, 1992). The backgrounds and orientations of the researchers involved in this project influenced all aspects of the study from data collection to interpretation. Researchers interested other aspects of food may have asked different interview questions and had a different interpretation of the food card sort results and in-depth interviews.

## Conclusions

Food schemas are complex and context specific cognitions that are differentially accessed depending on the food context. The importance of the more script oriented, personal-experience, and context-based categories identified in this study, as well as the multitude of themes that emerged for these categories, emphasizes the need for further study of food classifications for different contexts. The methods used in this project shed new light on food cognitions and should be further developed for food classification studies with different sets of participants, foods, and contexts. Distinguishing among the bases for food cognitions (personal-experience, context, and food) offers conceptual guidance for research about nutrition knowledge and behavior. Attending to the personal-experience and context-based categories that people construct for food choice is important to be sure that messages link to audience cognitions in a meaningful way.

## Acknowledgements

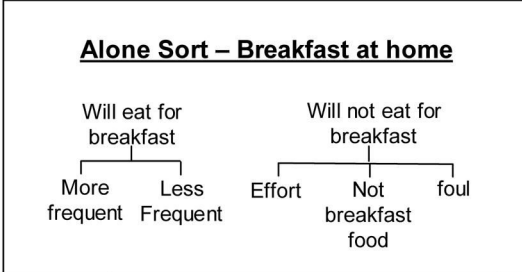
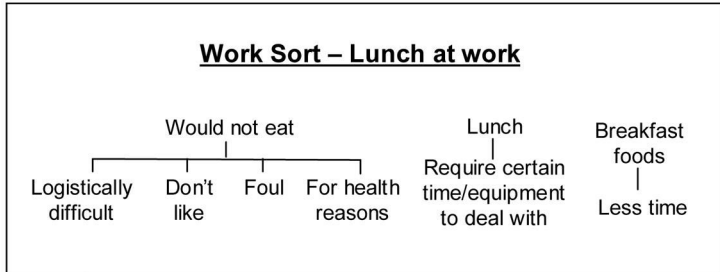
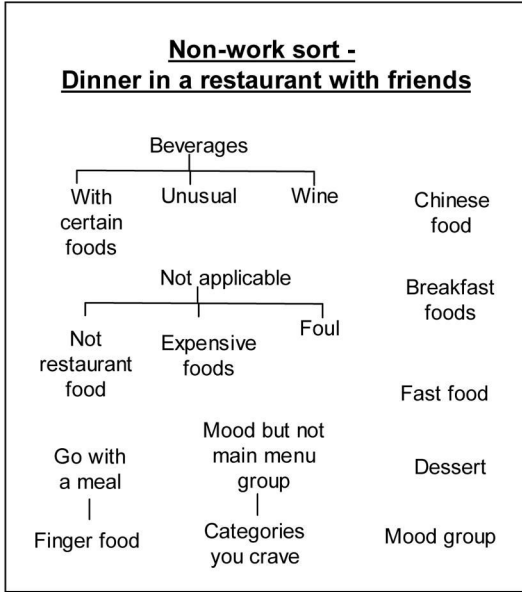
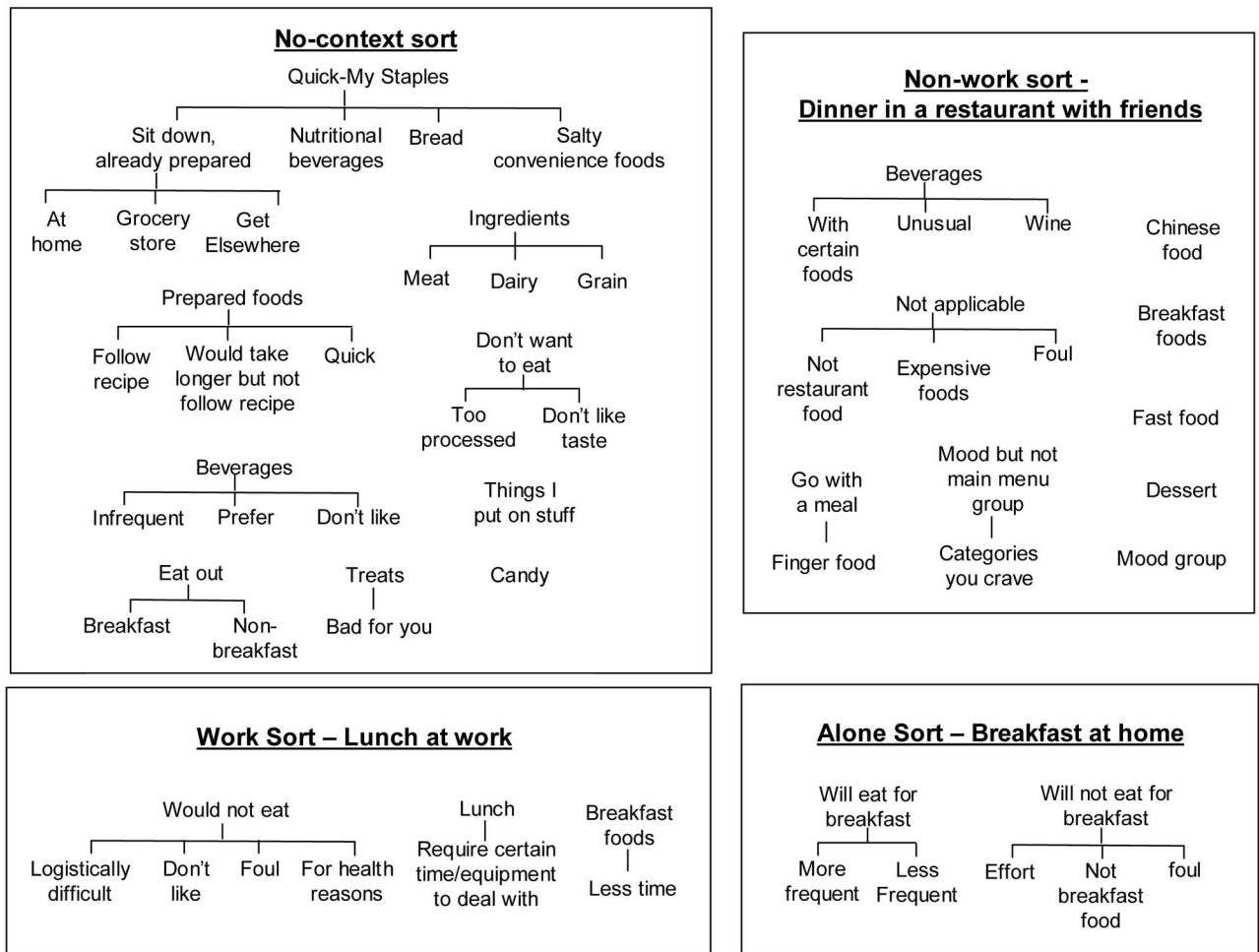
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**Figure 1.** Example of food card sort labels in four contexts for one participant

**Table 1**

Personal-experience-based category types, meanings, and card sort label examples

|            |   |
|------------|---|
| Types      | <p><b>Meanings (Card sort label example)</b><br/>                 Foods I eat/ Foods I don't Eat (e.g., "foods I eat"/"foods I don't do")<br/>                 Eat most often (e.g., "I'd eat most often")<br/>                 Once in a while (e.g., "once in a while")<br/>                 Hardly ever (e.g., "hardly ever")<br/>                 Never eat (e.g., "never eat")</p>   |
| Routine    | <p>Monthly (e.g., "one time per month")<br/>                 Weekly (e.g., "once a week")<br/>                 Daily/ Not Daily (e.g., "daily" and "not everyday")<br/>                 Staple food (e.g., "staples")<br/>                 Change of pace (e.g., "stuff I would have for a change of pace")<br/>                 Used to eat (e.g., "in my past life at home")</p>  |
| Preference | <p>Favorite (e.g., "favorite")<br/>                 Like (e.g., "I like it")<br/>                 Do not like (e.g., "do not like")<br/>                 Hate (e.g., "I hate")<br/>                 Treat (e.g., "treat")<br/>                 My food/ Not my food (e.g., "personal for me", "they eat, not me")<br/>                 Like but might not eat (e.g., "like it but don't do it")<br/>                 Don't like but might eat (e.g., "don't like but would eat")<br/>                 Don't like and won't eat (e.g., "wouldn't eat period")</p>  |
| Well-being | <p>Should eat/avoid for health reasons (e.g., "should have everyday", "do not eat for health reasons")<br/>                 Healthy food (e.g., "healthy")<br/>                 Unhealthy food (e.g., "bad for you")<br/>                 Very unhealthy (e.g., "pathological")<br/>                 Medicine (e.g., "medicinal")<br/>                 Diet food (e.g., "allowed on my diet")<br/>                 Energy food (e.g., "I would definitely eat to gain energy")<br/>                 Light food (e.g., "light food")<br/>                 Heavy food (e.g., "heavy food")<br/>                 Refreshing and cleansing food ("foods that are refreshing and cleansing")<br/>                 Mood and cravings (e.g., "mood foods")<br/>                 Hungry (e.g., "might eat if I felt really hungry")</p> |

**Table 2**

Context-based category types, meanings, and card sort label examples

| Types          | <b>Meanings (Card sort label example)</b>   |
|----------------|---|
| Meal/Time      | Breakfast/ Not breakfast (e.g., “breakfast”, “not breakfast”)<br>Brunch (e.g., “brunch”)<br>Lunch/ Not lunch (e.g., “lunch”, “not lunch”)<br>Dinner/ Not dinner (e.g., “dinner”, “not dinner”)<br>Snack/ Not snack (e.g., “snack”, “just aren’t snack foods”)<br>Break food/ Not break (e.g., “break food”, “never for break”)<br>Meal (e.g., “more of a meal”)<br>Between meals (e.g., “goes in between meals”)<br>Morning food/ Not morning food (e.g., “a morning thing”, “not have in the morning”)<br>Eat at noon (e.g., “eat at noon”)<br>Not afternoon food (e.g., “things that don’t fit [then]”)<br>Evening food (e.g., “stuff in the evening”)<br>Anytime food (e.g., “eat anytime”)<br>Weekend food (e.g., “special week-end food”)<br>Weekday food (e.g., “during the week”)<br>Winter food (e.g., “winter food”)<br>Summer food (e.g., “summer”)<br>Party food (e.g., “party food”)<br>Holiday food (e.g., “holiday’s etc.”) |
| Meal component | Appetizer (e.g., “appetizer”)<br>Salad (e.g., “salad course”)<br>Soup (e.g., “soup”)<br>Main dish (e.g., “main dish”)<br>Casserole (e.g., “casseroles”)<br>Side dish (e.g., “side dish”)<br>Condiment (e.g., “condiment”)<br>To put on bread (e.g., “things you can put on bread”)<br>Dessert (e.g., “dessert”)<br>Drink (e.g., “drinks”)<br>Foods that go together (e.g., “goes together”)<br>Extras (e.g., (“extras”)   |
| Convenience    | Quick and easy (e.g., “quick and easy just for me”)<br>Portable (e.g., “packable”)<br>Time consuming (e.g., “require certain time/equipment to deal with”)<br>Logistically difficult (e.g., “logistically difficult”)<br>Available/ Not available (e.g., “if available”, “not available”)<br>Buy/ Do not buy (e.g., “I buy”, “do not buy”)<br>Expensive food (e.g., “expensive food”)   |
| Location       | Eat at home (e.g., “eat at home”)<br>Eat at home or out (e.g., “eat at home or out”)<br>Restaurant food/ Not restaurant food (e.g., “restaurant food”, “not restaurant food”)<br>Work food/ Not work food (e.g., “at work”, “not work food”)<br>Eat at someone’s house (e.g., “might have in [someone’s house]”)<br>Car food/ Not car food (e.g., “foods I have in the car in the morning”, “can’t eat in the car”)<br>Road food when traveling (e.g., “road food”)<br>Sit down food (e.g., “stuff I would eat sitting at the table”)<br>On the go food/ Not on the go food (e.g., “stuff I would eat on the go”, “not on the run snack food”)  |
| Source         | Homemade (e.g., “make at home”)<br>Other people prepare (e.g., “prepared for me”)<br>Already prepared at the store (e.g., “would stop by store and get”)<br>Make or buy (e.g., “make or buy”)<br>Food from home (e.g., “made at home and brought in”)<br>Eating out (e.g., “food if we go out”)<br>Take out food (e.g., “take out”)<br>Vending machine food (e.g., “get out of the machine”)  |
| Person         | Foods for other people (e.g., “foods for my child”)<br>Eat with others (e.g., “company food”)<br>Eat alone (e.g., “just myself”)  |



**Table 3**

Food-based category types, meanings, and card sort label examples

| Types           | <b>Meanings (Card sort label example)</b>                             |
|-----------------|---|
|                 | Grains (e.g., “breads and grains”)                                    |
|                 | Fruits and vegetables (e.g., “fruits and vegetables”)                 |
|                 | Dairy (e.g., “dairy”)   |
|                 | Meat (e.g. “meats”)   |
|                 | Fish/seafood (e.g., “seafood or fish”)                                |
|                 | Poultry (e.g., “poultry”)   |
|                 | Beans and nuts (e.g., “beans and nuts”)                               |
| Food Group      | Vegetarian (e.g., “vegetarian”)                                       |
|                 | Butter/margarine (e.g., “butter/margarine”)                           |
|                 | Alcohol (e.g., “alcohol”)   |
|                 | Water (e.g., “water”)   |
|                 | Soda (e.g., “soda”)   |
|                 | Baked goods (e.g., “baked goods”)                                     |
|                 | Candy (e.g., “candy”)   |
|                 | Mixed composition (e.g., “mixed”)                                     |
|                 | Extras (“e.g., “extras”)  |
|                 | Carbohydrates (e.g., “starches/ carbohydrates”)                       |
| Nutrient        | Proteins (e.g., “proteins”)   |
| Composition     | Fats (e.g., “fats”)   |
|                 | Calorie/ No calorie (e.g., “calorie”, “no calorie”)                   |
|                 | Caffeinated (e.g., “caffeinated”)                                     |
|                 | Sweet food/ Not sweet food (e.g., “sweet food”, “not sweet food”)     |
|                 | Salty food (e.g., “salty”)  |
|                 | Savory food (e.g., “savory food”)                                     |
|                 | Crunch food (e.g., “crunch”)  |
|                 | Dry food (e.g., “dry snack food”)                                     |
|                 | Cooked food/ Uncooked food (e.g., “cooked”, “not cooked”)             |
| Physical        | Ingredient (e.g., “cooking ingredients”)                              |
| Characteristics | Leftovers (e.g., “leftover from the night before”)                    |
|                 | Premade food (e.g., “prepared foods”)                                 |
|                 | Processed food (e.g., “too processed”)                                |
|                 | Hot food/ cold food (e.g., “hot” and “cold”)                          |
|                 | Frozen food/ Non-frozen food (e.g., “frozen food”, “non frozen food”) |
|                 | Juice/ Non-juice (e.g., “juice”, “not juice”)                         |
|                 | Finger food (e.g., finger food”)                                      |

**Table 4**  
 Count of participants who used category types at least once in each food card sorting context and overall (n=42).

| Food Category Types                    | Card Sorting Context       |                   |                 |             |              |
|--|----------------------------|-------------------|-----------------|-------------|--------------|
|  | Used in any context (n=42) | No context (n=42) | Non-work (n=42) | Work (n=42) | Alone (n=42) |
| <i>Personal-experience-based</i>       |                            |                   |                 |             |              |
| Routine                                | 40                         | 30                | 35              | 33          | 33           |
| Preference                             | 38                         | 25                | 22              | 20          | 17           |
| Well-being                             | 28                         | 21                | 13              | 9           | 12           |
| <i>Personal-experience-based total</i> | <i>41</i>                  | <i>39</i>         | <i>37</i>       | <i>34</i>   | <i>37</i>    |
| <i>Context-based</i>                   |                            |                   |                 |             |              |
| Meal/Time                              | 42                         | 35                | 34              | 33          | 34           |
| Meal component                         | 36                         | 30                | 30              | 19          | 19           |
| Location                               | 25                         | 11                | 8               | 25          | 15           |
| Convenience                            | 22                         | 11                | 10              | 15          | 8            |
| Source                                 | 22                         | 14                | 14              | 12          | 4            |
| Person                                 | 13                         | 5                 | 10              | 4           | 7            |
| <i>Context-based total</i>             | <i>42</i>                  | <i>41</i>         | <i>40</i>       | <i>37</i>   | <i>38</i>    |
| <i>Food-based</i>                      |                            |                   |                 |             |              |
| Food group                             | 27                         | 22                | 14              | 9           | 10           |
| Physical Characteristics               | 20                         | 14                | 10              | 7           | 10           |
| Nutrient composition                   | 10                         | 10                | 4               | 2           | 4            |
| <i>Food-based total</i>                | <i>27</i>                  | <i>24</i>         | <i>15</i>       | <i>12</i>   | <i>14</i>    |