

VALIDATION OF A FOOD PREPARATION INVOLVEMENT QUESTIONNAIRE AND ITS
USE TO IDENTIFY FACTORS AFFECTING FRUIT AND VEGETABLE INTAKE IN
COLLEGE-AGE ADULTS

by

ELIZABETH LYNN RIPBERGER

(Under the Direction of Ruthann B. Swanson)

ABSTRACT

College-age adults are not consuming adequate amounts of fruits and vegetables. One factor that has emerged as influential in fruit and vegetable consumption is cooking skills and food preparation involvement although an assessment tool has not been validated. A food preparation involvement questionnaire was developed and validated using a 4-stage method that included content and face validity, and reliability and feasibility testing. The validated questionnaire was then used to assess relationships between factors involved in the food preparation process and fruit and vegetable consumption in college students ($n=214$). Chi-squared analyses revealed a significant relationship between cooking knowledge and food preparation behavior and consumption of dark-green leafy vegetables, and between resource availability and consumption of red and orange vegetables ($p<0.05$). This questionnaire provides a standardized tool to measure food preparation involvement in college-age adults that identified pertinent factors affecting their fruit and vegetable consumption.

INDEX WORDS: Fruits, Vegetables, Consumption, Cooking skills, Food preparation involvement

VALIDATION OF A FOOD PREPARATION INVOLVEMENT QUESTIONNAIRE AND ITS
USE TO IDENTIFY FACTORS AFFECTING FRUIT AND VEGETABLE INTAKE IN
COLLEGE-AGE ADULTS

by

ELIZABETH LYNN RIPBERGER

B.S., Miami University, 2012

A Thesis Submitted to the Graduate Faculty of the University of Georgia in Partial Fulfillment of
the Requirements for the Degree

MASTER OF SCIENCE

ATHENS, GEORGIA

2014

©2014

Elizabeth Lynn Ripberger

All Rights Reserved

VALIDATION OF A FOOD PREPARATION INVOLVEMENT QUESTIONNAIRE AND ITS
USE TO IDENTIFY FACTORS AFFECTING FRUIT AND VEGETABLE INTAKE IN
COLLEGE-AGE ADULTS

by

ELIZABETH LYNN RIPBERGER

Major Professor: Ruthann Swanson

Committee: Barbara Grossman
Joan Fischer

Electronic Version Approved:

Julie A. Coffield
Interim Dean of the Graduate School
The University of Georgia
August 2014

TABLE OF CONTENTS

CHAPTER

1	INTRODUCTION	1
	Fruit and vegetable intake and chronic disease risk.....	1
	Development of eating habits	3
	Factors limiting intake of fruits and vegetables	4
	References.....	6
2	LITERATURE REVIEW	7
	Dietary concerns in college students.....	7
	Factors affecting fruit and vegetable consumption among college students	8
	The effects of taster status on fruit and vegetable intake.....	9
	The effects of cooking skills and food preparation involvement on fruit and vegetable intake	11
	The effects of perceived health benefits and fruit and vegetable intake.....	12
	The theory of planned behavior	13
	Measuring frequency of fruit and vegetable consumption and degree of liking	14
	Identifying factors underlying food choices	15
	Assessment of cooking skills and food preparation.....	16
	Four stage validation methodology for cooking skills questionnaire	17
	Measurement of taste sensitivity.....	18
	References.....	21

3	METHODS	24
	Food preparation questionnaire development	24
	Factors affecting fruit and vegetable intake data collection	26
	Statistical analysis.....	28
	References.....	30
4	RESULTS AND DISCUSSION: FOOD PREPARATION QUESTIONNAIRE	
	DEVELOPMENT AND VALIDATION	31
	Content validity.....	32
	Face validity	40
	Reliability testing.....	40
	Feasibility testing	44
	Conclusion	53
	References.....	54
5	RESULTS AND DISCUSSION: FACTORS AFFECTING FRUIT AND	
	VEGETABLE7CONSUMPTION AMONG COLLEGE-AGED ADULTS.....	56
	Student profile.....	57
	Fruit and vegetable intake and frequency of consumption	60
	Food choices questionnaire.....	63
	Cooking skills and fruit and vegetable frequency of consumption.....	67
	Conclusions.....	74
	References.....	75
6	SUMMARY AND CONCLUSIONS	77
	References.....	80

REFERENCES	81
APPENDICES	85
A FOOD FREQUENCY QUESTIONNAIRE.....	85
B FOOD CHOICES QUESTIONNAIRE.....	86
C DEMOGRAPHIC INFORMATION.....	88
D PTC TEST.....	90
E FOOD LIKING QUESTIONNAIRE	91
F FOOD PREPARATION AND CONSUMPTION HABITS.....	92
G COOKING SKILLS QUESTIONNAIRE EVALUATED FOR CONTENT VALIDITY STEP 1	97
H ADDITIONAL COMMENTS FROM CONTENT VALIDITY STEP 1.....	101
I COOKING SKILLS QUESTIONNAIRE EVALUATED FOR CONTENT VALIDITY STEP 2.....	103
J ADDITIONAL COMMENTS FROM CONTENT VALIDITY STEP 2.....	108
K COOKING SKILLS QUESTIONNAIRE EVALUATED FOR FACE VALIDITY	110
L PARTICIPANT GENERATED RE-WORDING OF QUESTIONS FOR FACE VALIDITY	115
M COOKING SKILLS QUESTIONNAIRE EVALUATED FOR RELIABILITY	124

CHAPTER 1

INTRODUCTION

Fruit and vegetable intake and chronic disease risk

Chronic diseases, including heart disease, stroke, cancer, and diabetes are among the deadliest, most costly, and preventable problems plaguing the United States today. The Center for Disease Control currently estimates that a staggering 70% of American deaths annually can be attributed to chronic diseases, and of this group, heart disease and cancer alone accounted for more than 50% of all deaths (CDC Chronic Disease Prevention and Health Promotion 2012). Moreover, in 2005, it was estimated that over 133 million Americans, or around 50%, had at least one chronic illness suggesting this pattern is likely to transcend into future generations. The four overwhelming causes contributing to chronic disease risk include lack of physical activity, poor nutrition, tobacco use, and excessive alcohol consumption. Among the nutrition factors, inadequate fruit and vegetable intake specifically is associated with increased risk of chronic diseases including obesity, type 2 diabetes, and cardiovascular disease, as it may be a measure of nutritional quality (Adams and Colner 2008, CDC Chronic Disease Prevention and Health Promotion).

Boeing et al (2012) conducted a critical review to evaluate the role of fruit and vegetable consumption in the prevention of chronic diseases. Based upon analyses of all epidemiological studies available, the authors found convincing evidence supporting the notion that increased consumption of fruits and vegetables decreases the risk for hypertension, coronary heart disease, and stroke. Additionally, researchers concluded that probable evidence exists that overall cancer

risk is inversely associated with fruit and vegetable consumption; however, specific sites of cancer were not analyzed in this review. Further, a recent review from the American Cancer Society noted that those who consumed a diet including a variety of fruits and vegetables, whole grains, and fish or poultry rather than processed red meats, had lower incidences of cancer development and decreased mortality rates resulting from cancer (Kushi et al 2012). Finally, other possible relationships identified included: prevention of weight gain, decreased risk of dementia, certain eye diseases, rheumatoid arthritis, osteoporosis, certain asthmas, and COPD (Boeing et al 2012). Though these associations were deduced from analyses of literature, these researchers noted that the strength of relationships neither indicate the degree to which fruit and vegetable consumption can decrease risk nor was the quantity of intake required to achieve the greatest risk-reducing affects discernable.

One plausible explanation as to why fruit and vegetable consumption may decrease chronic disease risk is the presence of dietary bioactive compounds (Liu 2013). Liu (2013) examined the role of bioactive phytochemicals present in fruits and vegetables and how they may be related to health benefits, specifically the prevention of cardiovascular disease and cancer. Phytochemicals are defined as “bioactive non nutrient plant chemicals in fruits, vegetables, grains, and other plant foods that may provide desirable health benefits beyond basic nutrition to reduce the risk of major chronic diseases” (Liu 2013). Over 5000 individual phytochemicals have been identified and are categorized into the following groups: phenolics, alkaloids, nitrogen-containing compounds, organosulfur compounds, phytoesters, and carotenoids, with phenolics being the most studied. Liu (2013) suggested two mechanisms by which phytochemicals might play a role in reducing chronic disease risk. First, phytochemicals may decrease oxidative stress induced by free radicals, which is associated with the etiology of

chronic disease. Phytochemicals may have anti-inflammatory properties, as evidenced by the lowering of serum C-reactive protein levels. Finally, a key observation made by Liu (2013) was that in order to achieve optimal health benefits from phytochemicals, consumption levels of fruits and vegetables should be at least 2 cups/d and 2.5 cups/d, respectively, in accordance with the US Dietary Guidelines for Americans, and these servings should come in from a wide variety of sources of fruits and vegetables, including raw, canned, and frozen.

Whereas the Dietary Guidelines for Americans 2010 (USDA and USDHHS 2010), recommend an intake for fruits and vegetables of 2 cups/d and 2.5 cups/d, respectively, the average intake for American adults is 1.0 cup/d fruit and juices, and 1.6 cups/d vegetables, both of which fall short of current recommendations. Additionally, it is estimated that 76.6% of American adults consume less than the CDC recommended 5 servings of fruits and vegetables daily (CDC Behavioral Risk Factor Surveillance System 2009). Moreover, when looking at the college-aged adult population specifically, it has been reported that 94% are not consuming the recommended 5 servings of fruits and vegetables daily putting them in a higher-risk group (American College Health Association 2010). It can be asserted that Americans are currently not consuming the recommended amounts of fruits and vegetables, and are not getting the associated health benefits and as such, may be a greater risk for developing chronic diseases. Thus, factors affecting fruit and vegetable consumption in college-aged adults warrant further research.

Development of eating habits

Two stages of life that may play a role in the development of lifelong eating habits include the early periods of life and the later teenage years (Anzman et al 2010; Baronowski et al 1997). Anzman et al (2010) conducted a review in which the early environmental effects on children's eating and obesity risk were investigated. The time period analyzed included the

prenatal period, infancy, and the transition to table foods. It was highlighted that not only do parental genetics but also parental action shape these environmental influences which plays a subsequent role in child eating patterns later in life. Further, researchers suggest that parents have the opportunity during this time period to impact children's food preferences and behaviors illustrating how crucial this time period is in food pattern development (Anzman et al 2010).

While early environmental factors may play a role in the development of eating habits, Baronowski et al (1997) suggested that life-long eating behaviors also might be formed as young adults progress from high school to college. This transition period is particularly important because it involves changes in many social roles, motivations, and resources that affect the likelihood of someone performing a particular behavior. Specifically, in this study the researchers were looking at behaviors of students as they transition out of high school in relationship to cancer risk (Baranowski al 1997). In a subsequent study, Ha and Caine-Bish (2009) concluded that food habits established in college might also be of utmost importance in the development of lifelong eating habits, impacting not only individuals but their families as well.

Factors limiting intake of fruits and vegetables

A variety of factors that may contribute to fruit and vegetable intake (Drewnowski 1997; Larson et al 2006; Lohr et al 2006) have been identified. Taster status is a commonly hypothesized factor affecting fruit and vegetable consumption. Drewnowski (1997) ascertained that taste sensitivity to phenylthiocarbamide (PTC) was associated with decreased liking of vegetables and decreased vegetable consumption because those who were tasters typically had increased sensitivity to the bitter compounds, typically phenolics, commonly found in vegetables. Another key variable likely affecting fruit and vegetable consumption includes food

preparation involvement. Larson et al (2006) suggested that low food preparation involvement and poor cooking skills are associated with decreased consumption of fruits and vegetables because diet quality has been associated with food preparation involvement. Finally, a third key variable that may affect fruit and vegetable consumption is health motivation as a factor in food choices. Lohr et al (2006) found that increased perception of the health and the weight loss benefits that are related to a healthy diet were associated with increased fruit and vegetable consumption in college-aged adults, highlighting the role of health motivation specifically as an effect on food choices.

Although the aforementioned studies identify single factors they lack integration of multiple factors for comparative analysis. As such, research is needed to fill-in the gaps about our knowledge of the factors contributing to fruit and vegetable intake in college students. Therefore, the research question in this study addressed what factors are most influential in determining frequency of fruit and vegetable consumption among college students. The overall hypothesis was that taster status, food preparation involvement and cooking skills, and perceived health benefits are influential in determining frequency of fruit and vegetable consumption among college students. Three objectives for this study were:

1. To validate a food preparation involvement questionnaire for use with college students
2. To determine the relationship between taster status and fruit and vegetable liking, and fruit and vegetable consumption
3. To determine the relationship between food preparation involvement and fruit and vegetable consumption
4. To identify factors that affect food choices in general among college students

References

- Adams TB, Colner BS. The association of multiple risk factors with fruit and vegetable intake among a nationwide sample of college students. *J Am Coll Health* 2008;56(4):455-461.
- Anzman SL, Rollins BY, Birch LL. Parental influence on children's early eating environments and obesity risk: implications for prevention. *Int J Obesity* 2010;34(7):1116-1124.
- Baronowski T, Cullen CW, Basen-Enquist K, Wetter DW, Cummings S, Martineau DS, Prokhorov AV, Chorley J, Beech B, Hergenroeder AC. Transition out of high school: a time of increased cancer risk? *Prev Med* 1997;26(5):694-703.
- Boeing H, Bechthold A, Bub A, Ellinger S, Haller D, Kroke A, Leschik-Bonnet E, Muller MJ, Oberritter H, Schulze M. Critical review: vegetables and fruit in the prevention of chronic diseases. *Eur J Nutr* 2012;51(6):637-663.
- Center for Disease Control, Behavioral Risk Factor Surveillance System, 2009, Internet: <http://www.cdc.gov/brfss/index.htm> (accessed on 22 February 2013).
- Center for Disease Control, Chronic Disease Prevention and Health Promotion, Internet: <http://www.cdc.gov/chronicdisease/overview/index.htm> (accessed on 22 March 2014).
- Drewnowski A. Taste Preferences and food intake. *Annu Rev Nutr* 1997;17(1):237-253.
- Ha E, Caine-Bish N. Effect of nutrition intervention using a general nutrition course for promoting fruit and vegetable consumption among college students. *J Nutr Educ* 2009;21(2):103-109.
- Kushi LH, Doyle C, McCullough M, Rock CL, Denmark-Wahnefried W, Bandera EV, Gapstur S, Patel AV, Andrews K, Gansler T, et al. American Cancer Society guidelines on nutrition and physical activity for cancer prevention: Reducing the risk of cancer with healthy food choices and physical activity. *CA-Cancer J Clin* 2012;62:30-67.
- Larson NI, Perry CL, Story M, Neumark-Sztainer D. Food preparation by young adults is associated with better quality diet. *J Am Diet Assoc* 2006;106(12):2001-2007.
- Liu RH. Dietary bioactive compounds and their health implications. *J Food Sci* 2013;78(1):A18-A25.
- Lohr L, Swanson R, McElveen. Effects of economic and noneconomic factors on frequency of fruit and vegetable consumption. *J Agr Resour Econ* 2006;31(3):689-690.
- US Department of Agriculture, US Department of Health and Human Services, Dietary Guidelines for Americans, 2010. 7th ed. Washington, DC, page 51. Internet: <http://www.cnpp.usda.gov/Publications/DietaryGuidelines/2010/> (accessed on 24 April 2013).

CHAPTER 2

LITERATURE REVIEW

Dietary concerns in college students

Though data are unclear, recent research suggests that dietary patterns established during college are likely to be maintained throughout the lifespan (Ha and Caine-Bish 2009).

Unfortunately, college dietary patterns tend to consist of unhealthy behaviors including high intakes of fat, saturated fat, cholesterol, and sodium, and low intakes of fruits and vegetables, resulting in low intakes of fiber, vitamins A, C, and E, folate, iron, and calcium (Ha and Caine-Bish 2009). Among college students, 94% report eating less than the recommended 5 servings of fruits and vegetables daily. In addition, 21% of college students are overweight and an additional 11.5% are obese (American College Health Association 2010). Therefore, poor dietary habits followed during the college years may put these individuals at an increased risk for chronic disease.

Adams and Colner (2008), who recently linked healthy habits among college students to fruit and vegetable consumption, determined that in addition to reducing the development of obesity and obesity-related conditions, high fruit and vegetable intake was a significant predictor of other healthy habits. In a nationwide sample of 40,209 college students, the authors found that male and female college students who consumed at least 5 fruits and vegetables per day were significantly more likely to wear seatbelts and helmets, have increased rates of physical activity, have greater health perceptions, have higher amounts of sleep, and have higher grades ($p < 0.001$).

Thus, there is evidence suggesting that dietary intervention strategies aimed at increasing fruit and vegetable intakes are of utmost importance to the college population in reducing chronic disease risk. By identifying factors that contribute to fruit and vegetable intake, interventions can be tailored to this population increasing the likelihood of success. Therefore, among the college student population, identification of variables that may affect food choice decisions, particularly in terms of fruit and vegetable consumption, is needed.

Factors affecting fruit and vegetable consumption among college students

In a previous study, factors affecting fruit and vegetable intake among college students ($n = 217$), (Swanson et al 2007; Lohr et al 2006) were identified. Methodology for the study included use of a frequency of consumption questionnaire, a Food Choices Questionnaire, a smell acuity test, a demographic and health questionnaire, a phenylthiocarbamide (PTC) taste sensitivity test, and a food-liking questionnaire.

Employment status, and health related concerns including weight control ($P < 0.05$), using food for a stress relief, household size, being a vegetarian and familiarity with foods ($P < 0.1$) were positively associated with fruit and vegetable intake. Significant negative coefficients included being white, BMI, being on a special diet, and preparation requirements ($P < 0.05$). A complete list of identified significant coefficients is summarized in table 2.1.

Table 2.1: Variables related to fruit and vegetable intake in college students (Lohr et al 2006)

Variable	Coefficient	Significance
White	-0.283	0.05
Work	0.175	0.05
People in household	0.051	0.05
Vegetarian	0.206	0.10
BMI	-0.020	0.10
Special diet	-0.247	0.05
Health	0.202	0.05
Stress relief	0.066	0.10

Weight control	0.148	0.05
Preparation ease	-0.134	0.05
Familiarity	0.024	0.10

This study provides a basis for specific factors that should be further explored and is a key contributor to this area of research.

The effects of taster status on fruit and vegetable intake

Phenylthiocarbamide (PTC) is a compound that is perceived as extremely bitter by some subjects (tasters) and tasteless to others (nontasters) (Hong et al 2004) and has been used to classify individuals as non-tasters, medium tasters and supertasters. Among the US population overall, approximately 25% are nontasters, 50% are medium tasters and 25% are supertasters (Bartoshuk 2005). Sensitivity to this compound has been linked to consumption of specific fruits and vegetables in various age groups (Drewnowski 1997).

The ability to detect bitter compounds such as PTC arises from the presence of a functional TASR38 receptor, while increased intensity of PTC bitterness perception is a result of papillae density (Dineheart et al 2006). The functionality of the aforementioned factors affecting taste perceptions can be grouped together as genetic taste markers. As early as 1997, Drewnowski (1997) suggested that genetic taste markers influence food liking and consumption patterns for bitter vegetables and citrus fruits. Duffy et al (2010) determined that in college-aged adults ($n = 59$), there was a relationship between PROP (6-n-propylthiouracil) taste sensitivity, TAS2R38 function, and fruit and vegetable consumption ($p < 0.01$). PROP is a compound that is chemically related to PTC. Like PTC, tasters perceive PROP as bitter, while nontasters perceive PROP as tasteless. In a similar study, Dinehart et al (2006), measured PROP taste sensitivity in male and female participants ($n = 110$) in relationship to vegetable taste preference and overall vegetable consumption. Participants who tasted PROP as most bitter also tasted more bitterness

from the sampled vegetables ($p < 0.001$) (Dinehart et al 2006). Vegetables analyzed included asparagus, brussels sprouts, and kale. Additionally, multiple regression analyses indicated that vegetable preference was a direct predictor of intake in both males and females ($P < 0.01$), and those who taste PROP as most bitter consumed vegetables least frequently ($P = 0.03$). Similar results were reported by Tepper et al (2009) when they analyzed the relationship between PROP taste sensitivity and food selection in cruciferous and other green vegetables in college-aged women. Researchers examined PROP status and blood samples that were assayed for vitamin C, β -carotene, α -tocopherol, lycopene, uric acid and total peroxy-trapping antioxidant capacity; participants ($n = 93$) received PROP test papers and rated the intensity of bitterness on a 100-point gLMS, ranging from “barely detectable” to “strongest imaginable.” It was found that those who were classified as supertasters had lower α -tocopherol levels, a key indicator of vegetable oil and green vegetable intake, than nontasters, but overall antioxidant status was consistent between the groups. Therefore, it was concluded that while PROP status might not be a predictor of overall antioxidant status it is associated with serum α -tocopherol levels, suggesting that supertasters might consume less green vegetables and vegetable oils.

In a study by Yackinous and Guinard (2002), the relationship between fruit and vegetable intake and PROP sensitivity yielded opposite results. In this study college student ($n = 183$) participants were asked to rate the intensity of five PROP and five saline solutions on a 16-point categorical scale ranging from 0 being none, to 15 being high. Researchers found no significant differences between the individuals of varying taster statuses and subsequent intakes of fruits and vegetables. Similarly, McElveen and Swanson (2003), who employed a 5-point categorical scale, also found no significant relationship between taster status and fruit and vegetable consumption in this college-age population.

Scales used for assessment in the previously mentioned studies could play a role in the discrepancies found among researchers. Kalva et al (2014) analyzed the differences in response that can be noted when using a 9-point hedonic scale rather than the hedonic gLMS scale. By assessing the responses of 200 panelists in regards to taste perceptions to a variety of stimuli including quinine, sucrose, NaCl, and citric acid, on both a 9-point hedonic scale and a hedonic gLMS scale, these researchers noted a variation of response between the two assessment techniques. Moreover, the gLMS was deemed more credible in showing group differences in affective response making it the preferential choice when measuring taste sensitivity (Kalva et al 2014).

Since previous studies have shown conflicting results, though some of this variation might be explained by use of various types of scales, additional research is needed to determine if taster status plays a role in fruit and vegetable intake in college students using the more sensitive gLMS scale.

The effects of cooking skills and food preparation involvement on fruit and vegetable intake

Food preparation involvement and cooking skills have emerged as influential factors affecting food choice decisions (Larson et al 2006). In a cross-sectional analysis participants ($n = 1,710$) aged 18-23 y, Larson et al (2006) determined that as food preparation involvement increased from very low to high the likelihood of consuming ≥ 5 servings of fruits or vegetables daily increased. Food preparation involvement was assessed by generating a food preparation frequency score. This score was generated based upon responses to questions about how often they had performed the following 5 behaviors over the past 12 months: bought fresh vegetables, wrote a grocery list, prepared a green salad, prepared a dinner with chicken, fish or vegetables, and prepared an entire dinner for two or more people. Response categories included: never, 1 or

2 times, 4 or 5 times, monthly, weekly, or daily. Based upon the numerically calculated score, participants were categorized from low food preparation involvement to high food preparation involvement. Participants considered to be highly involved in food preparation were ten times more likely to consume ≥ 5 servings of fruits or vegetables daily than were those with very low involvement, with percentages equaling 31% and 3%, respectively. Percentages of low and moderately involved participants who consumed ≥ 5 servings of fruits or vegetables daily were 10 and 19, respectively.

Laska et al (2012), who conducted a 10-year longitudinal analysis ($n = 1700$) on the same participant sample used by Larson et al (2006), found that participants in their mid-to-late twenties who enjoyed cooking and were more involved in the food preparation process were also more engaged in these activities during their adolescent and early adult years ($p < 0.01$).

Additionally, it was determined that those who frequently prepared meals as adolescents that included vegetables were more involved in food preparation as adults ($p < 0.001$). Overall results indicated that there is a significant relationship between food preparation involvement and diet quality during adolescence and after a 10-year follow up period. Thus, there is evidence suggesting that food preparation involvement and cooking skills may affect fruit and vegetable consumption throughout the lifespan and this potential influence warrants further research.

The effects of perceived health benefits and fruit and vegetable intake

Perceived nutritional and weight maintenance benefits have been associated with fruit and vegetable intake among college students (Lohr et al 2006). Researchers reported that the consumption of fruits and vegetables was positively associated with perceptions of enhanced weight control and healthful food attributes ($n = 201$). Dissen et al (2011) found that among female college students ($n = 279$) there was a significant positive association between attitude

towards nutrition and health, nutrition knowledge, and fruit and vegetable consumption ($p = 0.0133$). In males, a significant positive association was seen between nutrition and health attitudes and fruit and vegetable consumption ($p = 0.0001$).

While perceived health benefits commonly include perceptions such as weight maintenance or increased nutrient intake, Ferrer et al (2013) proposed that worry, such as warding off chronic disease, is associated with perceived health benefits, and may, therefore, be a predictor of nutrition behaviors. The researchers examined the relationship between health-related worry and fruit and vegetable consumption in an adult sample obtained from the National Cancer Institute's 2007 Food and Attitudes Behavior Survey ($n = 3,397$). Researchers found that greater worry was associated with a higher intake of fruits and vegetables ($p < 0.01$). Therefore, research suggests that the perception of health benefits has been associated with fruit and vegetable consumption and should be studied as a factor that may affect fruit and vegetable intake in college students.

The theory of planned behavior

Under the theory of planned behavior (TPB) it is hypothesized that the single best predictor of a person's behavior is intention to perform that behavior (Ajzen 1991). Further, Ajzen (1991) explains that intention is predicted by attitudes which includes how an individual assesses the outcomes of performing a specific behavior; subjective norms, which includes how an individual perceives social pressure to perform a behavior; and perceived behavior control, which includes an individual's beliefs about resource availability and opportunities to carry-out the behavior. Application of the TPB maintains that attitudes, subjective norms, and perceived behavioral control are predictive factors of behavioral intention (BI). Ickes and Sharma (2011) examined the extent to which BI predicted nutrition behaviors, including fruit and vegetable

intake, in adolescent obesity. A cross-sectional study revealed that BI was predictive for consumption of fruits and vegetables among obese and overweight participants ($n = 318$). Another key principle of TBP that has been suggested by Hall and Fong (2007), is that the TBP may not adequately predict dietary behavior because it does not consider when the expected rewards may occur, meaning, in the short-term or in the long-term. Decisions about fruit and vegetable consumption may include both short-term goals such as selection due to taste or flavor, or long-term such as decreasing risk of chronic disease. Because dietary behaviors tend to be habitual, consumers must be given a reason to change their behaviors (Collins and Mullan 2011). Therefore, including these concepts will be important in predicting fruit and vegetable consumption decisions in college students.

Brug et al (2006) confirmed that the TPB could predict fruit intake of adults ($n = 627$). Sex, attitudes, subjective norms, perceived benefits different self-efficacy expectations, and habit strength were significantly associated with the intention to eat two or more servings of fruit per day ($p < 0.05$). Thus, there is evidence that supports the idea of using the TPB as a model to predict fruit and vegetable consumption.

Measuring frequency of fruit and vegetable consumption and degree of liking

In a longitudinal analysis of adults ($n = 1,130$) Larson et al (2012) determined that taste preference for fruit and vegetables was significantly associated with fruit and vegetable intake during baseline data collection ($p < 0.01$) after 5 y and after 10 y; as such, measuring these variables is important. Lohr et al (2006) assessed fruit and vegetable consumption using a 7-point food frequency questionnaire. Responses were based on fruit and vegetable consumption over the past year. The 7-point scale ranged from 1 being never consuming fruits and vegetables, to 7 being eating fruits and vegetables more than 4 times per day. Methodology included

providing participants ($n = 201$) with a 20-item list of fruits and vegetables adapted from Drewnowski et al (2000) and Stables et al (2002). Participants also were asked to rate the degree of liking of the same foods on a 7-point scale with 1 being dislike extremely and 7 being liked extremely.

Bajec and Pickering (2010) used similar methodology when assessing the extent to which participants ($n = 127$) liked specific foods. However, these researchers used a 332 item-list of various foods as well as multiple preparation methods of foods. Participants were asked to rate their liking of the particular item on a 7-point Likert scale ranging from 1, being like extremely, and 7, being dislike extremely. In addition, the questionnaire allowed the subjects to indicate specific allergies to foods, a lack of exposure to a certain food, or a lack of knowledge (not knowing what the item was), in lieu of providing a liking rating. These similar methodologies indicate that the use of a food item list in addition to a 7-point Likert scale is a possible way to measure food liking.

Identifying factors underlying food choices

Steptoe et al (1995) developed a multidimensional questionnaire to assess the perceived importance of factors that affect food choice decisions. In a multi-staged research endeavor the research team hypothesized that several distinct factors associated with food choice would include multiple dimensions such as health, price, sensory appeal, convenience, weight control, degree of familiarity, and mood; this led to the development of the Food Choice Questionnaire (FCQ). The FCQ is a 36-item questionnaire where participants were asked to rate the relative importance of each statement, using a range from 1, being not important at all, to 4, being very important. In addition to the construction of this questionnaire, researchers validated the instrument for test-retest reliability and internal consistency. Upon completion and validation,

the questionnaire was administered to $n = 358$ adults. Factor analysis was conducted and nine explanatory factors emerged, including health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity, and ethical concern. Overall the FCQ was able to account for 58% of the total variance of participant response.

In a subsequent study from Milošević et al (2012), researchers used the FCQ to determine motives for food choices in Western European countries. The aim of the study was to determine if the FCQ was useful in identifying food choice behavior in similar subpopulations. Upon collection of response ($n = 3085$), data analyses were conducted and eight factors emerged yielding very similar results among various subpopulations studied. Lohr et al (2006) also utilized the FCQ in determining factors that affect fruit and vegetable consumption in college students. Upon analyses, a significant relationship was found between perceived health benefits and fruit and vegetable consumption (Lohr et al 2006). These studies indicate the FCQ is consistent and yields consistent results among various subpopulations in western countries.

Assessment of cooking skills and food preparation

As stated previously, cooking skills and food preparation involvement are likely associated with fruit and vegetable consumption. Even though research has identified this as a likely relationship, researchers have not developed and validated a questionnaire to evaluate participant response. Therefore, research is needed to develop and validate a questionnaire for use within the college population.

Larson et al (2006) has identified important questions that when included in a single questionnaire, may be a valid tool for assessing cooking skills and food preparation involvement. In a cross-sectional study with $n = 1,710$ participants aged 18-23 y, food preparation involvement and its relationship to diet quality was assessed. To assess the degree to which participants were

involved in food preparation, the researchers developed a questionnaire that asked over the past 12 months how often the following behaviors were performed: (a) bought fresh vegetables; (b) wrote a grocery list; (c) prepared a green salad; (d) prepared a dinner with chicken, fish, or vegetables; and (e) prepared an entire dinner for two or more people. Possible responses included: (a) never; (b) 1-2 times; (c) 4-5 times; (d) monthly; (d) weekly; or (e) daily.

Measurement of perceived cooking skills and resources to buy food was also evaluated using a separate questionnaire with the following items: (a) adequacy of cooking skills; (b) money to buy food; (c) appliances for food preparation; (d) food selection in local stores; (e) time to prepare food. Responses were based on a 4-point Likert scale ranging from 1 = very inadequate to 4 = very adequate. The researchers found those who reported frequent food preparation were more likely to meet dietary recommendations for fat, calcium, fruits, vegetables ($p < 0.001$), and whole-grains ($p = 0.003$) This questionnaire was not formally validated; however, it was pretested in the target population.

Four stage validation methodology for cooking skills questionnaire

Barton et al (2011) reviewed the methodology required to validate a questionnaire assessing the impact of a cooking skills intervention using a four-step validation process. Validation included testing for content and face validity, reliability testing, and feasibility testing. Content was validated via email from professionals in the field. The researchers asked professionals to evaluate the questionnaire by giving each item a score of 1-10 on the following criteria: clarity, content in terms of appropriateness, cognitive complexity, and relevance. A total of $n = 28$ professionals evaluated the questionnaire, and the questionnaire was amended as appropriate. Face validity involved asking participants ($n = 20$), who were similar to the target audience to complete the questionnaire. Upon completion, participants were interviewed

regarding ease of completion and comprehension with further probing to ensure all questions were properly understood. After analysis of the results, the questionnaire was amended as appropriate. Reliability testing involved usage of a pre- and post-test design in a sample group ($n = 57$) similar to the target population. The questionnaire was administered at two time points 7 days apart. From the results, the questionnaire was evaluated for internal consistency using Cronbach's alpha. Questions that did not reach 0.5 were discarded. In addition, the Item Difficulty Index was applied to determine if a specific question should be included or excluded. The Item Difficulty Index involved calculating the percentage of participants who correctly answered each question. For inclusion, between 20% and 80% of participants must have answered the question correctly. Upon data analysis at each stage the questionnaire was amended as appropriate. Finally, feasibility testing involved distribution of the finalized questionnaire to the target sample group ($n = 10$). All participants were asked to complete the questionnaire at baseline and again at the completion of the intervention. During the administration of the questionnaire difficulties participants had with completion, any missing responses, any queries that arose from respondents, and any personal comments on perceived ease of administration were documented. Upon completion the questionnaire was amended and finalized.

Measurement of taste sensitivity

Assessment of taste sensitivity may help to qualify individuals as tasters or non-tasters. As previously stated, PTC and PROP are chemically related compounds that are perceived as bitter by tasters and tasteless by non-tasters (Hong et al 2004). Drewnowski et al (2001) validated effective methodology for use in a non-laboratory setting which involves preparing and administering PROP/PTC with tasting papers. Researchers dipped filter paper into a saturated sample of PROP which was heated close to boiling point. Next, the papers were dried, cut into

1-inch squares, and stored in glassine envelopes. Participants were then given the saturated paper to taste and were asked to record response. PTC impregnated filter paper strips are commercially available.

Previous studies have used category scales to record participant response for intensity of flavor stimuli (Drewnowski et al 2001). One example of a category scale involves using a 9-point scale where participants are asked to rate a perceived stimuli such as saltiness, from 1 being not at all salty to 9 being extremely salty (Drewnowski et al 2001). However, Bartoshuk et al (2004) explains that this kind of assessment may be problematic as perceived sensations cannot be directly compared using this type of scale. For example, all individuals may taste the saltiness of sodium chloride and rate it as “extremely salty” but there is no way to assess whether or not each individual experiences the intensity the same way. Additionally, using a category scale such as a 9-point scale, a rating of “8” is greater than “4” but not necessarily twice as great (Bartoshuk et al 2005). Therefore, Bartoshuk et al (2004) proposed that taste intensity would be better measured on a general labeled magnitude scale (gLMS). gLMS uses a 100 point scale, with 0 being no sensation, and 100 being strongest imaginable sensation. The scale has intermediate labels such as 1.4 being barely detectable, 6 being weak, 17 being moderate, 35 being strong, and 53 being very strong. Using this type of scale and spacing an oral sensation of 80 is perceived twice as strong as a sensation rated 40. Figure 2.1 below shows an example of a gLMS, as well as how a gLMS may be adapted for flavor perception (Bartoshuk et al 2005).

Figure 2.1:

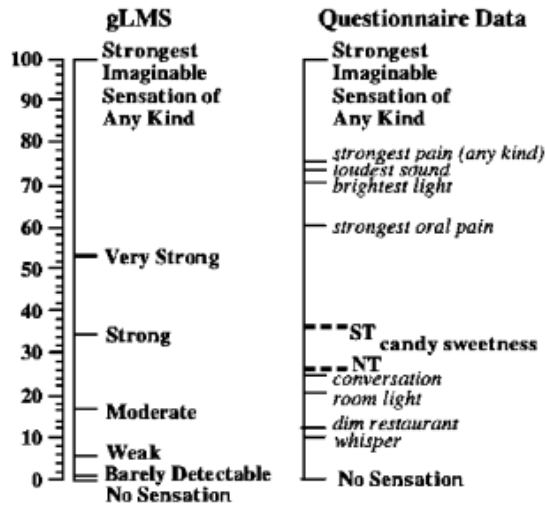


Fig 2.1. The figure on the left represents a standard gLMS scale, while the figure on the right represents how a gLMS scale may be used for sensory analysis (Bartoshuk et al 2005)

In a recent study on college-aged women by Tepper et al (2009), the relationship between PROP taste sensitivity and food selection, particularly, cruciferous and other green vegetables and bitter fruits was determined. Testing involved participants ($n = 93$) receiving PROP test papers and rating the intensity of bitterness on a 100-point gLMS, ranging from “barely detectable” to “strongest imaginable.” Those who rated intensity of PROP ≤ 15 were classified as non-tasters; those who rated intensity as > 67 were classified as super tasters; those who rated intensity between 15 and 67 were classified as medium tasters. Delwiche (2005) outlined the following protocol for categorizing taster status, those with a score < 11 were categorized as non-tasters, those with a score of 11-82 were considered tasters, and those with a score > 82 were considered supertasters. These studies support the use of PTC/PROP test papers paired with gLMS to yield usable results of taste sensitivity.

References

- Adams TB, Colner BS. The association of multiple risk factors with fruit and vegetable intake among a nationwide sample of college students. *J Am Coll Health* 2008;56(4):455-461.
- American College Health Association, National College Health Assessment II, 2010, Internet: <http://www.achancha.org/> (assessed on 15 February 2013).
- Bajec MR, Pickering GJ. Association of thermal taste and PROP responsiveness with food liking, neophobia, body mass index, and waist circumference. *Food Qual Prefer* 2010;21(6):589-601
- Barton KL, Wrieden WL, Anderson AS. Validity and reliability of a short questionnaire for assessing the impact of cooking skills interventions. *J Hum Nutr Diet* 2011;24(6):588-595.
- Bartoshuk LM, Duffy VB, Green BG, Hoffman HJ, Ko CW, Lucchina LA, Marks LE, Snyder DJ, Weiffenbach JM. Valid across-group comparisons with labeled scales: the gLMS versus magnitude matching. *Physiol Behav* 2004;82(1):109-114.
- Bartoshuk LM, Fast K, Snyder DJ. Differences in our sensory worlds: invalid comparisons with labeled scales. *Curr Dir Psychol Sci* 2005;14(3):122-125.
- Brug J, Vet E, Nuijter J, Verplanken B. Predicting fruit consumption: cognitions, intentions, and habits. *J Nutr Educ Behav* 2006;38(2):73-81.
- Collins A, Mullan B. An extension of the theory of planned behavior to predict immediate hedonic behaviors and distal benefit behaviors. *Food Qual Prefer* 2011;22(7):638-646.
- Odelwiche J. Individual differences in perception. In: *Understanding flavor: Background, Modern Advances and Impact of Aging*; IFT Short course, July 15-16, New Orleans.
- Dinehart ME, Hayes JE, Bartoshuk LM, Lanier SL, Duffy VB. Bitter taste markers explain variability in vegetable sweetness, bitterness, and intake. *Physiol Behav* 2006;87(2):304-313.
- Dissen A, Policastro P, Quick V, Byrd-Bredbenner C. Interrelationships among nutrition knowledge, attitudes, behaviors, and body satisfaction. *Health Educ J* 2011;111(4):283-295.
- Drewnowski A. Taste Preferences and food intake. *Annu Rev Nutr* 1997;17(1):237-253.
- Drewnowski A, Hann C, Henderson SA, Gorenflo D. Both food preferences and food frequency scores predict fat intakes of women with breast cancer. *J AM Diet Assoc* 2000;100(11):1325-1333.
- Drewnowski A, Kristal A, Choen J. Genetic taste responses to 6-n-propylthiouracil among adults: a screening tool for epidemiological studies. *Chem Senses* 2001;26(5):483-489.

Duffy VB, Hayes JE, Davidson AC, Kidd JR, Kidd KK, Bartoshuk LM. Vegetable intake in college-aged adults is explained by oral sensory phenotypes and TAS238 genotype. *Chem Percept* 2010;3(3-4):137-148.

Ferrer RA, Bergman HE, Klein WM. Worry as a predictor of nutrition behaviors: results from a nationally representative survey. *Health Educ Behav* 2013;40(1):88-97.

Ha E, Caine-Bish N. Effect of nutrition intervention using a general nutrition course for promoting fruit and vegetable consumption among college students. *J Nutr Educ* 2009;21(2):103-109.

Hall PA, Fong GT. Temporal self-regulation theory: A model for individual health behavior. *Health Psychol* 2007;1(1):6-52.

Hong JH, Chung JW, Kim YK, Chung SC, Lee SW, Kho HS. The relationship between PTC taster status and taste thresholds in young adults. *Oral Surg Oral Med O* 2005;99(6):711-715.

Ickes MJ, Sharma M. Does behavioral intention predict nutrition behaviors related to adolescent obesity. *ICAN: Infant, Child, & Adolescent Nutrition* 2011;3(1):38-48.

Kalva JJ, Sims CH, Lorenzo PA, Snyder DJ, Bartoshuk LM. Comparison of the hedonic general labeled magnitude scale with the hedonic 9-point scale. *J Food Sci* 2014;79(2):S-238-S245.

Larson NI, Laska MN, Story M, Neu-Sztainer D. Predictors of fruit and vegetable intake in young adulthood. *J Am Diet Assoc* 2012;112(8):1216-1222.

Larson NI, Perry CL, Story M, Neumark-Sztainer D. Food preparation by young adults is associated with better quality diet. *J Am Diet Assoc* 2006;106(12):2001-2007.

Laska MN, Larson NI, Neumark-Sztainer D, Story M. Does involvement in food preparation track from adolescence to young adulthood and its associated with better dietary quality? Findings from a 10-year longitudinal study. *Public Health Nutr* 2011;15(7):1150-1158.

Lohr L, Swanson R, McElveen, ?? . Effects of economic and noneconomic factors on frequency of fruit and vegetable consumption. *J Agr Resour Econ* 2006;31(3):689-690.

McElveen ML, Swanson RB. PTC sensitivity: Effects on extent of liking and food selection. *J Am Diet Assoc* 2003;103(9):116.

Milošević J, Žeželj I, Gorton M, Barjolle D. Understandings the motives for food choice in Western Balkan countries. *Appetite* 2012;58(1):205-214.

Stables GJ, Subar AF, Blossom PH, Dodd K, Heimendinger J, Van Duyn MS, Neveling L. Changes in vegetable and fruit consumption and awareness among US adults: Results of the 1991 and 1997 5 A Day for Better Health Program surveys. *J Am Diet Assoc* 2002;102(6):809-817.

Stephoe A, Pollard T, Wardle J. Development of a measure of the motives underlying the selection of food: the Food Choice Questionnaire. *Appetite* 1995;25(3):267-284.

Swanson R, Lohr L, McElveen ML. Motivational and demographic effects on fruit and vegetable consumption among college students. *J Am Diet Assoc* 2007;107(8):A101.

Tepper BJ, Williams TZ, Burgess JR, Antalis CJ, Mattes RD. Genetic variation in bitter taste and plasma markers of anti-oxidant status in college women. *Int J Food Sci Nutr* 2009;60(2):35-46.

Yackinous CA, Guinard JX. Relation between PROP (6-n-propylthiouracil) taster status, taste anatomy and dietary intake measures for young men and women. *Appetite* 2002;38(3):201-209.

CHAPTER 3

METHODS

Food preparation questionnaire development

The first study was a validation study of a food preparation involvement questionnaire to be used in a second study designed to determine fruit and vegetable consumption in college students. This questionnaire was initially developed to assess the degree to which the participants are involved in their own food preparation, and the impact this plays on food habits.

Using a protocol established by Barton et al (2011), a 20-item questionnaire utilizing a closed-question format was designed based on key domains known to be involved in the evaluation of food preparation. Questions used in the preliminary draft of the questionnaire were adapted from the following: expert opinions of University of Georgia faculty and staff familiar with the cooking skills of this population and materials adapted from Larson et al (2006) and Lohr et al (2006), the questionnaire was tested for content and face validity, reliability, and feasibility using the following methodology. This portion of the study was approved by the University of Georgia's Institutional Review Board prior to the distribution of any materials.

Content validity was assessed by University of Georgia faculty, staff, and graduate students who served as an expert panel in two steps. Data were collected on the Internet via Qualtrics (Provo, UT). A copy of the first draft of the questionnaire was emailed to the participants ($n = 22$). Participants were asked to evaluate each item on the draft questionnaire on a 10-point scale, with 1 being poor, and 10 being excellent, in terms of clarity, content (in terms of appropriateness), cognitive complexity (i.e. how important is this question? Is the content

appropriate? Is the phrasing clear? and overall opinion of the question), and overall relevance. Moreover, these experts were asked for any additional comments or suggestions in regards to the questionnaire. Following administration, the experts evaluated the questionnaire ($n = 11$). Data were collated and amendments to the questionnaire were made as necessary. This process was repeated with a second version of the questionnaire where a similar but different group of foods and nutrition experts ($n = 9$) were asked to evaluate the questionnaire in the same way that was previously described. Data obtained from the experts ($n = 6$) were collated, and amendments were made as indicated.

Face validity was assessed by University of Georgia Peer Nutrition Educators as these undergraduate students ($n = 9$) were considered similar to the target audience. Data were collected on the Internet via Qualtrics (Provo, UT). The questionnaire revised post content validity was emailed to the participants. These evaluators were asked to restate in their own words what they thought each question was asking. Following administration the participants evaluated that questionnaire ($n = 5$).

Reliability was assessed by University of Georgia students enrolled in the summer session of FDNS 2100. Students were administered the revised questionnaire during two time points a week apart. Students were asked to fill-out the questionnaire to completion ($n = 18$). Data were collected and analyzed using Statistical Analysis Software (SAS, Version 9.1, Cary, NC). Frequency data were generated, and were used for the Item Difficulty Index analyses from the time point 1 completion. For the cooking knowledge questions, which had correct answers, correct answers by 20-80% of the respondents resulted in retention of the question. Cronbach's alpha data were generated for questions relating to resource availability (Q7, Q8a-Q8e), cooking skill awareness (Q9-Q11), food preparation involvement behaviors (Q12, Q19) and food

purchasing habits (Q20a-Q20e). These four domain scores as well as the individual questions were used in subsequent analyses. Finally Spearman's correlation analyses were conducted ($p < 0.05$) for each question comparing responses from time point 1 to time point 2 for each question. From these results the questionnaire was amended as necessary.

Finally, feasibility was tested using students enrolled in the fall session of FDNS 2100. Students were administered the revised questionnaire and were asked to fill-it out to completion ($n = 215$). While the students were completing the questionnaire they were observed for confusion related to the questions. Following the administration of the questionnaire frequency data (SAS, Version 9.1, Cary, NC) were obtained and questionnaires were evaluated for completeness. Internal consistency of each of the previously identified domains were assessed with Cronbach's alpha. Additionally, Chi-squared analysis was conducted to determine the relationships between specific variables and/or domains. No further amendments were made to the questionnaire following feasibility testing.

Factors affecting fruit and vegetable intake data collection

This phase of the study had a cross-sectional design and involved the use of a frequency of consumption questionnaire, food liking questionnaire, food choices questionnaire, demographic and health questionnaire, food preparation involvement questionnaire, and taste sensitivity test. The theory of planned behavior served as the theoretical framework following principles applied to previous studies (Ikes and Sharma 2011; Hall and Fong 2007). This portion of the study was approved by the University of Georgia's Institutional Review Board prior to the distribution of any materials.

All data were collected from students enrolled in the spring session of FDNS 2100 ($n = 214$). Upon obtaining consent, students received a 3-digit coded series of the following

questionnaires: Food Frequency Questionnaire (Appendix A), Food Choices Questionnaire (Appendix B), Demographic Information Questionnaire (Appendix C), PTC Taste Sensitivity Questionnaire (Appendix D), Food Liking Questionnaire (Appendix E), and Food Preparation and Consumption Habits Questionnaire (Appendix F). Prior to distribution students were given directions to complete each questionnaire in its entirety. Moreover, the students were asked to work at their own pace, and to stop once they came to the PTC taste sensitivity questionnaire for further instruction. Following the PTC taste sensitivity test students were asked to complete the final questionnaires and turn-in their packets. Students were encouraged to ask questions as necessary.

The demographic questionnaire was written to obtain information about gender, age, height, weight, ethnicity, drug and tobacco use, adherence to special diets, and presence of common medical conditions that may interfere with taste and smell functionality of the participants. Both food frequency and food liking were measured using a 19-item food list adapted from Drewnowski et al (2000) and Stables et al (2002). Frequency of consumption was rated on a scale from 1 being never consuming fruits and vegetables, to 7 being eating fruits and vegetables more than four times per day. Similarly, food liking was rated on a scale from 1 being dislike extremely, to 7 being liked extremely. Factors influencing food choices were measured using a 36-item food choices questionnaire validated by Steptoe et al (1995). Responses of relative importance ranged from 1 being not important at all to 4 being very important.

For PTC taste sensitivity, students received two random 3-digit coded strips, one control, and one impregnated (0.3 micrograms) with PTC (Flinn Scientific, Batavia IL); the participants had no knowledge as to what each strip was. In addition, each student received two baby carrots, one 4-oz room temperature soufflé cup filled with distilled water, and two unsalted saltine

crackers to be used to as palate cleansing agents. The students were instructed to first cleanse their palate then place the control paper on their tongue and record a value of perceived sensation on the appropriately labeled scale. Then, after a second palate cleanse, the students were instructed to place the PTC saturated paper on their tongue and record a value of perceived sensation on the appropriately labeled scale (Drewnowski et al 2001; Bartoshuk et al 2005). The scale used for this assessment was a 100-point gLMS, ranging from 0, being no sensation, to 100 being, the strongest imaginable sensation of any kind. Participants who scored the PTC <11 were categorized as non-tasters, those with a score of 11-82 were considered tasters, and those >82 were considered supertasters (Delwiche 2005).

Statistical analysis

Descriptive statistics including means and standard deviations were calculated from the fruit and vegetable frequency and liking questionnaires. Spearman's correlations ($p < 0.1$) were generated between fruit and vegetable liking and fruit and vegetable consumption by item. Data were analyzed using SAS version 9.3 (Cary, NC). Next, fruits and vegetables were subdivided into groups as suggested by the dietary guidelines for healthy eating patterns: red and orange vegetables, dark-green vegetables, starchy vegetables, fruit juices, and melons. Subsequent descriptive statistics and Chi-squared analyses were conducted to determine frequency of consumption based upon gender.

From the food choices questionnaire means, standard deviations, and frequency of response were calculated for each item. Data were analyzed using SAS version 9.3 (Cary, NC). Next, factors were extracted with the principal factor method. All factors were subjected to a scree test and varimax rotation. Question factor inclusion criteria included a factor loading value greater than three and a Cronbach's alpha value greater than 0.70 for each factor.

Frequency of response was generated for the cooking skills and demographic questionnaires. BMI was calculated based on height and weight information provided on the demographic questionnaire. Participants were categorized into one of four groups including: underweight (<18.5), normal weight (18.6-24.9), overweight (25.0-29.9), and obese (>30.0) based on calculated BMI.

For the cooking skills questionnaire, scores were generated for each domain of interest including resource availability (Q7, Q8a-Q8e), cooking skill awareness (Q9-Q11), food preparation involvement behaviors (Q12, Q19) and food purchasing habits (Q20a-Q20e), and food preparation knowledge (Q14-17). Scores were generated by initially assigning a numerical score of 1, 2, 3, 4, 5 or 6, where 1 was low and 6 was high on each scale employed. For resource availability, possible scores ranged from 6-26; scores ranging from 6-8 were considered unimportant, scores from 9-17 were considered slightly important, scores ranging from 18-22 were considered moderately important, and scores of 23-26 were considered very important. For cooking skill awareness, scores ranged from 3-12 where scores from 2-6 were considered lower-level cooking skills and scores from 7-12 were considered higher-level cooking skills. Food preparation involvement behavior scores ranged from 1-11 where scores ranging from 1-4 were considered low involvement, scores ranging from 5-8 were considered moderate involvement, and scores ranging from 9-11 were considered high involvement. The possible range of summated responses ranged from 5-25. Summed scores from 5-7 represented behavior frequencies that approximated “never or rarely,” scores between 8-17 approximated “one to five times per year,” scores between 18-22 corresponded to “monthly” and scores between 23-25 were indicative of “at least weekly” as recommended by Larson et al (2006). Finally, food preparation knowledge scores ranged from 0-4 where 0 represented lowest knowledge and 4

represented greatest knowledge; responses that were correct received a score of “1” and incorrect responses received a score of “0”. Chi-squared analysis was used to examine relationships between two variables, perceived cooking skills and actual cooking knowledge, to aid in profiling participants.

Taster status was determined by calculating an adjusted PTC taste score by subtracting the control rating from the rating assigned to each PTC saturated paper. Responses were categorized into three groups of non-tasters, tasters, and supertasters based on protocol outlined by Delwiche (2005). Respondents with a score <11 were categorized as non-tasters, those with a score of 11-82 were considered tasters, and those with a score >82 were considered supertasters. Food frequency and food liking responses were categorized into three groups of low, moderate, and high. For food frequency, responses of never and less than once per month or 1-3 times per month were categorized as low, responses of 1-3 times per week or 4+ times per week were categorized as moderate, and responses including 1-3 times per day and 4+ times per day were considered high. For food liking, a 7-pt scale was used ranging from dislike extremely to like extremely. Responses 1-3 were categorized as low, responses 4-5 were categorized as moderate, and responses of 6-7 were categorized as high. Following the grouping of the aforementioned data Chi-squared analyses were conducted to examine pertinent relationships ($P<0.05$).

References

Delwiche J. Individual differences in perception. In: Understanding flavor: Background, Modern Advances and Impact of Aging; IFT Short course, July 15-16, New Orleans.

Larson NI, Perry CL, Story M, Neumark-Sztainer D. Food preparation by young adults is associated with better quality diet. *J Am Diet Assoc* 2006;106(12):2001-2007.

Lohr L, Swanson R, McElveen. Effects of economic and noneconomic factors on frequency of fruit and vegetable consumption. *J Agr Resour Econ* 2006;31(3):689-690.

CHAPTER 4

RESULTS AND DISCUSSION:

FOOD PREPARATION QUESTIONNAIRE DEVELOPMENT AND VALIDATION

Food preparation involvement and cooking knowledge has been associated with a positive effect on diet quality (McLaughlin et al 2003; Chu et al 2013; Laska et al 2011) including fruit and vegetable consumption (Larson et al 2006). A tool to measure food preparation involvement and cooking skills has not yet been validated for use in college-aged adults, although data suggest that food prepared at home by this population is more healthful than foods prepared away from home (Nielsen et al 2002). The goal was to develop a short questionnaire that could be used in intervention settings with a completion time that did not exceed 15 minutes. Portions of this questionnaire were drawn from previous studies by Larson et al (2006) and Lohr et al (2006). Additional questions were included after soliciting input from University of Georgia faculty and staff familiar with the cooking skills of this population. Overall the questionnaire was developed to gain information about food preparation involvement by measuring: food preparation involvement behaviors, resource availability, cooking knowledge awareness, and purchasing behavior. In addition, several questions that were not part of the assessment tool but that did allow the population to be characterized were included. The questionnaire was subjected to the 4-stage validation method outlined by Barton et al (2011). Specifically, content validity, face validity, reliability testing and feasibility testing were conducted. Input received at each stage was used to modify the questionnaire prior to the next validation stage.

Content validity

The initial draft of the questionnaire consisted of 26 questions, 3—food preparation involvement behaviors, 6—resource availability, 5—cooking knowledge, and 5—purchasing behavior. An additional 7 questions addressed adherence to special diets and other demographic information including where food was consumed. In stage 1, content validity was assessed by University of Georgia Department of Foods and Nutrition faculty and graduate students using the criteria outlined by Barton et al (2011). Twenty-two participants were invited to assess the questionnaire and the response rate was 50%. The intent was to determine the relevance of the included content. The respondents ($n=11$) evaluated each item on the questionnaire on a 10-point scale with 1 being poor and 10 being excellent in terms of clarity, content, cognitive complexity (How important is this question? Is the content appropriate? Is the phrasing clear? and Overall opinion of question), and overall relevance; a copy of the initial questionnaire can be found in Appendix G. The results are summarized below in table 4.1.

Table 4.1. Content validity data for cooking skills questionnaire by evaluation criterion ($n = 11$)

Question	Evaluation Criterion	Mean±SD
1	Clarity	7.92±2.07
	Content	8.00±2.09
	Cognitive complexity	8.64±1.57
	Overall relevance	8.58±2.07
2	Clarity	9.50±1.18
	Content	9.58±1.16
	Cognitive complexity	9.33±1.44
	Overall relevance	9.83±0.39
3	Clarity	8.17±1.75
	Content	9.58±0.79
	Cognitive complexity	9.00±1.44
	Overall relevance	9.83±0.39
4	Clarity	8.67±1.23
	Content	9.67±0.89
	Cognitive complexity	8.67±2.31
	Overall relevance	9.75±0.62
5	Clarity	8.83±1.80

	Content	9.83±0.39
	Cognitive complexity	8.58±2.35
	Overall relevance	9.92±0.29
6	Clarity	8.67±1.92
	Content	9.64±0.67
	Cognitive complexity	8.09±2.55
	Overall relevance	9.00±1.56
7	Clarity	9.27±1.27
	Content	9.45±1.04
	Cognitive complexity	8.55±2.21
	Overall relevance	8.91±1.38
8a	Clarity	9.55±0.82
	Content	10.00±0.00
	Cognitive complexity	9.00±1.61
	Overall relevance	9.73±0.90
8b	Clarity	10.00±0.00
	Content	10.00±0.00
	Cognitive complexity	9.09±2.43
	Overall relevance	9.82±0.60
8c	Clarity	9.27±1.10
	Content	9.64±0.92
	Cognitive complexity	8.55±2.38
	Overall relevance	9.20±1.75
8d	Clarity	9.91±0.30
	Content	9.82±0.60
	Cognitive complexity	9.00±2.19
	Overall relevance	9.64±0.92
8e	Clarity	10.00±0.00
	Content	10.00±0.00
	Cognitive complexity	9.09±2.43
	Overall relevance	9.82±0.60
9	Clarity	10.00±0.00
	Content	9.73±0.65
	Cognitive complexity	8.91±2.47
	Overall relevance	9.73±0.65
10	Clarity	9.27±1.01
	Content	9.45±1.04
	Cognitive complexity	8.55±2.21
	Overall relevance	9.27±1.27
11	Clarity	9.55±0.82
	Content	9.73±0.47
	Cognitive complexity	8.73±2.33
	Overall relevance	9.36±1.50

12	Clarity	9.91±0.30
	Content	9.45±0.82
	Cognitive complexity	8.82±2.36
	Overall relevance	8.73±2.24
13	Clarity	10.00±0.00
	Content	9.09±1.70
	Cognitive complexity	8.91±1.64
	Overall relevance	9.09±1.58
14	Clarity	10.00±0.00
	Content	9.18±1.47
	Cognitive complexity	8.91±1.81
	Overall relevance	8.73±1.62
15	Clarity	10.00±0.00
	Content	9.27±1.27
	Cognitive complexity	9.00±1.41
	Overall relevance	9.09±1.58
16	Clarity	9.73±0.65
	Content	9.45±1.29
	Cognitive complexity	8.55±2.46
	Overall relevance	8.55±1.97
17	Clarity	9.73±0.65
	Content	9.55±0.82
	Cognitive complexity	8.91±1.81
	Overall relevance	9.36±1.29
18a	Clarity	9.82±0.40
	Content	9.64±0.92
	Cognitive complexity	8.64±2.50
	Overall relevance	9.00±1.67
18b	Clarity	9.36±1.29
	Content	8.82±1.66
	Cognitive complexity	8.18±2.79
	Overall relevance	8.64±2.06
18c	Clarity	9.55±0.82
	Content	8.36±2.80
	Cognitive complexity	8.55±1.92
	Overall relevance	8.82±1.47
18d	Clarity	9.00±1.41
	Content	9.09±1.14
	Cognitive complexity	8.36±2.20
	Overall relevance	8.55±2.07
18e	Clarity	8.64±1.96
	Content	8.64±1.63
	Cognitive complexity	8.09±2.70
	Overall relevance	8.45±2.21

^AResponses were based on a 10-point scale ranging from 1 being poor and 10 being excellent

^BRespondents included FDNS graduate students, professors, and staff

Based on the results indicated above, clarity of the questions ranged from 7.92-10.00, content ranged from 8.00-10.00, cognitive complexity ranged from 8.09-9.09, and overall relevance ranged from 8.45-9.82; thus, no questions were adjusted based upon these evaluation parameters. Mean values for all four evaluation criteria fell in the upper range of the scale and suggested that content was appropriate for the tool’s intended use.

In addition to assigning a numeric value to each criterion for each question participants were invited to add additional comments and suggestions after reading the questionnaire. The results were subjected to themes analysis and are summarized below in table 4.2. These suggestions were used to make amendments to the questionnaire. A complete list of comments can be found in appendix H.

Table 4.2. Themes emerging from the additional comments provided by expert reviewers during the content validation step (n=9)

Suggestion Type	Comment
Include	New Question. Include a question to test food safety knowledge to compare against self-assessment Question #17. Add an option for “I do not use recipes” Question #18. Include all raw meat, poultry and fish options, rather than specifying only fish and chicken
Exclude	Question #7 and #18c. Omit one question about preparing an entire meal for two, both asking about the same thing
Clarifications	Question #1. Specify what is meant by a “special diet” Question #2. Specify “dining hall” to “university dining hall” Question #3. Specify that “eating out” refers to eating outside of the pace of residence other than a university dining hall Question #4. Specify what is meant by “fast foods” Question #5. Re-phrase “main meal” to more easily understood terminology Question #7. Specify what is meant by preparing an “entire” meal Question #18e. Re-phrase “convenience” foods to “packaged pre-cut”

^ARespondents included FDNS graduate students, professors, and staff

Based on comments received the questionnaire was amended prior to step 2 of the content validity process. Appendix I shows final modifications, overall, 2 questions were added (11 and 17), 1 question was removed (20c), and 12 questions were adjusted to increase clarity (1, 3-4, 6-7, 8c, 10, 18, and 20b-e). The revised questionnaire (Appendix I) was distributed to a new set of respondents for the second step of content validity. Again, these foods and nutrition professionals ($n=6$), including FDNS professors and FDNS staff, evaluated each item on the questionnaire on the same 10-point scale with 1 being poor and 10 being excellent, in terms of clarity, content, cognitive complexity, and overall relevance; a copy of the initial questionnaire can be found in Appendix G. The results are summarized in table 4.3.

Table 4.3. Content validity data for cooking skills questionnaire by evaluation criterion ($n = 6$)

Question	Evaluation Criterion	Mean±SD
1	Clarity	7.33±2.80
	Content	8.33±2.25
	Cognitive complexity	5.00±2.10
	Overall relevance	8.83±1.17
2	Clarity	9.83±0.41
	Content	9.33±1.03
	Cognitive complexity	7.17±3.13
	Overall relevance	9.50±0.84
3	Clarity	9.67±0.82
	Content	9.83±0.41
	Cognitive complexity	6.67±2.42
	Overall relevance	9.83±0.41
4	Clarity	8.17±2.14
	Content	9.50±0.84
	Cognitive complexity	7.00±2.37
	Overall relevance	9.50±0.55
5	Clarity	8.17±1.94
	Content	9.17±1.60
	Cognitive complexity	7.00±2.76
	Overall relevance	9.50±0.84
6	Clarity	8.17±1.72
	Content	9.67±0.52
	Cognitive complexity	7.50±2.17
	Overall relevance	9.33±1.21

7	Clarity	9.50±0.55
	Content	8.33±1.86
	Cognitive complexity	7.00±2.76
	Overall relevance	8.67±1.75
8a	Clarity	8.83±2.04
	Content	9.50±0.84
	Cognitive complexity	7.67±2.25
	Overall relevance	9.83±0.41
8b	Clarity	10.00±0.00
	Content	9.83±0.41
	Cognitive complexity	7.50±3.33
	Overall relevance	10.00±0.00
8c	Clarity	9.67±0.52
	Content	9.50±0.84
	Cognitive complexity	7.33±2.25
	Overall relevance	10.00±0.00
8d	Clarity	9.17±2.04
	Content	9.67±0.82
	Cognitive complexity	7.00±2.28
	Overall relevance	9.83±0.41
8e	Clarity	10.00±0.00
	Content	9.83±0.41
	Cognitive complexity	7.33±3.08
	Overall relevance	10.00±0.00
9	Clarity	10.00±0.00
	Content	9.33±1.21
	Cognitive complexity	7.50±3.21
	Overall relevance	9.33±1.21
10	Clarity	9.00±1.67
	Content	9.33±1.03
	Cognitive complexity	7.67±1.86
	Overall relevance	8.83±1.17
11	Clarity	7.50±4.36
	Content	9.50±0.71
	Cognitive complexity	9.50±0.71
	Overall relevance	Data Unavailable
12	Clarity	10.00±0.00
	Content	10.00±0.00
	Cognitive complexity	7.33±3.08
	Overall relevance	10.00±0.00
13	Clarity	10.00±0.00
	Content	9.33±1.03
	Cognitive complexity	7.33±3.20
	Overall relevance	9.33±1.03

14	Clarity	9.83±0.41
	Content	7.83±1.33
	Cognitive complexity	8.17±1.60
	Overall relevance	8.33±1.63
15	Clarity	9.83±0.41
	Content	8.67±1.37
	Cognitive complexity	7.83±2.04
	Overall relevance	8.67±1.51
16	Clarity	10.00±0.00
	Content	9.83±0.41
	Cognitive complexity	8.83±1.86
	Overall relevance	9.67±0.52
17	Clarity	9.33±0.82
	Content	8.83±1.60
	Cognitive complexity	8.33±1.37
	Overall relevance	9.00±1.67
18	Clarity	7.67±2.07
	Content	9.17±0.75
	Cognitive complexity	7.83±1.72
	Overall relevance	9.17±0.75
19	Clarity	9.50±0.55
	Content	9.67±0.52
	Cognitive complexity	8.83±1.17
	Overall relevance	9.67±0.52
20a	Clarity	10.00±0.00
	Content	9.67±0.82
	Cognitive complexity	7.17±2.99
	Overall relevance	9.83±0.41
20b	Clarity	10.00±0.00
	Content	9.50±0.84
	Cognitive complexity	6.83±3.54
	Overall relevance	9.50±0.84
20c	Clarity	9.83±0.41
	Content	9.50±0.84
	Cognitive complexity	7.17±3.06
	Overall relevance	9.67±0.82
20d	Clarity	10.00±0.00
	Content	9.67±0.82
	Cognitive complexity	7.17±3.06
	Overall relevance	9.83±0.41
20e	Clarity	9.50±1.22
	Content	9.67±0.82
	Cognitive complexity	7.33±3.20
	Overall relevance	9.83±0.41

^AResponses were based on a 10-point scale ranging from 1 being poor and 10 being excellent

^BRespondents included FDNS graduate students, professors, and staff

Based on these results clarity of the questions ranged from 7.33-10.00, content ranged from 7.83-10.00, cognitive complexity ranged from 5.00-9.50, and overall relevance ranged from 8.33-10.00. The low end of the cognitive complexity range was attributed to the first question thus an amendment was made to this question. No further amendments were made based upon these parameters.

Themes that emerged from participant comments included suggestions to rephrase specific questions, to add questions, and to clarify phraseology used. Based on these results (table 4.4) amendments were made to the 3 questions (1, 4-5), as seen in appendix K. A list of verbatim comments can be found in appendix J.

Table 4.4. Themes emerging form the additional comments provided by expert reviewers during the content validation step (n=6)

Suggestion Type	Comment
Re-phrase	Question #1. Re-phrase awkward wording describing specific diets Question #4. Provide examples of fast food restaurants Question #5. Re-phrase the term “main meal”
Include	Question #8. Add question about access to transportation in terms of obtaining food
Clarify	Question #8a. Provide examples of specific cooking skills Question #9. Give more specifics about rating cooking skills, this may be too subjective Questions #5 and #20 Be sure to keep all time frames consistent in the response selections
Exclude	Question #8a. Remove “where you shop” as it may influence participant response Question #8c. It may not be required to explain what is meant by “kitchen utensils” Question #17. Remove “a washed apple” as a response, this could cause some confusion with the question

^ARespondents included FDNS graduate students, professors, and staff

Face validity

Face validity was assessed by University of Georgia Peer Nutrition Educators, a group of undergraduate students studying consumer foods, nutrition and dietetics who work with the UGA Food Services', and the University Health Center's Registered Dietitians to plan and implement nutrition and health-related programming to student groups. Participants ($n=5$) were asked to state in their own words what each question was asking. A copy of the questionnaire as administered to the Peer Nutrition Educators and a complete list of re-worded questions generated can be found in appendices K and L, respectively.

Based upon the response by the Peer Nutrition Educators it was evident that the questions as written were clear and easily understood and would likely be well understood and clear to the target audience. Even though none of the respondents appeared to have misunderstood the questions minor adjustments were made to the questionnaire prior to continuing on to the reliability step of validation. Due to the similar wording of a number of questions, revisions involved the underlining of key terms for emphasis. In total, 8 questions were modified in this manner (2-5, 7, 11, and 20) as seen in appendix M.

Reliability testing

Next, reliability testing was conducted using students enrolled in the summer session of FDNS 2100 Human Nutrition and Foods. These students ($n=18$) completed the questionnaire during two time periods, one week apart. All responses were subjected to comparative analysis between the two time points. A copy of the questionnaire that was distributed to the participants can be found in appendix M. Consistency of response was measured via Spearman's correlation coefficients ($p<0.05$) for all questions on the questionnaire. The results are summarized below in table 4.5. Because these respondents were not participating in a nutrition intervention a change in

response was not anticipated. Further, in this test-retest assessment it was assumed that respondents were not influenced by their initial exposure. The criteria established for temporal validity were that each question must first reach significance and then exhibit a correlation of at least 0.46, meeting the temporal validity criteria accepted by Barton and others (2011). Overall, moderate to strong correlations were found with responses to only two questions not meeting the established significance value of 0.05 suggesting that the questions produce reliable results.

Table 4.5. Reliability testing data for cooking skills questionnaire by test-retest validation

Question	Spearman's Correlation Coefficient	Spearman's Correlation p-value
Q1. Are you on any type of special diet?	1.000	<0.001
Q2. How often do you eat at a university dining hall in a month?	0.921	0.000
Q3. How often do you eat outside your place of residence (e.g. house, apartment, or dorm room) other than the university dining hall in a month?	0.443	0.065
Q4. How often do you eat fast foods prepared by quick service restaurants (e.g. McDonalds, Chipotle, Burger King) in a month?	0.829	0.000
Q5. How often do you eat your largest meal(s) at your place of residence in a month?	0.914	0.000
Q6. How many of those main meals eaten at home were take-out or mostly foods prepared outside of the home?	0.480	0.044
Q7. How often do you cook an entire dinner for 2 or more people (including yourself) during the year?	0.743	0.000
Q8a. Indicate the extent to which each of the following affects the meals you consume: cooking skills	0.535	0.022
Q8b. Indicate the extent to which each of the following affects the meals you consume: money available to buy food	0.774	0.000
Q8c. Indicate the extent to which each of the following affects the meals you consume: access to a kitchen equipped with major appliances such as a range and refrigerator, pots and pans, and utensils such as knives, spatulas, spoons, can openers used in food preparation	0.498	0.036
Q8d. Indicate the extent to which each of the following affects the meals you consume: foods available in local stores where you shop	0.497	0.036

Q8e. Indicate the extent to which each of the following affects the meals you consume: time available to prepare food	0.652	0.003
Q9. Do you consider your cooking skills to be:	0.824	0.000
Q10. How aware are you of the food safety you should follow to ensure food you prepare is safe to eat?	0.638	0.004
Q11. How aware are you of the food safety measures you should follow when storing food for future consumption?	0.560	0.016
Q12. How often do you try a new recipe?	0.859	0.000
Q14. How many fluid ounces are in a one-cup liquid measuring cup?	0.472	0.048
Q15. One stick of margarine or butter is equal to:	0.887	0.000
Q16. How many teaspoons are in tablespoon?	0.534	0.022
Q17. Which of the following foods is potentially hazardous?	0.668	0.153
Q18. How often when you plan a meal, are all of the items ready to be served at the same time?	0.815	0.000
Q19. If a recipe calls for a specific herb or spice and there is none available what would you do?	0.711	0.001
Q20a. In the past 12 months how often have you done the following: made a grocery list	0.711	0.001
Q20b. In the past 12 months how often have you done the following: bought packaged pre-cut fresh vegetables, other than salad for convenience	0.726	0.001
Q20c. In the past 12 months how often have you done the following: other than packaged precut vegetables, have you bought fresh vegetables such as broccoli stalks or crowns, or whole unpeeled carrots and onions	0.655	0.003
Q20d. In the past 12 months how often have you done the following: other than packaged precut fruits, have you bought fresh fruits such as uncut melons, pineapples, or apples	0.787	0.000
Q20e. In the past 12 months how often have you done the following: have you bought raw meat (beef, pork, lamb), poultry (chicken or turkey), or fish including shellfish like shrimp to prepare?	0.798	0.000

^AA bold response indicates a significant relationship ($p < 0.05$) was not found between the test-retest responses

^BRespondents included students enrolled in the summer session of FDNS 2100

^CQuestion 13 was omitted because response choices were not relevant for correlation analysis

Questions 2-4 were related to how often participants ate in specified locations. Lack of significant correlation between the two time points and a correlation lower than 0.46 for Question 3 was attributed to the fact that this questionnaire was given in the summer; it was assumed that results would likely differ if students were enrolled in either the spring or fall semester. In addition, the response is likely to differ based upon when within a semester the questionnaire is given. The retest was given within 8 days of the end of the semester when students are typically focused on completion of course requirements. The time period specified was likely short enough to capture differences due to time of the semester. As such, to clarify the questionnaire further, a time frame of “during the academic year” was added to decrease variability of response.

Questions 14-17 were knowledge questions. Lack of a significant correlation between time 1 and time 2 for Question 17 may reflect the fact that both the initial and subsequent responses were guesses where different answers were selected each time. The percentage of respondents correctly answering this question at time 1 was less than 30%, with approximately 33% correctly answering this question at time 2.

In addition to the test-retest assessment, reliability testing also entailed determining internal consistency within the questionnaire. Cronbach’s alpha coefficients were determined using responses given from time point 1 across the questions perceived to be related to each domain. If these results produce an acceptable alpha value the summated multi-question domain rather than the individual questions can be used as predictor variables in subsequent analyses. Analyses for questions 7, 8a-8e, representing resource availability, questions 9-11, representing cooking skill awareness, questions 12 and 19, representing food preparation involvement behaviors, questions 20a-20e, representing purchasing behavior yielded Cronbach’s alpha values

of 0.75, 0.58, 0.60, and 0.64, respectively. Cronbach's alpha was determined when all scales were the same for each question within the domain and Cronbach's standardized alpha was determined when mixed scales were in a single domain (Gliem and Gliem, 2003). These coefficient values all surpassed the 0.50 used by Barton et al (2011) as the cutoff for inclusion, and thus all measures were retained in the questionnaire with the reliability of these individual domains confirmed.

Next, an item difficulty index analysis was conducted on appropriate questions to determine the percentage of participants who were able to "correctly" answer questions. Questions 14-17 were subjected to this analysis as each knowledge-based question yielded a "correct" response. All analyses were conducted using the data from time point 1 to reduce response bias related to participants discovering the "correct" response prior to time point 2. The results are as follows: question 14--66.7%, question 15--27.8%, question 16--22.2%, and question 17-27.8%. All responses fell within the acceptable range Barton et al (2011) set as inclusion criteria. All questions were correctly answered by 20-80% of the respondents; thus, all knowledge-based questions were validated for inclusion.

Feasibility testing

The final stage for questionnaire validation included feasibility testing. Students enrolled in a fall session of FDNS 2100 Human Nutrition and Foods, representing a group similar to the target population, were asked to complete the questionnaire. The average time of completion was 10-15 minutes. Out of the 115 students asked to fill-out the survey, 112 questionnaires, that were filled-out to completion, were received. No questions were asked by the students during the process suggesting good comprehension of all questions. A summary of response is reported below in tables 4.6 and 4.7.

Table 4.6. Feasibility testing data for cooking skills questionnaire by percentage of respondents saying (*n* = 112), group profile

Questions	Percent Respondents Saying (%)				
Questions to Profile Group					
Q1. Are you on any type of special diet, (e.g. allergies, weight control, vegetarian, diabetes etc.)?	Yes			No	
	14.29			85.71	
Q2. During the academic school year, how often do you eat at a university dining hall	Never	1-2 times/month	3-5 times/month	≥ 2 times/week	Daily
	75.89	4.46	0.89	1.79	16.96
Q3. How often do you eat outside your place of residence (e.g. house, apartment, or dorm room) other than the university dining hall in a month?	Never	1-2 times	3-5 times	≥ 2 times/week	Daily
	0.89	13.39	43.75	33.93	8.04
Q4. How often do you eat fast foods prepared by quick service restaurants (e.g. McDonalds, Chipotle, Burger King) in a month?	Never	1-2 times	3-5 times	≥ 2 times/week	Daily
	7.14	33.93	41.96	15.18	1.79
Q5. How often do you eat your largest meal(s) at your place of residence in a month?	Never	1-2 times	3-5 times	≥ 2 times/week	Daily
	12.50	6.25	9.82	15.18	56.25
Q6. How many of those main meals eaten at home were take-out or mostly foods prepared outside of the home?	Never	1-2 times	3-5 times	≥ 2 times/week	Daily
	33.93	46.43	11.61	4.46	3.57

Table 4.7. Feasibility testing data for cooking skills questionnaire by percentage of respondents saying ($n = 112$), grouped by domain

Questions by Domain	Percentage of Respondents Saying:						
Food preparation involvement behaviors (Cronbach's alpha = 0.38)							
Q12. How often do you try a new recipe?	≤ 1 time/year	Several times/year	Monthly	Several times/month	Weekly	Several times/month	I do not use recipes
	7.14	29.46	30.36	18.75	7.14	0.00	7.14
Q19. If a recipe calls for a specific herb or spice and there is none available what would you do?	Would not make the recipe		Would leave out and prepare recipe with remaining ingredients		Would substitute with a spice or herb that tastes similar or is found in similar dishes		I do not use recipes
	7.14		25.00		62.50		5.36
Resource availability (Cronbach's alpha = 0.58s)							
Q7. How often do you cook an entire dinner for 2 or more people (including yourself) during the year?	Never	1-2 times	3-5 times	≥ 1 times/month	≥ 1 times/week	Daily	
	12.29	11.61	10.71	32.14	25.89	5.36	
Q8a. Indicate the extent to which each of the following affects the meals you consume: cooking skills	Not at all		Slightly		Moderately		Very much so
	16.07		27.88		35.71		20.54

Q8b. Indicate the extent to which each of the following affects the meals you consume: money available to buy food	Not at all	Slightly	Moderately	Very much so
	8.93	24.11	39.29	27.68
Q8c. Indicate the extent to which each of the following affects the meals you consume: access to a kitchen equipped with major appliances such as a range and refrigerator, pots and pans, and utensils such as knives, spatulas, spoons, can openers used in food preparation	Not at all	Slightly	Moderately	Very much so
	25.89	16.07	19.64	38.39
Q8d. Indicate the extent to which each of the following affects the meals you consume: foods available in local stores where you shop	Not at all	Slightly	Moderately	Very much so
	31.26	17.86	18.75	32.14
Q8e. Indicate the extent to which each of the following affects the meals you consume: time available to prepare food	Not at all	Slightly	Moderately	Very much so
	4.46	18.75	38.39	38.39
Cooking knowledge awareness (Cronbach's alpha = 0.73)				
Q9. Do you consider your cooking skills to be:	Poor	Average	Good	Excellent
	8.93	42.86	42.86	5.36
Q10. How aware are you of the food safety you should follow to ensure food you prepare is safe to eat?	Not at all	Slightly	Moderately	Very much so
	2.68	20.54	49.11	27.68

Q11. How aware are you of the food safety measures you should follow when storing food for future consumption?	Not at all	Slightly	Moderately	Very much so	
	1.79	18.75	53.57	25.89	
Purchasing behavior (Cronbach's alpha = 0.78)					
Q20a. In the past 12 months how often have you done the following: made a grocery list	Never	1-2 times	3-5 times	≥ 1 times/month	≥ 1 times/week
	6.25	11.61	7.14	32.14	42.86
Q20b. In the past 12 months how often have you done the following: bought packaged pre-cut fresh vegetables, other than salad for convenience	Never	1-2 times	3-5 times	≥ 1 times/month	≥ 1 times/week
	19.64	15.18	16.07	33.04	16.07
Q20c. In the past 12 months how often have you done the following: other than packaged pre-cut vegetables, have you bought fresh vegetables such as broccoli stalks or crowns, or whole unpeeled carrots and onions	Never	1-2 times	3-5 times	≥ 1 times/month	≥ 1 times/week
	12.50	8.93	13.39	33.04	32.14
Q20d. In the past 12 months how often have you done the following: other than packaged pre-cut fruits, have you bought fresh fruits such as uncut melons, pineapples, or apples	Never	1-2 times	3-5 times	≥ 1 times/month	≥ 1 times/week
	7.14	5.46	8.93	39.29	39.29

Q20e. In the past 12 months how often have you done the following: have you bought raw meat (beef, pork, lamb), poultry (chicken or turkey), or fish including shellfish like shrimp to prepare?	Never	1-2 times	3-5 times	≥ 1 times/month	≥ 1 times/week
	13.39	6.25	14.29	33.04	33.04
^A Respondents included students enrolled in the fall session of FDNS 2100					

The feasibility testing results shown above (Table 4.7) illustrate that the internal consistency within these domains as measured with Cronbach's alpha was generally acceptable. The cutoff point for acceptance identified by Barton et al (2011) who employed a questionnaire of similar overall length was >0.5 , and all but one domain (Food preparation involvement behaviors) met this criterion. The alpha of less than 0.5 for the food preparation involvement behaviors domain suggests that for this group of respondents the 3 questions included in this domain are not measuring the same underlying construct despite having done so in the test-retest reliability assessment when assessed with Cronbach's standardized alpha as well as when the single measures that comprise the domain were assessed with test-retest correlations. The number of questions, dimensionality, and item interrelatedness all impact alpha (Tavakol and Dennick, 2011). Therefore, when using this questionnaire an assessment of this domain to determine if these questions should be included in subsequent analyses as a single domain based on the summated multi-item scale or should be used as single-item measures is indicated. It should be noted that single-item questions are less reliable than a summated multi-item scale when measuring a construct (Gliem and Gliem, 2003). Barton and others (2011) final validated cooking intervention assessment included 2 multi-question constructs (confidence—4 questions and knowledge—7 questions) and 10 questions that were validated as single-item measures via significant correlations between test-retest assessments.

Tables 4.6 and 4.7 above illustrate how particular information can be extracted from the cooking skills and food preparation questionnaire using single item questions. For example, the majority of this group of participants regard their cooking skills as average to good based on the responses generated from questions 9-11. Most eat their largest meal of the day at their place of residence with more than half doing so (56.25%) on a daily basis. The majority of these students

participated in food preparation activities at least once per month but less often than daily. In terms of the resources available that affected food preparation involvement, available time was the most important factor followed by available monetary resources and cooking skills.

This tool also allows for the examination of relationships between two measures. For example, purchasing behavior as it is related to specific food groups, and in the case of fruits and vegetables, the form in which the fresh product is purchased, can be examined via Chi-Square analysis. Similarly, the relationship between purchasing behavior and cooking knowledge or perceived cooking skill level (Table 4.8) can be assessed.

Table 4.8. Examination of the relationships emerging from the cooking skills and food preparation questionnaire (*n* = 112)

Factors Compared	Chi-Squared Value	Significance
Cooking skills and raw meat purchasing for preparation	27.09	0.0075
Purchasing of precut vegetables and purchasing of whole vegetables	90.17	<0.0001
Purchasing of whole vegetables and purchasing of raw meat for preparation	50.26	<0.0001
Purchasing of precut fruits and purchasing of raw meat for preparation	44.03	0.0002
Cooking skills and use of new recipes	41.14	0.0003

^ARespondents included students enrolled in the fall session of FDNS 2100

From the aforementioned Chi-squared analyses the following conclusions can be drawn: there was no significant relationship between being on a special diet and consuming the largest meal of the day at the place of residence ($x^2= 3.79$, $p=0.43$); there was no significant relationship between self-perceived cooking skills and purchasing of pre-cut vegetables ($x^2= 19.48$, $p=0.08$); however, there was a trend ($x^2= 27.09$, $p=0.08$) toward increased purchase of whole vegetables as self-perceived cooking skills improved. There was a significant relationship between perceived cooking skills and purchasing of raw meat for preparation ($x^2= 27.09$, $p=0.01$) and those who perceived themselves to have excellent cooking skills were most likely to purchase

raw meat for preparation. There was a significant relationship between purchasing whole vegetables and purchasing pre-cut vegetables ($\chi^2= 90.17, p<0.0001$) and participants who did not purchase whole vegetables also did not purchase pre-cut vegetables whereas the opposite was also true. There was a significant relationship between purchasing of whole vegetables and purchasing of raw meat for preparation ($\chi^2= 50.26, p<0.0001$) and in general those who did not purchase whole vegetables did not purchase raw meat for preparation whereas the opposite was also true. There was a significant positive linear relationship between purchasing of pre-cut fruit and purchase of raw meat for preparation ($\chi^2=44.03, p=0.0002$) whereas as purchasing of pre-cut fruits increased, so did purchasing of raw meat for preparation. Finally, there was a significant relationship between perceived cooking skills and use of new recipes ($\chi^2= 41.14, p=0.0003$) with 60% of those who perceived themselves to have poor cooking skills never using recipes or using recipes once per year or less; those who perceived themselves to have moderate to excellent cooking skills were the most likely to use recipes.

Although useful information can be obtained by examining relationships between single-item measures, the use of summated multi-question scales provides stronger evidence of relationships (Gliem and Gliem, 2003). The reliability testing revealed 3 domains, perceived cooking skills, availability of food preparation resources, and purchasing habits, composed of multiple questions that could be used for analyses with a potential fourth domain that could be used upon validation post-administration. To create these summated scales, response categories within each validated domain should be examined for frequency of response. To create the domain score, a numerical score of 1, 2, 3, 4, 5 etc. in an ordered manner where 1 is low and 5 is high is assigned to each response category for each question. The generated score for all queries within each domain are summed. For example, the food purchasing behavior domain was

comprised of 5 questions where never being 1, 1-2 times per year being 2, 3-5 times per year being 3, 1 time per month being 4 and greater than or equal to 1 times per week being 5. The possible range of summated responses in the current feasibility sample equaled 5-25. Summed scores from 5-7 represented behavior frequencies that approximated “never or rarely,” scores between 8-17 approximated “one to five times per year,” scores between 18-22 corresponded to “monthly” and scores between 23-25 were indicative of “at least weekly.” Similar to the Chi-Squared analysis between single-item measures, bivariate associations between the scores and single measures or scores associated with other domains can be determined. For example, scores generated from the cooking knowledge awareness domain were significantly associated with question 18: “How often when you plan a meal are all of the items ready to be served at the same time” ($\chi^2 = 39.53, p=0.02$). In general, those with greater cooking knowledge were more likely to have all meal components ready to serve at the same time.

Coupling this survey with those that assess dietary intake should allow relationships between these food-related behaviors, knowledge and resource constraints and actual intake to be identified in this college age adult population.

Conclusion

The final questionnaire comprised three topic sections: food habits, culinary literacy, and food preparation activity, totaling 20 questions. Design factors taken into account included age of participants, clarity, culinary literacy of the population, and the ability of the questionnaire to be used in college-age adults to assess cooking knowledge and their degree of involvement in food preparation. The questionnaire was easily understood by the target audience and could be completed in approximately 10-15 minutes making its use in intervention settings feasible. The suitability for practical use was shown via feasibility testing.

After following the four-stage validation method outlined by Barton et al (2011), the Food Preparation and Consumption Habits questionnaire is a validated tool that may be used in subsequent research studies in which information on perceived cooking skills, availability of food preparation resources, purchasing habits and involvement in food preparation of college-age adults is desirable. It must be noted that reliability and validity testing does not guarantee that this questionnaire can be used in all groups across the United States and the reliability of each domain should be assessed for each group of respondents. During testing, validation results for domain 1 (food preparation behaviors) were inconsistent. Moreover, any modifications made to the questionnaire would require additional validation testing. In conclusion, the final questionnaire provides a standardized tool to measure cooking skills and food preparation involvement by college-age adults.

References

- Barton KL, Wrieden WL, Anderson AS. Validity and reliability of a short questionnaire for assessing the impact of cooking skills interventions. *J Hum Nutr Diet* 2011;24(6):588-595.
- Chu YL, Storey KE, Veugelers PJ. Involvement in meal preparation at home is associated with better diet quality among Canadian Children. *J Nutr Educ Behav* 2013 in press;1-4
- Gliem JA, Gliem RR. Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales. *Proceedings from 2003 Midwest Research to Practice Conference in Adult, Continuing, and Community Education* 2003; 82-88.
- Larson NI, Perry CL, Story M, Neumark-Sztainer D. Food preparation by young adults is associated with better quality diet. *J Am Diet Assoc* 2006;106(12):2001-2007.
- Laska MN, Larson NI, Neumark-Sztainer D, Story M. Does involvement in food preparation track from adolescence to young adulthood and its associated with better dietary quality? Findings from a 10-year longitudinal study. *Public Health Nutr* 2011;15(7):1150-1158.
- Lohr L, Swanson R, McElveen. Effects of economic and noneconomic factors on frequency of fruit and vegetable consumption. *J Agr Resour Econ* 2006;31(3):689-690.
- Mc Laughlin C, Tarasuk V, Kreiger N. An examination of at-home food preparation activity among low-income, food insecure women. *JADA* 2003; 03:1506-1512.

Nielsen S, Siega-Riz A, Popkin B. Trends in food locations and sources among adolescents and young adults. *Prev Med* 2002;35:107-113.

Tavakol M, Dennick R. Making sense of Cronbach's alpha. *International Journal of Medical Education*. 2011; 2:53-55

CHAPTER 5

RESULTS AND DISCUSSION: FACTORS AFFECTING FRUIT AND VEGETABLE CONSUMPTION AMONG COLLEGE-AGED ADULTS

Among the college student population identification of variables that may affect food choice decisions, particularly in terms of fruit and vegetable consumption, is needed. Adherence to poor dietary habits during the college years may put these individuals at an increased risk for chronic disease especially as recent research suggests that dietary patterns established during college are likely to be maintained throughout the lifespan (Ha and Caine-Bish 2009). According to the American College Health Association (2010), 21% of college students are overweight and an additional 11.5% are obese. Furthermore, 94% report eating less than the recommended 5 servings of fruits and vegetables per day. Consumption of the recommended servings of fruits and vegetables has been linked to decreased risk for hypertension, coronary heart disease, and stroke (Boeing et al 2012). By identifying factors that contribute to food choices in general, and fruit and vegetable intake specifically, interventions can be tailored to this population, increasing the likelihood of their success. College-aged adults enrolled in *FDNS 2100, Human Nutrition and Foods*, at the University of Georgia, spring 2014, completed a validated general food choices questionnaire, a frequency of consumption and degree of liking survey for 19 specific fruits and vegetables, determined their taster status, completed a validated food preparation involvement survey and answered questions that allowed the group as a whole to be profiled. It is important to note that students living on-campus are not required to participate in a university meal plan.

Student profile

The majority of the respondents were white (76.2%) females (72.0%) aged 18-21 years (74.3%). Most were unemployed (55.6%), although 42% held a part-time job. Nearly all were nonsmokers (95.3%) who did not routinely take any drugs including over-the-counter medications (65.9%). Drug use including over-the-counter medications as well as smoking has previously been found to impact smell and taste perception potentially impacting food choices and food preparation (Mann 2002; Mattes et al 1990).

The majority of these respondents (67.8%), when calculated using self-reported height and weight, had a normal BMI although nearly 30% were either overweight or obese. These percentages are similar to those reported for college students in general by the American College Health Association (2010). The most common medical conditions included allergies and sinus-related upper respiratory conditions (16.8%), which may, at least on a temporary basis, impact smell and taste perception (Mann 2002). Medical conditions that have potential long term impacts on food choices, such as diabetes or hypertension were not prevalent in this population (Table 5.1) and nearly 80% of these respondents indicated they were not on a special diet (Table 2) including a weight control diet. The vast majority had no children living in their household (98.13%) although nearly half (47.7%) lived in a household with 3-4 residents (Table 5.1).

Where food is consumed has been found to impact dietary quality, including consumption of fruits and vegetables, in older adolescents and adults. In general, when meals are consumed away from home, consumption of fruits and vegetables tends to decrease (Bowman and Vinyard 2004; Taveras et al 2005). The largest percentage (45.1%) of these respondents (Table 5.2) ate their main meal of the day at home, although 1-2 times per week these main meals were take-out (40.7%). Nearly half ate their main meal outside their place of residence 3-

5 times weekly (45.6%) and more than one-third consumed fast food 3-5 times weekly (39.7%).

Nearly two-thirds never ate in a University dining hall during the academic year; this finding, however, is not unexpected as less than 20% of these respondents were first year students who are required to live on campus.

Item	Percent Respondents Saying (%)						
Class standing	1st year	2nd year	3rd year	4th year	5th year	6th year	7+year
	17.29	35.98	22.90	21.50	1.87	0.47	0.00
Employment status	Full-time		Part-time		Not employed		
	2.80		41.59		55.61		
Age range	18-21	21-23	24-26	27-29	30-39	40-49	50-Over
	74.30	24.77	0.93	0.00	0.00	0.00	0.00
Gender	Male			Female			
	28.04			71.96			
Ethnicity	White	Black or African American	Asian	Native American or Alaskan	Other	Hispanic (2)	
	76.17	9.81	12.15	0.47	1.40	1.87	
Number of people in household	1-2		3-4		5-6		7+
	27.10		47.66		14.02		11.21
Number of children <10 yrs of age in household	0	1	2	3	4	5+	
	98.13	1.40	0.47	0.00	0.00	0.00	
BMI	Underweight (<18.5)		Normal (18.5-24.9)		Overweight (25.0-29.9)		Obese (>30.0)
	3.27		67.76		21.96		7.01
Smoker status	Yes			No			
	4.67			95.33			
Routine drug use	Yes			No			
	34.11			65.89			
Purchase of local ingredients	Yes			No			
	37.38			62.62			
Medical Conditions	Hypertension	Sinus/ Allergies	Diabetes	Heart Related	Dental Problems	Nutrient Deficiency	Food Allergy
	0.00	16.82	0.47	2.34	1.40	5.14	7.48

^ARespondents included students enrolled in the spring session of FDNS 2100

Table 5.2. Data for cooking skills questionnaire by percentage of respondents saying (*n* = 214), group profile

Questions	Percent Respondents Saying (%)				
Questions to Profile Group					
Q1. Are you on any type of special diet, (e.g. allergies, weight control, vegetarian, diabetes etc.)?	Yes			No	
	20.59			79.41	
Q2. During the academic school year, how often do you eat at a university dining hall	Never	1-2 times	3-5 times	≥ 2 times/week	Daily
	62.25	3.43	2.45	1.47	30.39
Q3. How often do you eat outside your place of residence (e.g. house, apartment, or dorm room) other than the university dining hall in a month?	Never	1-2 times	3-5 times	≥ 2 times/week	Daily
	1.47	9.31	45.59	38.24	5.39
Q4. How often do you eat fast foods prepared by quick service restaurants (e.g. McDonalds, Chipotle, Burger King) in a month?	Never	1-2 times	3-5 times	≥ 2 times/week	Daily
	6.86	33.82	39.71	18.14	1.47
Q5. How often do you eat your largest meal(s) at your place of residence in a month?	Never	1-2 times	3-5 times	≥ 2 times/week	Daily
	9.31	12.24	12.25	21.08	45.10
Q6. How many of those main meals eaten at home were take-out or mostly foods prepared outside of the home?	Never	1-2 times	3-5 times	≥ 2 times/week	Daily
	29.90	40.69	21.08	2.45	5.88

Fruit and vegetable intake and frequency of consumption

According to the American College Health Association (2010), 7% of college students report eating 0 servings of fruits and vegetables daily, 61.2% report eating 1-2 servings daily, 27.0% report eating 2-4 servings daily, and 4.8% reporting consuming 5 or more servings of fruits and vegetables daily. Among these respondents (Table 5.3), 2.3% consumed 5 or more

servings per day of the fruits and vegetables listed on the food frequency questionnaire which was adapted from a 20-item list of fruits and vegetables used by Drewnowski et al (2000) and Stables et al (2002).

In college-aged adults, neither Lohr et al (2006) nor McLean-Meyinsse et al (2013) found a statistically significant relationship between overall fruit and vegetable consumption and gender in college-age adults when participants were asked to report frequency of consuming fresh fruits and vegetables. However, while the total number of fruits and vegetables consumed did not differ, differences in the specific types of fruits and vegetables chosen have been reported to vary with gender (Lohr 2006). Among these respondents the items most frequently consumed by males included tomato-based products, oranges, onions, garlic, and green leafy vegetables, with 10.91%, 5.45%, 5.45%, 5.45% and 5.45% consuming the product at least once per day, respectively. Items most frequently consumed by females included leafy green vegetables, apples, berries, carrots, and fresh tomatoes, with 16.18%, 10.29%, 7.35%, 7.35%, and 4.41% consuming the product at least once per day, respectively.

What an individual chooses to consume frequently—what is part of his/her habitual intake—has the potential to contribute to or protect against chronic disease development. The results in table 4 reveal that on average across all respondents, apples, the most frequently consumed fruit, was eaten approximately 1-3 times per week. Of the fruits queried, the one consumed least frequently was cantaloupe which was eaten less often than once per month on average. The vegetable-based product eaten most frequently was tomato-based such as sauces, soups, or ketchup, which was consumed approximately 1-3 times per week. Cabbage was consumed least frequently with consumption less than once per month on average.

In general, when comparing frequency of consumption based on gender, a statistically significant relationship between gender and the following food items was found: females consumed more berries ($x^2=16.19$; $p=0.0003$), apples ($x^2=9.21$; $p=0.01$), fresh tomatoes ($x^2=7.24$; $p=0.03$), carrots ($x^2=6.73$; $p=0.03$), and leafy green vegetables ($x^2=8.44$; $p=0.01$), whereas males consumed more tomato-based products ($x^2=15.62$; $p=0.0004$), and garlic ($x^2=6.97$; $p=0.03$).

Overall the 19 fruits and vegetables queried here were relatively well-liked (Table 5.4), with 10 rating above 5 on the 7 point scale where 7 equaled like extremely. Generally, vegetables were liked less than fruits and the least liked vegetables were cabbage and fresh tomatoes. However, green vegetables, including non-cabbage cruciferous vegetables such as broccoli, were liked more than cabbage, suggesting the importance of querying about specific produce items rather than classes of fruits and vegetables with similar nutrient content, e.g. cruciferous vegetables or high beta-carotene fruits and vegetables. Further, products prepared with tomatoes, either cooked or fresh, were liked more than fresh tomatoes suggesting the importance of the food preparation methods applied when extent of liking of specific produce items is queried. Indeed, salsa equaled potatoes as the most liked vegetable. In general, while fruits were considered to be more liked they were not consumed more frequently than vegetables and vegetable-based products.

Spearman's correlations ($p<0.1$) between liking and frequency of consumption are summarized in table 5.4. Significant positive correlations were found between frequency of consumption and liking for all fruits and vegetables listed. In each of these cases, as liking increased so did frequency of consumption, and vice-versa, suggesting a general trend between fruit and vegetable liking and the frequency of consumption. Previously, Larson et al (2012)

found a significant association between a taste preference for specific fruits and vegetables and their consumption by college-aged adults.

Table 5.4. Mean±SD and Spearman's Correlations for Fruit and Vegetable Liking and Frequency of Consumption

Category	Mean±SD		Spearman's Correlation Coefficients
	Frequency ^A	Liking ^B	
Cantaloupe	2.18±0.96	4.38±1.92	0.678*
Berries	3.59±1.06	6.15±1.21	0.519*
Watermelon	2.40±0.83	5.47±1.64	0.519*
Grapes	3.35±1.08	5.76±1.33	0.526*
Apples	3.98±1.10	5.85±1.15	0.410*
Oranges	3.39±1.21	5.39±1.57	0.497*
Fresh Tomatoes	2.93±1.49	3.94±2.11	0.794*
Tomato Products	3.90±1.12	4.95±1.56	0.651*
Corn	2.97±0.89	5.13±1.40	0.433*
Green Beans	3.13±1.02	4.85±1.68	0.607*
Broccoli	3.29±1.20	5.04±1.78	0.596*
Potatoes	3.53±1.05	5.48±1.52	0.479*
Sweet Potatoes	2.65±1.18	4.71±2.04	0.621*
Onions	3.36±1.37	4.45±2.05	0.807*
Garlic	3.25±1.32	4.60±1.92	0.738*
Cabbage	2.07±1.16	3.22±1.86	0.798*
Carrots	3.48±1.24	4.88±1.63	0.627*
Leafy Green Vegetables	3.82±1.43	5.02±1.68	0.599*
Salsa	3.22±1.04	5.49±1.63	0.515*

* denotes a significant correlation between frequency and liking ($p<0.001$)

^AFrequency of consumption was assessed on a 7-point scale ranging from 1 being never and 7 being 4+ times/day

^BLiking was assessed on a 7-point scale ranging from 1 being dislike extremely to 7 being like extremely

Food choices questionnaire

The food choices questionnaire is a multidimensional validated questionnaire used to assess the perceived importance of a variety of factors that affect food choice decisions (Stephens et al 1995). Means, standard deviation, and frequency of response were generated for each item of the food choices questionnaire. The data are summarized below in table 5.5.

Table 5.5. Means±SD and frequency of response for food choices questionnaire

It is important to me that the food I eat on a typical day...	Means±SD	Relative Importance ^A Frequency of Response (%)			
		Not at all important	A little important	Moderately important	Very important
1. is easy to prepare	3.08±0.80	2.35	21.13	42.72	33.80
2. contains no additives	2.20±0.85	21.13	44.60	27.70	6.57
3. is low in calories	2.52±0.90	14.55	32.39	39.44	13.62
4. tastes good	3.71±0.50	0.47	0.94	25.35	73.24
5. contains natural ingredients	2.71±0.84	7.04	32.86	42.25	17.84
6. is not expensive	3.10±0.78	2.35	18.31	46.01	33.33
7. is low in fat	2.64±0.85	9.86	30.52	45.07	14.55
8. is familiar	2.62±0.86	11.27	29.11	46.01	13.62
9. is high in fiber and roughage	2.21±0.86	20.66	45.07	26.76	7.51
10. is nutritious	3.28±0.72	0.94	12.68	43.66	42.72
11. is easily available in shops and supermarkets	3.32±0.77	1.88	12.68	37.09	48.36
12. is good value for money	3.30±0.76	1.88	12.68	39.44	46.01
13. cheers me up	2.62±0.92	11.74	32.39	37.56	18.31
14. smells nice	2.68±0.87	8.45	33.80	38.97	18.78
15. can be cooked very simply	3.03±0.82	3.76	20.66	44.13	31.46
16. helps me cope with stress	2.09±0.98	31.92	38.97	17.37	11.74
17. helps me control my weight	2.79±0.94	9.39	28.17	36.15	26.29
18. has a pleasant texture	2.73±0.87	7.98	30.99	41.31	19.72
19. is packaged in an environmentally friendly way	1.77±0.80	42.25	41.78	12.21	3.76
20. comes from countries I approve of politically	1.36±0.69	73.71	18.78	5.16	2.35
21. is like the food I ate when I was a child	1.75±0.79	43.66	40.38	13.15	2.82
22. contains a lot of vitamins and minerals	2.67±0.81	5.16	38.97	39.44	16.43
23. contains no artificial ingredients	2.28±0.89	20.19	40.38	30.52	8.92
24. Keeps me awake or alert	2.46±0.83	12.21	38.97	38.97	9.86
25. looks nice	2.23±0.86	23.00	36.15	35.68	5.16
26. helps me relax	2.11±0.85	26.76	40.38	28.17	4.69
27. is high in protein	2.82±0.84	6.10	27.23	45.54	21.13
28. takes no time to prepare	2.32±0.87	15.49	48.36	24.88	11.27
29. keeps me healthy	3.34±0.73	0.94	12.68	37.56	48.83

30. is good for my skin, teeth, hair, nails etc.	2.70±0.86	7.51	33.33	40.38	18.78
31. makes me feel good	2.92±0.87	4.69	27.23	38.97	29.11
32. has the country of origin clearly marked	1.47±0.79	68.08	19.25	9.86	2.82
33. is what I usually eat	2.54±0.82	10.33	35.21	44.13	10.33
34. helps me to cope with life	1.89±0.87	38.50	38.97	17.37	5.16
35. can be brought in shops close to where I live or work	2.94±0.90	7.51	21.13	41.31	30.05
36. is cheap	2.94±0.89	5.63	25.35	38.50	30.52

^ARelative importance was assessed on a 4-point scale ranging from 1 being not important at all and 4 being very important

Generally, results from the food choice questionnaire are subjective to exploratory principal factor analysis, which allows underlying factors that shape respondent decision-making to be determined. The five factors extracted along with the specific questions that loaded on each factor are summarized in table 5.6.

Table 5.6. Factor analysis of the food choices questionnaire

Factor (% variance)	Cronbach's alpha	Items loading	Factor loading
Health and Nutrition (41.95%)	0.84	Is nutritious	0.77
		Contains a lot of vitamins and minerals	0.68
		Is high in protein	0.55
		Keeps me healthy	0.70
		Is good for my skin, teeth, hair, nails etc.	0.59
Mood and Feelings (25.57%)	0.86	Cheers me up	0.55
		Helps me cope with stress	0.84
		Helps me relax	0.71
		Helps me to cope with life	0.78
Convenience and Cost (11.03%)	0.82	Is not expensive	0.73
		Is easily available in shops and supermarkets	0.46
		Is good value for money	0.81
		Can be brought in shops close to where I live or work	0.47
Familiarity and Palatability (6.45%)	0.70	Is cheap	0.79
		Is familiar	0.54
		Smells nice	0.47
		Has a pleasant texture	0.46
		Looks nice	0.72

		Is what I usually eat	0.50
Weight	0.82	Is low in calories	0.79
Maintenance		Is low in fat	0.66
(5.30%)		Helps me control my weight	0.67

The factors extracted included health and nutrition, mood and feelings, convenience and cost, familiarity and palatability, and weight maintenance. Cronbach's alphas for these extracted factors ranged from 0.70 to 0.86 indicating good internal consistency. Overall, these factors explained 90.3% of the variability in response. In previous studies of urban adults, the food choices questionnaire accounted for 58% of total variance of response (Steptoe et al 1995). McElveen and Swanson (2005) who employed the food choices questionnaire with a college-age audience reported that this survey explained 50.7% of the variability in selection. The factors that emerged, and in general, the questions that loaded on each factor were similar to those previously reported in this population (McElveen and Swanson 2005).

Interestingly, both health and nutrition and weight management emerged as major but different factors affecting food choices. Items loading on the health and nutrition factor were related to general nutrition and overall well-being and a popular weight loss diet. Items loading on the mood and feelings factor were related to general mood, relaxation, and stress management. Items loading on the cost and convenience factor were related to ease and quickness of preparation, and food costs, which may reflect limited financial resources of many college students. Items loading on the familiarity and palatability factor were related to sensory appeal and overall recognition of foods consumed suggesting that these students were not adventurous eaters. Finally, items loading on the weight maintenance factor were related to fat and calories for weight control rather than for general health suggesting these students desired weight control for reasons other than health.

Whereas this questionnaire confirms the importance of nutrition and health, cost and convenience, and palatability as factors influencing food choices, it addresses food choices in general rather than fruits and vegetables specifically. Previously, preparation and cooking skills have been identified as an important factor affecting fruit and vegetable consumption specifically (Larson et al 2006). Only 4 questions in this questionnaire are related to food preparation and cooking skills. These questions either loaded on cost and convenience or did not load on any factor.

Cooking skills and fruit and vegetable frequency of consumption

The factors that stood out as most pertinent in affecting meals prepared were access to kitchen equipment (39.22%) and time available to prepare food (35.78%). In terms of food purchasing behavior, most actions were completed greater than once per month, but less than weekly (Table 5.7). Interestingly nearly 20% of these respondents never purchased fresh vegetables, other than packaged salads, or raw meat/poultry/fish products that required additional preparation prior to consumption.

The greatest percentage of respondents considered themselves to be moderately aware of food safety practices when preparing food (49.5%) and when storing food (49.51%) with average (41.67%) to good (38.24%) cooking skills. Self-perceived cooking skills (Table 5.7) were significantly associated with cooking knowledge in this group ($\chi^2=13.31$; $p=0.010$) in that as self-perceived cooking skills increased, so did actual cooking knowledge. Nearly half prepared a meal for at least 1 other person at least once per month. However, there were no significant relationships between cooking knowledge and frequency of recipe use (Q12) or ability to adapt a recipe (Q19). The cooking knowledge domain was significantly related to the frequency of

recipe use and ability to adapt a recipe where as cooking knowledge increased so did the frequency of recipe use and ability to adapt a recipe.

Table 5.7. Data for cooking skills questionnaire by percentage of respondents saying ($n = 204$), grouped by domain							
Questions within domain	Percentage of Respondents Saying :						
Food preparation involvement behaviors (Cronbach's alpha = 0.56)							
Q12. How often do you try a new recipe?	≤ 1 time/year	Several times/year	Monthly	Several times/month	Weekly	Several times/month	I do not use recipes
	11.27	27.45	28.43	17.16	7.84	1.47	6.37
Q19. If a recipe calls for a specific herb or spice and there is none available what would you do?	Would not make the recipe		Would leave out and prepare recipe with remaining ingredients	Would substitute with a spice or herb that tastes similar or is found in similar dishes		I do not use recipes	
	10.78		24.02	59.31		5.88	
Resource availability (Cronbach's alpha = 0.50)							
Q7. How often do you cook an entire dinner for 2 or more people (including yourself) during the year?	Never	1-2 times/year	3-5 times/year	≥ 1 times/month	≥ 1 times/week	Daily	
	21.08	9.80	19.61	26.96	18.63	3.92	
Q8a. Indicate the extent to which each of the following affects the meals you consume: cooking skills	Not at all	Slightly		Moderately		Very much so	
	12.25	26.96		45.10		15.20	
Q8b. Indicate the extent to which each of the following	Not at all	Slightly		Moderately		Very much so	

affects the meals you consume: money available to buy food	6.37	20.10	43.14	30.39
Q8c. Indicate the extent to which each of the following affects the meals you consume: access to a kitchen equipped with major appliances such as a range and refrigerator, pots and pans, and utensils such as knives, spatulas, spoons, can openers used in food preparation	Not at all	Slightly	Moderately	Very much so
	22.06	13.73	25.00	39.22
Q8d. Indicate the extent to which each of the following affects the meals you consume: foods available in local stores where you shop	Not at all	Slightly	Moderately	Very much so
	16.18	20.59	34.80	28.43
Q8e. Indicate the extent to which each of the following affects the meals you consume: time available to prepare food	Not at all	Slightly	Moderately	Very much so
	4.90	16.67	42.65	35.78
Cooking knowledge awareness (Cronbach's alpha = 0.71)				
Q9. Do you consider your cooking skills to be:	Poor	Average	Good	Excellent
	9.31	41.67	38.24	10.78
Q10. How aware are you of the food safety procedures you should follow to ensure food you prepare is safe to eat?	Not at all	Slightly	Moderately	Very much so
	2.94	18.14	49.51	29.41
Q11. How aware are you of the food safety measures you	Not at all	Slightly	Moderately	Very much so
	1.47	20.10	49.51	29.41

should follow when storing food for future consumption?					
Purchasing behavior (Cronbach's alpha = 0.71)					
Q20a. In the past 12 months how often have you done the following: made a grocery list	Never	1-2 times/yr	3-5 times/yr	≥ 1 times/month	≥ 1 times/week
	9.80	13.24	13.73	34.31	27.94
Q20b. In the past 12 months how often have you done the following: bought packaged pre-cut fresh vegetables, other than salad for convenience	Never	1-2 times	3-5 times	≥ 1 times/month	≥ 1 times/week
	17.16	16.18	15.69	34.41	16.67
Q20c. In the past 12 months how often have you done the following: other than packaged pre-cut vegetables, have you bought fresh vegetables such as broccoli stalks or crowns, or whole unpeeled carrots and onions	Never	1-2 times	3-5 times	≥ 1 times/month	≥ 1 times/week
	15.20	16.18	15.20	33.82	19.61
Q20d. In the past 12 months how often have you done the following: other than packaged pre-cut fruits, have you bought fresh fruits such as uncut melons, pineapples, or apples	Never	1-2 times	3-5 times	≥ 1 times/month	≥ 1 times/week
	5.88	8.82	16.18	40.20	28.92
Q20e. In the past 12 months how often have you done the	Never	1-2 times	3-5 times	≥ 1 times/month	≥ 1 times/week

following: have you bought raw meat (beef, pork, lamb), poultry (chicken or turkey), or fish including shellfish like shrimp to prepare?	18.63	5.39	11.76	37.75	26.47
^A Respondents included students enrolled in the spring session of FDNS 2100					

Cooking knowledge reported as a domain score was found to be significantly related to consumption of broccoli ($\chi^2=21.74$; $p=0.01$) and carrots ($\chi^2=23.27$; $p=0.003$) whereas those with lower cooking knowledge scores reported less frequent intake. Further, when examining the relationship between cooking knowledge score and fruit and vegetable intake by group, there was a general trend that those with greater cooking knowledge had greater consumption of dark-green leafy vegetables though this relationship was not significant ($\chi^2=14.76$; $p=0.06$). No other significant relationships between cooking knowledge and fruit and vegetable intake were found suggesting cooking knowledge might be an important variable effecting consumption of dark-green leafy vegetables, carrots, and broccoli but was of lesser importance for other groups of fruits and vegetables. This is of particular interest since one of the recommendations of the Dietary Guidelines for Americans 2010 is to eat a variety of vegetables, especially dark-green and red and orange vegetables (USDA and USDHHS 2010).

In terms of the food preparation involvement behavior domain, significant relationships were found with consumption of dark-green vegetables ($\chi^2=14.43$; $p=0.006$) and alliums ($\chi^2=19.48$; $p=0.006$). In both cases as food preparation involvement increased so did the frequency of consumption. No other significant relationships were found between food preparation involvement behavior and fruit and vegetable consumption. These data suggest that food preparation involvement behavior might be particularly important in the consumption of dark-green leafy vegetables and alliums but not as important in consuming other groups of fruits and vegetables.

When examining the relationship between the resource availability domain and fruit and vegetable consumption a significant relationship was found with consumption of orange and red vegetables ($\chi^2=19.69$; $p=0.006$). In general, as availability of resources increased in importance

there was a decrease in consumption of orange and red vegetables. No other significant relationships were found between resource availability and fruit and vegetable consumption. This suggests that availability of resources is an important variable in consumption of red and orange vegetables but is of lesser importance in consumption of other groups of fruits and vegetables.

Conclusions

Fruit and vegetable consumption of these 19 items could not be explained by taster status in this college-age population, however significant positive correlations were found between frequency of consumption and extent of liking of each fruit and vegetable listed. The food choices questionnaire which assisted in identifying factors affecting food choices in general identified health and nutrition as particularly important. Cost and convenience as well as palatability and familiarity also emerged as important factors. However, this questionnaire was not specific to fruits and vegetables and did not address cooking skills and food preparation involvement in a meaningful way. In intervention studies, numerous researchers have identified cooking skills and food preparation involvement as instrumental in increasing consumption of fruits and vegetables. Use of the validated food preparation involvement questionnaire showed cooking knowledge was related to perceived cooking skill level and facilitated identifying resources that served as possible barriers to consumption of various fruits and vegetables, and dark-green leafy and red and orange vegetables in particular. In conclusion, the cooking skills and food preparation involvement questionnaire identified factors not identified with other assessment tools. In addition, it allowed topics and issues that should be considered when designing food and nutrition interventions in this population to be identified.

References

American College Health Association, National College Health Assessment II, 2010, Internet: <http://www.achancha.org/> (assessed on 15 February 2013).

Bowman SA, Vinyard BT. Fast Food Consumption of U.S. Adults: Impact on Energy and Nutrient Intakes and Overweight Status. *Journal of the American College of Nutrition* 2004;23(2):163-168.

Dinehart ME, Hayes JE, Bartoshuk LM, Lanier SL, Duffy VB. Bitter taste markers explain variability in vegetable sweetness, bitterness, and intake. *Physiol Behav* 2006;87(2):304-313.

Duffy VB, Hayes JE, Davidson AC, Kidd JR, Kidd KK, Bartoshuk LM. Vegetable intake in college-aged adults is explained by oral sensory phenotypes and TAS238 genotype. *Chem Percept* 2010;3(3-4):137-148.

Drewnowski A, Hann C, Henderson SA, Gorenflo D. Both food preferences and food frequency scores predict fat intakes of women with breast cancer. *J Am Diet Assoc* 2000;100(11):1325-1333.

Larson NI, Laska MN, Story M, Neu-Sztainer D. Predictors of fruit and vegetable intake in young adulthood. *J Am Diet Assoc* 2012;112(8):1216-1222.

Larson NI, Perry CL, Story M, Neumark-Sztainer D. Food preparation by young adults is associated with better quality diet. *J Am Diet Assoc* 2006;106(12):2001-2007.

Lohr L, Swanson R, McElveen. Effects of economic and noneconomic factors on frequency of fruit and vegetable consumption. *J Agr Resour Econ* 2006;31(3):689-690.

Mann NM. Management of smell and taste problems. *Cleveland Clinic Journal of Medicine* 2002; 69(4):329-336.

Mattes RD, Cowart BJ, Schiavo MA, Arnold, C, Garrison, B, Kare, MR and Lowry, LD. 1990. Dietary evaluation of patients with smell and/or taste disorders. *Am J Clin Nutr* 51(2): 233-240.

McLean-Meyinsse PE, Harris EG, Taylor SS, Gager JV. Examining college students' daily consumption of fresh fruits and vegetables. *Journal of Food Distribution Research* 2013;44(1):10-16.

Stephoe A, Pollard T, Wardle J. Development of a measure of the motives underlying the selection of food: the Food Choice Questionnaire. *Appetite* 1995;25(3):267-284.

Stables GJ, Subar AF, Blossom PH, Dodd K, Heimendinger J, Van Duyn MS, Neveling L. Changes in vegetable and fruit consumption and awareness among US adults: Results of the 1991 and 1997 5 A Day for Better Health Program surveys. *J Am Diet Assoc* 2002;102(6):809-817.

Swanson RB, McElveen, ML. Motives underlying the selection of foods by college students. *Journal of the American Dietetics Association*. 2005;105(9S): 27.

Taveras EM, Berkey CS, Rifas-Shiman SL, Ludwig DS, Rockett HRH, Field AE, Colditz GA, Gillman MW. 2005. Association of consumption of fried food away from home with body mass index and diet quality in older children and adolescents. *Pediatrics* 116(4): e518-e524.

US Department of Agriculture, US Department of Health and Human Services, Dietary Guidelines for Americans, 2010. 7th ed. Washington, DC, page 51. Internet: <http://www.cnpp.usda.gov/Publications/DietaryGuidelines/2010/> (accessed on 23 May 2014).

Wilkie LM, Capaldi Phillips ED, Wadnera, D. Sucrose and non-nutritive sweeteners can suppress the bitterness of vegetables independent of PTC taster phenotype. *Chem. Percept.* 2013;6:127-139.

Yackinous CA, Guinard JX. Relation between PROP (6-n-propylthiouracil) taster status, taste anatomy and dietary intake measures for young men and women. *Appetite* 2002;38(3):201-209

CHAPTER 6

SUMMARY AND CONCLUSIONS

Americans are falling short of current recommended intakes of fruits and vegetables. As stated in the Dietary Guidelines for Americans 2010 (USDA and USDHHS 2010), the recommended intake for fruits and vegetables is 2 cups/d and 2.5 cups/d respectively while the average American adult consumes 1.0 cup/d fruit and juices, and 1.6 cups/day vegetables. College students in particular have low reported intakes with 94% of students reporting eating <5 servings of fruits and vegetables per day (American College Health Association 2010). Evidence suggests that low intakes of fruits and vegetables are associated with increased chronic disease risk across the lifespan. Additionally, it has been suggested that life-long dietary habits develop as student's progress from high school to college. Therefore, it is of utmost importance for public health to identify specific factors influencing fruit and vegetable intake in college-age students. Identifying specific factors that affect fruit and vegetable intake will help guide dietary intervention strategies targeting fruit and vegetable consumption, thereby reducing chronic disease risk.

Three factors that have emerged that are associated with fruit and vegetable consumption include taste sensitivity to bitter compounds, food preparation and cooking skills, and health motivation as a factor in food choices (Duffy et al 2010; Larson et al 2006; Lohr et al 2006). While previous research studies of this nature have identified single factors contributing to fruit and vegetable intake, very few include comparative analyses between multiple factors. This

innovative study focused on multiple domains, and how these areas contributed to fruit and vegetable intake, both independently and collectively.

Even though food preparation and cooking skills have been identified as an important factor affecting fruit and vegetable consumption, a validated tool to assess it has not been developed. Therefore, a cooking skills and food preparation questionnaire was developed and validated using a 4-step validation method, as outlined by Barton et al (2011). A twenty-item questionnaire utilizing a closed-question format was designed based on factors known to be involved in the evaluation of cooking skills and food preparation involvement. Content validity was assessed by nutrition experts, in two stages ($n=17$). Face validity ($n=5$) and internal and repeat reliability were assessed with groups of students ($n=18$) similar to the target audience. Feasibility of use with college students was assessed ($n=112$). The final questionnaire was comprised of 3 distinct domains including food habits, culinary literacy, and food preparation activity, and provides researchers with a standardized tool to measure cooking skills and food preparation involvement by college-age adults.

Further data collection involved using participants ($n = 214$) from the University of Georgia's FDNS 2100 class. Data collection methodology involved the use of validated questionnaires and techniques including, demographic and health questionnaires, frequency of consumption questionnaires, food choices questionnaires, food liking questionnaires, cooking skills questionnaires, and PTC taste sensitivity testing. All data were self-reported.

Results revealed several interesting relationships between factors affecting fruit and vegetable consumption. First, the food choices questionnaire was able to explain 90.30% of variability of response. Extracted factors affecting food choices in this group included health and nutrition, mood and feelings, cost and convenience, familiarity and palatability, and weight

maintenance. However, while the food choices questionnaire was able to provide information about dietary habits in this population, it was not specific to fruit and vegetable consumption.

Next, relationships between cooking skills and fruit and vegetable consumption were examined. The factors that stood out as most pertinent in affecting fruit and vegetable consumption were cooking knowledge, food preparation involvement behavior, and resource availability. Cooking knowledge was found to be significantly related to consumption of broccoli and carrots, whereas cooking skills increased, so did consumption of these two vegetables ($p < 0.05$). Further, there was a general trend, though insignificant ($p = 0.06$), between increased cooking skills and increased consumption of dark-green leafy vegetables. Further increased food preparation involvement behaviors were found to be significantly related to increased consumption of dark-green leafy vegetables, and alliums. In addition, resource availability was found to be significantly related to consumption of orange and red vegetables. As availability of resources increased in importance, consumption of orange and red vegetables decreased. Finally, no significant relationships were found between taster status and frequency of consumption, or liking of fruits and vegetables in this study. However, significant correlations were found between extent of liking and frequency of consumption of the fruits and vegetables queried.

Various factors affecting fruit and vegetable intake were identified in this study. The cooking skills and food preparation questionnaire developed and utilized here defined factors that had not previously been identified with other assessment tools employed in this study, allowing a more in-depth exploration of factors to consider when considering developing new dietary interventions in this population. Based on the results found in this study, data will provide insight to healthcare professionals on how to tailor dietary interventions for this target population to increase fruit and vegetable intake, thereby reducing chronic disease risk.

References

American College Health Association, National College Health Assessment II, 2010, Internet: <http://www.achacha.org/> (assessed on 15 February 2013).

Barton KL, Wrieden WL, Anderson AS. Validity and reliability of a short questionnaire for assessing the impact of cooking skills interventions. *J Hum Nutr Diet* 2011;24(6):588-595.

Duffy VB, Hayes JE, Davidson AC, Kidd JR, Kidd KK, Bartoshuk LM. Vegetable intake in college-aged adults is explained by oral sensory phenotypes and TAS238 genotype. *Chem Percept* 2010;3(3-4):137-148.

Larson NI, Perry CL, Story M, Neumark-Sztainer D. Food preparation by young adults is associated with better quality diet. *J Am Diet Assoc* 2006;106(12):2001-2007.

Lohr L, Swanson R, McElveen. Effects of economic and noneconomic factors on frequency of fruit and vegetable consumption. *J Agr Resour Econ* 2006;31(3):689-690.

US Department of Agriculture, US Department of Health and Human Services, *Dietary Guidelines for Americans, 2010*. 7th ed. Washington, DC, page 51. Internet: <http://www.cnpp.usda.gov/Publications/DietaryGuidelines/2010/> (accessed on 23 May 2014).

REFERENCES

Adams TB, Colner BS. The association of multiple risk factors with fruit and vegetable intake among a nationwide sample of college students. *J Am Coll Health* 2008;56(4):455-461.

American College Health Association, National College Health Assessment II, 2010, Internet: <http://www.achancha.org/> (assessed on 15 February 2013).

Anzman SL, Rollins BY, Birch LL. Parental influence on children's early eating environments and obesity risk: implications for prevention. *Int J Obesity* 2010;34(7):1116-1124.

Bajec MR, Pickering GJ. Association of thermal taste and PROP responsiveness with food liking, neophobia, body mass index, and waist circumference. *Food Qual Prefer* 2010;21(6):589-601

Baronowski T, Cullen CW, Basen-Enquist K, Wetter DW, Cummings S, Martineau DS, Prokhorov AV, Chorley J, Beech B, Hergenroeder AC. Transition out of high school: a time of increased cancer risk? *Prev Med* 1997;26(5):694-703.

Barton KL, Wrieden WL, Anderson AS. Validity and reliability of a short questionnaire for assessing the impact of cooking skills interventions. *J Hum Nutr Diet* 2011;24(6):588-595.

Bartoshuk LM, Duffy VB, Green BG, Hoffman HJ, Ko CW, Lucchina LA, Marks LE, Snyder DJ, Weiffenbach JM. Valid across-group comparisons with labeled scales: the gLMS versus magnitude matching. *Physiol Behav* 2004;82(1):109-114.

Bartoshuk LM, Fast K, Snyder DJ. Differences in our sensory worlds: invalid comparisons with labeled scales. *Curr Dir Psychol Sci* 2005;14(3):122-125.

Boeing H, Bechthold A, Bub A, Ellinger S, Haller D, Kroke A, Leschik-Bonnet E, Muller MJ, Oberritter H, Schulze M. Critical review: vegetables and fruit in the prevention of chronic diseases. *Eur J Nutr* 2012;51(6):637-663.

Bowman SA, Vinyard BT. Fast Food Consumption of U.S. Adults: Impact on Energy and Nutrient Intakes and Overweight Status. *Journal of the American College of Nutrition* 2004;23(2):163-168.

Brug J, Vet E, Nooijer J, Verplanken B. Predicting fruit consumption: cognitions, intentions, and habits. *J Nutr Educ Behav* 2006;38(2):73-81.

Center for Disease Control, Behavioral Risk Factor Surveillance System, 2009, Internet: <http://www.cdc.gov/brfss/index.htm> (accessed on 22 February 2013).

Center for Disease Control, Chronic Disease Prevention and Health Promotion, Internet: <http://www.cdc.gov/chronicdisease/overview/index.htm> (accessed on 22 March 2014).

Chu YL, Storey KE, Veugelers PJ. Involvement in meal preparation at home is associated with better diet quality among Canadian Children. *J Nutr Educ Behav* 2013 in press;1-4.

Collins A, Mullan B. An extension of the theory of planned behavior to predict immediate hedonic behaviors and distal benefit behaviors. *Food Qual Prefer* 2011;22(7)638-646.

Delwiche J. Individual differences in perception. In: *Understanding flavor: Background, Modern Advances and Impact of Aging*; IFT Short course, July 15-16, New Orleans.

Dinehart ME, Hayes JE, Bartoshuk LM, Lanier SL, Duffy VB. Bitter taste markers explain variability in vegetable sweetness, bitterness, and intake. *Physiol Behav* 2006;87(2)304-313.

Dissen A, Policastro P, Quick V, Byrd-Bredbenner C. Interrelationships among nutrition knowledge, attitudes, behaviors, and body satisfaction. *Health Educ J* 2011;111(4)283-295.

Drewnowski A. Taste Preferences and food intake. *Annu Rev Nutr* 1997;17(1)237-253.

Drewnowski A, Hann C, Henderson SA, Gorenflo D. Both food preferences and food frequency scores predict fat intakes of women with breast cancer. *J AM Diet Assoc* 2000;100(11):1325-1333.

Drewnowski A, Kristal A, Choen J. Genetic taste responses to 6-n-propylthiouracil among adults: a screening tool for epidemiological studies. *Chem Senses* 2001;26(5):483-489.

Duffy VB, Hayes JE, Davidson AC, Kidd JR, Kidd KK, Bartoshuk LM. Vegetable intake in college-aged adults is explained by oral sensory phenotypes and TAS238 genotype. *Chem Percept* 2010;3(3-4):137-148.

Ferrer RA, Bergman HE, Klein WM. Worry as a predictor of nutrition behaviors: results from a nationally representative survey. *Health Educ Behav* 2013;40(1):88-97.

Gliem JA, Gliem RR. Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales. *Proceedings from 2003 Midwest Research to Practice Conference in Adult, Continuing, and Community Education* 2003; 82-88.

Ha E, Caine-Bish N. Effect of nutrition intervention using a general nutrition course for promoting fruit and vegetable consumption among college students. *J Nutr Educ* 2009;21(2):103-109.

Hall PA, Fong GT. Temporal self-regulation theory: A model for individual health behavior. *Health Psychol* 2007;1(1):6-52.

Hong JH, Chung JW, Kim YK, Chung SC, Lee SW, Kho HS. The relationship between PTC taster status and taste thresholds in young adults. *Oral Surg Oral Med O* 2005;99(6):711-715.

Ickes MJ, Sharma M. Does behavioral intention predict nutrition behaviors related to adolescent obesity. *ICAN: Infant, Child, & Adolescent Nutrition* 2011;3(1):38-48.

Kalva JJ, Sims CH, Lorenzo PA, Snyder DJ, Bartoshuk LM. Comparison of the hedonic general labeled magnitude scale with the hedonic 9-point scale. *J Food Sci* 2014;79(2):S-238-S245.

Kushi LH, Doyle C, McCullough M, Rock CL, Denmark-Wahnefried W, Bandera EV, Gapstur S, Patel AV, Andrews K, Gansler T, et al. American Cancer Society guidelines on nutrition and physical activity for cancer prevention: Reducing the risk of cancer with healthy food choices and physical activity. *CA-Cancer J Clin* 2012;62:30-67.

Larson NI, Laska MN, Story M, Neu-Sztainer D. Predictors of fruit and vegetable intake in young adulthood. *J Am Diet Assoc* 2012;112(8):1216-1222.

Larson NI, Perry CL, Story M, Neumark-Sztainer D. Food preparation by young adults is associated with better quality diet. *J Am Diet Assoc* 2006;106(12):2001-2007.

Laska MN, Larson NI, Neumark-Sztainer D, Story M. Does involvement in food preparation track from adolescence to young adulthood and its associated with better dietary quality? Findings from a 10-year longitudinal study. *Public Health Nutr* 2011;15(7):1150-1158.

Liu RH. Dietary bioactive compounds and their health implications. *J Food Sci* 2013;78(1):A18-A25.

Lohr L, Swanson R, McElveen. Effects of economic and noneconomic factors on frequency of fruit and vegetable consumption. *J Agr Resour Econ* 2006;31(3):689-690.

Mann NM. Management of smell and taste problems. *Cleveland Clinic Journal of Medicine* 2002; 69(4):329-336.

Mattes RD, Cowart BJ, Schiavo MA, Arnold, C, Garrison, B, Kare, MR and Lowry, LD. 1990. Dietary evaluation of patients with smell and/or taste disorders. *Am J Clin Nutr* 51(2): 233-240.

Mc Laughlin C, Tarasuk V, Kreiger N. An examination of at-home food preparation activity among low-income, food insecure women. *JADA* 2003; 03:1506-1512.

McElveen ML, Swanson RB. PTC sensitivity: Effects on extent of liking and food selection. *J Am Diet Assoc* 2003;103(9):116.

McLean-Meyinsse PE, Harris EG, Taylor SS, Gager JV. Examining college students' daily consumption of fresh fruits and vegetables. *Journal of Food Distribution Research* 2013;44(1):10-16.

- Milošević J, Žeželj I, Gorton M, Barjolle D. Understandings the motives for food choice in Western Balkan countries. *Appetite* 2012;58(1):205-214.
- Nielsen S, Siega-Riz A, Popkin B. Trends in food locations and sources among adolescents and young adults. *Prev Med* 2002;35:107-113.
- Stables GJ, Subar AF, Blossom PH, Dodd K, Heimendinger J, Van Duyn MS, Neveling L. Changes in vegetable and fruit consumption and awareness among US adults: Results of the 1991 and 1997 5 A Day for Better Health Program surveys. *J Am Diet Assoc* 2002;102(6):809-817.
- Stepptoe A, Pollard T, Wardle J. Development of a measure of the motives underlying the selection of food: the Food Choice Questionnaire. *Appetite* 1995;25(3):267-284.
- Swanson R, Lohr L, McElveen ML. Motivational and demographic effects on fruit and vegetable consumption among college students. *J Am Diet Assoc* 2007;107(8):A101.
- Swanson RB, McElveen, ML. Motives underlying the selection of foods by college students. *Journal of the American Dietetics Association*. 2005;105(9S): 27.
- Tavakol M, Dennick R. Making sense of Cronbach's alpha. *International Journal of Medical Education*. 2011; 2:53-55
- Taveras EM, Berkey CS, Rifas-Shiman SL, Ludwig DS, Rockett HRH, Field AE, Colditz GA, Gillman MW. 2005. Association of consumption of fried food away from home with body mass index and diet quality in older children and adolescents. *Pediatrics* 116(4): e518-e524.
- Tepper BJ, Williams TZ, Burgess JR, Antalis CJ, Mattes RD. Genetic variation in bitter taste and plasma markers of anti-oxidant status in college women. *Int J Food Sci Nutr* 2009;60(2):35-46.
- US Department of Agriculture, US Department of Health and Human Services, Dietary Guidelines for Americans, 2010. 7th ed. Washington, DC, page 51. Internet: <http://www.cnpp.usda.gov/Publications/DietaryGuidelines/2010/> (accessed on 24 April 2013).
- Wilkie LM, Capaldi Phillips ED, Wadnera, D. Sucrose and non-nutritive sweeteners can suppress the bitterness of vegetables independent of PTC taster phenotype. *Chem. Percept.* 2013;6:127-139.
- Yackinous CA, Guinard JX. Relation between PROP (6-n-propylthiouracil) taster status, taste anatomy and dietary intake measures for young men and women. *Appetite* 2002;38(3):201-209.

APPENDIX A

FOOD FREQUENCY QUESTIONNAIRE

Think about how often you ate the foods listed below within the **last year**. Please indicate the response that **best** describes how often you ate each food. Check only **one** answer for each food.

How often did you consume the following foods during the last year? (Check the best response)	Frequency of consumption						
	Never	Less than 1 x per month	1-3 x per month	1-3 x per week	4+ x per week	1-3 x per day	4+ x per day
1. cantaloupe							
2. Berries such as strawberries or blueberries							
3. watermelon							
4. grapes as whole fruit or juice							
5. apples as whole fruits or juice							
6. oranges as whole fruit or juice							
7. fresh tomatoes							
8. tomato-based products such as sauces, soups or ketchup							
9. corn							
10. green beans							
11. broccoli							
12. potatoes							
13. sweet potatoes							
14. onions							
15. garlic							
16. cabbage, cooked or raw							
17. carrots							
19. dark green leafy vegetables, such as spinach and collards							
20. salsa							

APPENDIX B

FOOD CHOICES QUESTIONNAIRE

Next we would like to know about the factors that are important in your food choices. Please indicate the relative importance of each factor in the following list by checking the most appropriate box to the right of **each** statement.

It is important to me that the food I eat on a typical day...	Relative Importance			
	Not at all important	A little important	Moderately important	Very important
1. is easy to prepare				
2. contains no additives				
3. is low in calories				
4. tastes good				
5. contains natural ingredients				
6. is not expensive				
7. is low in fat				
8. is familiar				
9. is high in fiber and roughage				
10. is nutritious				
11. is easily available in shops and supermarkets				
12. is good value for money				
13. cheers me up				
14. smells nice				
15. can be cooked very simply				
16. helps me cope with stress				
17. helps me control my weight				
18. has a pleasant texture				
19. is packaged in an environmentally friendly way				
20. comes from countries I approve of politically				
21. is like the food I ate when I was a child				
22. contains a lot of vitamins and minerals				
23. contains no artificial ingredients				
24. Keeps me awake or alert				
25. looks nice				

26. helps me relax				
27. is high in protein				
28. takes no time to prepare				
29. keeps me healthy				
30. is good for my skin, teeth, hair, nails etc.				
31. makes me feel good				
32. has the country of origin clearly marked				
33. is what I usually eat				
34. helps me to cope with life				
35. can be brought in shops close to where I live or work				
36. is cheap				

APPENDIX C

DEMOGRAPHIC INFORMATION

Please answer the following information about yourself. Responses will allow analysis of the participants as a whole. All information is and will remain confidential.

1. **Major:** _____
2. **Class Standing:**
___ 1st year ___ 2nd year ___ 3rd year ___ 4th year ___ 5th year ___ 6th year ___ 7+year
3. **Employment: (Check one)** ___ Full-time ___ Part-time ___ Not employed
4. **Age:** ___ 18-21 ___ 21-23 ___ 24-26 ___ 27-29 ___ 30-39 ___ 40-49 ___ 50-Over
5. **Gender:** ___ Male ___ Female
6. **Ethnic Background:** Do you consider yourself to be:
___ White
___ Black or African American
___ Asian
___ Native American or Alaskan
___ Some other race—Print race:

7. **Do you consider yourself to be Hispanic?** ___ Yes ___ No.
8. **Household Composition:**
 - a. How many people live at your current address? ___ 1-2 ___ 3-4 ___ 5-6 ___ 7+
 - b. How many children under the age of 10 live at your current address?
___ 0 ___ 1 ___ 2 ___ 3 ___ 4 ___ 5+

Medical Information

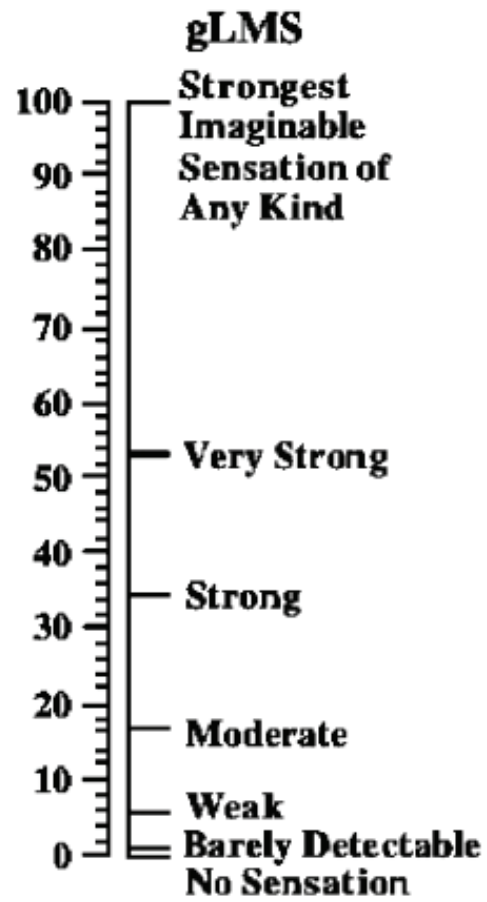
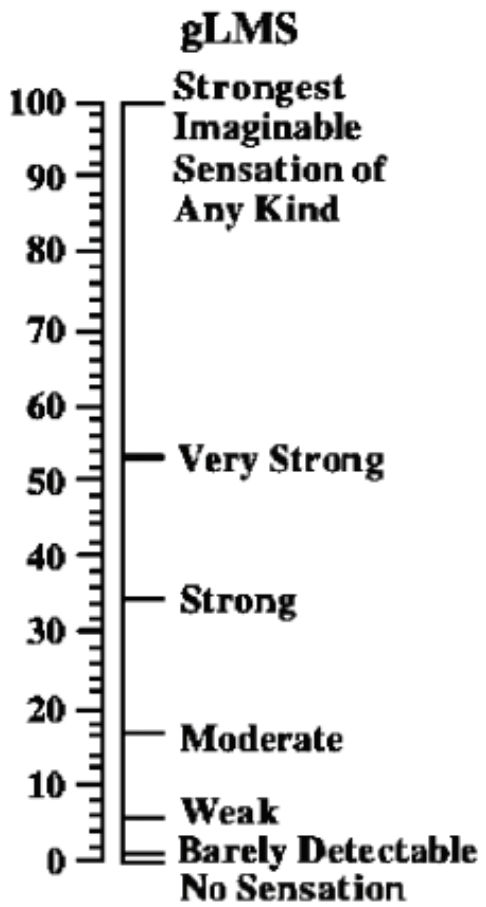
9. **Please record your height:** _____ in inches, **and weight:** _____ in pounds. If know, BMI: _____ kg/m²
10. **Do you smoke?** ___ Yes ___ No
11. **Do you routinely take any drugs (prescribed, over the-the-counter, other)?** ___ Yes ___ No
12. **In general, do you choose to buy local ingredients?** ___ Yes ___ No

13. Please mark if you have any of the following medical conditions (Check all that apply)

- Hypertension
- Sinus problems/Allergies
- Diabetes
- Heart Related
- Dental Problems/Braces/Dentures
- Nutrient Deficiency: _____
- Food Allergy: _____

APPENDIX D

PTC TEST



APPENDIX E

FOOD LIKING QUESTIONNAIRE

Food Liking Questionnaire

We would like to know how much you like the following foods. Please check the box on the scale to the right of **each** food item that best describes how **much you like each food**.

Based on the scale to the right, how much do you like the following foods? (Check one box beside each food)	Food Liking						
	Dislike			Like			
	Extremely					Extremely	
	1	2	3	4	5	6	7
1. cantaloupe							
2. Berries such as strawberries or blueberries							
3. watermelon							
4. grapes as whole fruit or juice							
5. apples as whole fruits or juice							
6. oranges as whole fruit or juice							
7. fresh tomatoes							
8. tomato-based products such as sauces, soups or ketchup							
9. corn							
10. green beans							
11. broccoli							
12. potatoes							
13. sweet potatoes							
14. onions							
15. garlic							
16. cabbage, cooked or raw							
17. carrots							
19. dark green leafy vegetables, such as spinach and collards							
20. salsa							

APPENDIX F

FOOD PREPARATION AND CONSUMPTION HABITS

Think about your typical dietary choices and please indicate the response that best describes your diet.

Food Habits:

1. Are you on any type of special diet, (e.g. allergies, weight control, vegetarian, diabetes etc.)?

_____yes

_____no

a. If yes, describe the special diet you follow?

2. During the academic school year, how often do you eat at a university dining hall in a typical month?

_____never

_____1-2 times

_____3-5 times

_____at least twice per week

_____daily

3. During the academic school year, how often do you eat outside of your place of residence (e.g. house, apartment, or dorm room) other than the university dining hall in a typical month?

_____never

_____1-2 times

_____3-5 times

_____at least twice per week

_____daily

4. During the academic school year, how often do you eat fast foods prepared by quick service restaurants (e.g. McDonalds, Chipotle, Burger King) in a typical month?

_____never

_____1-2 times

_____3-5 times

_____at least twice per week

_____daily

5. During the academic school year, how often do you eat your largest meal(s) at your place of residence in a typical month?

- | | |
|------------------------------------|--|
| <input type="checkbox"/> never | <input type="checkbox"/> at least twice per week |
| <input type="checkbox"/> 1-2 times | <input type="checkbox"/> daily |
| <input type="checkbox"/> 3-5 times | |

6. How many of those main meals eaten at home were take-out or mostly foods prepared outside of the home?

- | | |
|-------------------------------|------------------------------------|
| <input type="checkbox"/> none | <input type="checkbox"/> 6-7 |
| <input type="checkbox"/> 1-2 | <input type="checkbox"/> 8 or more |
| <input type="checkbox"/> 3-5 | |

7. How often do you cook an entire dinner for 2 or more people (including yourself) during the year?

- | | |
|------------------------------------|--|
| <input type="checkbox"/> never | <input type="checkbox"/> at least once per month |
| <input type="checkbox"/> 1-2 times | <input type="checkbox"/> at least once per week |
| <input type="checkbox"/> 3-5 times | <input type="checkbox"/> daily |

8. Indicate the extent to which each of the following affects the meals you consume:

a. Cooking skills

- | | |
|-------------------------------------|---------------------------------------|
| <input type="checkbox"/> not at all | <input type="checkbox"/> moderately |
| <input type="checkbox"/> slightly | <input type="checkbox"/> very much so |

b. Money available to buy food

- | | |
|-------------------------------------|---------------------------------------|
| <input type="checkbox"/> not at all | <input type="checkbox"/> moderately |
| <input type="checkbox"/> slightly | <input type="checkbox"/> very much so |

c. Access to a kitchen equipped with major appliances such as a range and refrigerator, pots and pans, and utensils such as knives, spatulas, spoons, can openers used in food preparation

- | | |
|-------------------------------------|---------------------------------------|
| <input type="checkbox"/> not at all | <input type="checkbox"/> moderately |
| <input type="checkbox"/> slightly | <input type="checkbox"/> very much so |

d. Foods available in local stores where you shop

- | |
|---------------------------------------|
| <input type="checkbox"/> not at all |
| <input type="checkbox"/> slightly |
| <input type="checkbox"/> moderately |
| <input type="checkbox"/> very much so |

e. Time available to prepare food

_____ not at all
_____ slightly

_____ moderately
_____ very much so

Culinary Literacy:

9. Do you consider your cooking skills to be:

_____ poor
_____ average

_____ good
_____ excellent

10. How aware are you of the food safety measures you should follow to ensure food you prepare is safe to eat?

_____ not at all
_____ slightly

_____ moderately
_____ very much so

11. How aware are you of the food safety measures you should follow when storing food for future consumption?:

_____ not at all
_____ slightly

_____ moderately
_____ very much so

12. How often do you try a new recipe?:

_____ once per year or less
_____ several times per year
_____ monthly
_____ several times per month

_____ weekly
_____ several times per week
_____ I do not use recipes

13. Where do you find new recipes?:

_____ cookbook
_____ family member
_____ friend
_____ internet
_____ cooking classes

_____ TV
_____ magazine
_____ other _____ (please list)
_____ I do not use recipes

14. How many fluid ounces are in a one-cup liquid measuring cup?

_____ 4 fluid ounces
_____ 6 fluid ounces
_____ 8 fluid ounces

_____ 10 fluid ounces
_____ don't know

15. One stick of margarine or butter is equal to:

- 1 cup
 1/4 cup
 1/3 cup
 1/2 cup
 don't know

16. How many teaspoons are in a tablespoon?

- 2 teaspoon
 3 teaspoon
 4 teaspoon
 6 teaspoon
 don't know

17. Which of the following foods is potentially hazardous?

- refrigerated ketchup
 commercial mayonnaise
 fresh, raw seed sprouts
 don't know

18. How often when you plan a meal, are all of the items ready to be served at the same time?

- never
 sometimes
 often
 all of the time

Food Preparation Activity:

19. If a recipe calls for a specific herb or spice and there is none available what would you do?

- would not make the recipe
 would leave out and prepare recipe with remaining ingredients
 would substitute with a spice or herb that tastes similar or is found in similar dishes
 I do not use recipes

20. In the past 12 months, how often have you done the following:

a. Made a grocery list

- never
 1-2 times
 3-5 times
 at least once per month
 at least once per week
 daily

b. Bought packaged pre-cut fresh vegetables, other than salad for convenience

- never
 1-2 times
 3-5 times
 at least once per month
 at least once per week

c. Other than packaged precut vegetables, have you bought fresh vegetables such as broccoli stalks or crowns, or whole unpeeled carrots and onions

_____ never
_____ 1-2 times
_____ 3-5 times

_____ at least once per month
_____ at least once per week

d. Other than packaged precut fruits, have you bought fresh fruits such as uncut melons, pineapple, or apples

_____ never
_____ 1-2 times
_____ 3-5 times

_____ at least once per month
_____ at least once per week

e. Have you bought raw meat (beef, pork lamb), poultry (chicken or turkey) or fish including shellfish like shrimp to prepare?

_____ never
_____ 1-2 times
_____ 3-5 times

_____ at least once per month
_____ at least once per week

APPENDIX G

**COOKING SKILLS QUESTIONNAIRE EVALUATED FOR CONTENT VALIDITY
STEP 1**

Think about your typical dietary choices and please indicate the following response that best describes your diet.

Food Habits:

1. Are you currently on a restricted diet?

_____ yes

_____ no

a. If yes, explain?

2. How often do you eat at a dining hall in a month?

_____ never

_____ 1-2 times

_____ 3-5 times

_____ at least twice per week

_____ daily

3. How often do you eat out in a month?

_____ never

_____ 1-2 times

_____ 3-5 times

_____ at least twice per week

_____ daily

4. How often do you eat fast foods in a month?

_____ never

_____ 1-2 times

_____ 3-5 times

_____ at least twice per week

_____ daily

5. How often do you eat your main meal at home in a week?

_____ never	_____ at least twice per week
_____ 1-2 times	_____ daily
_____ 3-5 times	

6. How many of those main meals eaten at home were take-out or ready-prepared foods?

_____ none	_____ 6-7
_____ 1-2	_____ 8 or more
_____ 3-5	

7. How often do you prepare an entire dinner for 2 or more people during the year?

_____ never	_____ at least once per month
_____ 1-2 times	_____ at least once per week
_____ 3-5 times	_____ daily

8. Indicate the extent to which each of the following affects the meals you consume:

a. Cooking skills

_____ not at all	_____ moderately
_____ slightly	_____ very much so

b. Money to buy food

_____ not at all	_____ moderately
_____ slightly	_____ very much so

c. Appliances for food preparation

_____ not at all	_____ moderately
_____ slightly	_____ very much so

d. Foods selection in local stores

_____ not at all	_____ moderately
_____ slightly	_____ very much so

e. Time available to prepare food

_____ not at all	_____ moderately
_____ slightly	_____ very much so

Culinary Literacy:

9. Do you consider your cooking skills to be:

_____ poor
_____ average

_____ good
_____ excellent

10. I am aware of the necessary food safety measures to take while preparing food and cleaning up:

_____ not at all
_____ slightly

_____ moderately
_____ very much so

11. How often do you try a new recipe:

_____ once per year or less
_____ several times per year
_____ monthly
_____ several times per month

_____ weekly
_____ several times per week
_____ I do not use recipes

12. Where do you find new recipes:

_____ cookbook
_____ family member
_____ friend
_____ internet

_____ cooking classes
_____ TV
_____ other _____ (please list)
_____ I do not use recipes

13. How many fluid ounces are in a one-cup liquid measuring cup?

_____ 4 fl oz
_____ 6 fl oz
_____ 8 fl oz

_____ 10 fl oz
_____ don't know

14. One stick of margarine or butter is equal to:

_____ 1 cup
_____ 1/4 cup
_____ 1/3 cup

_____ 1/2 cup
_____ don't know

15. How many teaspoons are in a tablespoon?

_____ 2 tsp
_____ 3 tsp
_____ 4 tsp

_____ 6 tsp
_____ don't know

16. I can plan accordingly to the cooking times for meal components, so that all of the items are completed and served at the same time.

_____ never
_____ sometimes

_____ often
_____ all of the time

Food Preparation Activity:

17. If a recipe calls for a specific herb or spice and there is none available what would you do?

_____ would not make the recipe
_____ would leave out and prepare recipe with remaining ingredients
_____ would substitute with a spice or herb that tastes similar or is found in similar dishes

18. In the past 12 months, how often have you done the following:

a. Made a grocery list

_____ never
_____ 1-2 times
_____ 3-5 times

_____ at least once per month
_____ at least once per week
_____ daily

b. Prepared a dinner with chicken, fish, or vegetables

_____ never
_____ 1-2 times
_____ 3-5 times

_____ at least once per month
_____ at least once per week

c. Prepared an entire dinner for 2 or more people

_____ never
_____ 1-2 times
_____ 3-5 times

_____ at least once per month
_____ at least once per week

d. Bought packaged convenience fresh vegetables, other than salad

_____ never
_____ 1-2 times
_____ 3-5 times

_____ at least once per month
_____ at least once per week

e. Bought any fresh vegetable, other than packaged convenience fresh vegetables such as broccoli, carrots, and onions

_____ never
_____ 1-2 times
_____ 3-5 times

_____ at least once per month
_____ at least once per week

APPENDIX H

ADDITIONAL COMMENTS FROM CONTENT VALIDITY STEP 1

Question 1: is everyone supposed to interpret "restricted" in the same way. Should you have them fill in "for what" so you know how they interpreted it? eg., do you mean for weight, sodium, fat, religion, my own restriction, vegetarianism, allergy, etc. And even if all is okay with you, will everyone know you mean all these are included in restricted? Question 2: Should you say college or university dining hall? Dining hall could mean different things to different people. Question 3: How often do you eat "out". Do you mean outside the home? Or since the question right before it said dining hall, could this be interpreted as outside the home or dining hall? Restaurants only? I would clarify what you mean, eg., how often do you eat outside your own home. (What if they live in a dorm room without the ability to ever eat at home, by the way? Do you need some description or answer as to whether they have a kitchen to be able to prepare their own meals?) Question 7: How often do you prepare an entire dinner -- do you mean from scratch, with recipes, or just assemble foods and have people over? "entire" to me doesn't describe what you might mean about food preparation. Question 8d: Food selection in local stores...do you care if they interpret this as ingredients for recipes they might want to use, vs. the selection of ready-to-eat foods? (you do say food selection, not ingredient selection) General: Should you put a question or two in to actually test their food safety knowledge which they are self-rating? Example: do they know what temp to cook a hamburger or chicken patty to? Do they know what temp. their refrigerator should be set to?

Number 7 and 18c. seem to be the same question Do not switch between saying "I" and "you" in the questions or statements. Stay with one or the other. On 18b. I am not clear what you are trying to assess. On 18e. I would re-word to say " packaged pre-cut fresh vegetables" instead of "convenience"

Nice Job!! Overall, a good survey. #3- Consider adding a definition of eating "out". Someone that eats in a dining hall may consider that "out", since it is not in their home, even though they eat the majority of their meals there. Similarly, for #4 and #6, consider defining fast foods and ready-prepared or convenience foods. For #5, the concept of the "main meal" might be a bit confusing to some. #10, some may not be familiar with the term "food safety". #17- add an option for "I do not use recipes". #18 b. Is there a reason you only chose chicken, fish or vegetables?

I think that the survey will generate a lot of interesting information! My suggestions are as follows: Question 1: We use "Are you following a particular diet?" for Dr. Fischer's class. Some people may not view a diet plan as necessarily restrictive. Question 3: Does eating out include or exclude eating in the dining hall or at campus eateries? Question 12: Add "magazine" as an option to sources of recipes. Some may not necessarily think of that in the "other" category. Question 18b: Why exclude beef, pork, past, eggs? You may want to ask separate questions about main ingredients in meals to get more information (i.e., I cook 3 vegetable meals per week but only 1 chicken meal per month). Question 18c: What is the reason for the qualifier of 2+ people? Some students may live alone but cook for themselves

(although they may be outliers). If you are looking for the social aspect of eating, you may need to include this qualifier in the questions about eating out and eating at the dining hall, too (do you eat out alone or with friends?) Question 18d and e: Can you do a separate question for fruit? There are some ready-prepared fresh fruits available, too. Best wishes!

#1: explain "restricted" (e.g. low calorie or low sodium or high protein or low lactose or food allergy) #3: what do you mean by "eat out" (does that include eating at a friends' house? #4: does "fast foods" include convenience food you cook at home (frozen pizza?) #7: does "for 2 or more people" include yourself? #8c: are "applicances" just big equipment (stove, refrigerator etc), or does it include things like food processor, blender (I would put some examples) #10: I think students may be unsure as to what "food safety measures" are...they might think about using knives, not burning themselves etc...you might want to be a bit more specific if you mean food sanitation #18b: do you mean from scratch? or any meal that has chicken, fish or veggies (e.g. does fish sticks count??) #18c: do you count yourself in the "2 or more people" #18d: put some examples...believe it or not, the student won't be sure what "packaged convenience fresh vegetables are" #18e: indicate that "fresh" is what you find in the produce aisle, and doesn't include frozen or canned Sorry for all of the edits, but after teaching FDNS 2100 for so long, I know how the students think...and what confuses them.
Dr. G

Consider adding examples (such as fast food restaurants like McDonalds, taco bells, etc- also now we have these fast food/full service restaurant intermediates like Moe's and I don't know where they would fall. Also, if a student is on the meal plan does this count as eating out or eating at home? Please define.

I am unsure of the benefits of question 18. Twelve months seems like a long time frame, maybe 3 or 6 would result in better answers?

questions 3 and 4- you could list examples of "eating out" and "fast food". question 6- what is a ready-prepared food, list an example. 8- do you mean appliances or overall tools in the kitchen? 11- cooking or eating a new recipe?

Looks good. I only question the necessity of the similar questions regarding how many times you've prepared a dinner for 2 or more guests

5. How often do you eat your main meal at home in a week?

_____ never	_____ at least twice per week
_____ 1-2 times	_____ daily
_____ 3-5 times	

6. How many of those main meals eaten at home were take-out or mostly foods prepared outside of the home even though they were consumed at home?

_____ none	_____ 6-7
_____ 1-2	_____ 8 or more
_____ 3-5	

7. How often do you cook an entire dinner for 2 or more people (including yourself) during the year?

_____ never	_____ at least once per month
_____ 1-2 times	_____ at least once per week
_____ 3-5 times	_____ daily

8. Indicate the extent to which each of the following affects the meals you consume:

a. Cooking skills

_____ not at all	_____ moderately
_____ slightly	_____ very much so

b. Money available to buy food

_____ not at all	_____ moderately
_____ slightly	_____ very much so

c. Access to a kitchen equipped with major appliances such as a range and refrigerator, pots and pans and utensils such as knives, spatulas, spoons, can openers used in food preparation

_____ not at all	_____ moderately
_____ slightly	_____ very much so

d. Foods available in local stores where you shop

_____ not at all	_____ moderately
_____ slightly	_____ very much so

e. Time available to prepare food

_____ not at all
_____ slightly

_____ moderately
_____ very much so

Culinary Literacy:

9. Do you consider your cooking skills to be:

_____ poor
_____ average

_____ good
_____ excellent

10. How aware are you of the food safety measures you should follow to ensure food you prepare is safe to eat?

_____ not at all
_____ slightly

_____ moderately
_____ very much so

11. How aware are you of the food safety measures you should follow when storing food for future consumption?:

_____ not at all
_____ slightly
_____ moderately
_____ very much so

12. How often do you try a new recipe:

_____ once per year or less
_____ several times per year
_____ monthly
_____ several times per month

_____ weekly
_____ several times per week
_____ I do not use recipes

13. Where do you find new recipes:

_____ cookbook
_____ family member
_____ friend
_____ internet
_____ cooking classes

_____ TV
_____ magazine
_____ other _____ (please list)
_____ I do not use recipes

14. How many fluid ounces are in a one-cup liquid measuring cup?

4 fluid ounces
 6 fluid ounces
 8 fluid ounces

10 fluid ounces
 don't know

15. One stick of margarine or butter is equal to:

1 cup
 1/4 cup
 1/3 cup

1/2 cup
 don't know

16. How many teaspoons are in a tablespoon?

2 teaspoon
 3 teaspoon
 4 teaspoon

6 teaspoon
 don't know

17. Which of the following foods is potentially hazardous?

refrigerated ketchup
 commercial mayonnaise

fresh, raw seed sprouts
 a washed apple
 don't know

18. You can plan accordingly to the cooking times for each meal component, so that all of the items in the meal are completed and served at the same time.

never
 sometimes

often
 all of the time

Food Preparation Activity:

19. If a recipe calls for a specific herb or spice and there is none available what would you do?

would not make the recipe
 would leave out and prepare recipe with remaining ingredients
 would substitute with a spice or herb that tastes similar or is found in similar dishes
 I do not use recipes

20. In the past 12 months, how often have you done the following:

a. Made a grocery list

never
 1-2 times
 3-5 times

at least once per month
 at least once per week
 daily

b. Bought packaged pre-cut fresh vegetables, other than salad for convenience

_____ never	_____ at least once per month
_____ 1-2 times	_____ at least once per week
_____ 3-5 times	

c. Other than packaged pre-cut vegetables, have you bought fresh vegetables such as broccoli, carrots, and onions

_____ never	_____ at least once per month
_____ 1-2 times	_____ at least once per week
_____ 3-5 times	

d. Other than packaged pre-cut fruits, have you bought fresh fruits such as melons, pineapple, and apples

_____ never	_____ at least once per month
_____ 1-2 times	_____ at least once per week
_____ 3-5 times	

e. Have you bought raw meat (beef, pork lamb), poultry (chicken or turkey) or fish including shellfish like shrimp to prepare?

_____ never	_____ at least once per month
_____ 1-2 times	_____ at least once per week
_____ 3-5 times	

APPENDIX J

ADDITIONAL COMMENTS FROM CONTENT VALIDITY STEP 2

I just have some ticky things to say, so you may or may not want to follow these suggestions. Question #1 is awkward - may list alternative lifestyle diets as a second question in #1, much like "special diet". Question #3 is awkward; however, I can't think of a better way to phrase it...I do know what you are asking. Question #4 - do you want to provide an example(s) of quick service restaurants...I am not sure that all students will know what kind of restaurants you mean. Question #5 - using "main meal" through me a little bit, so I wasn't sure if I should focus on breakfast, lunch, or dinner or all? Again, I am not sure there is a better way to phrase this question. Question #8 - maybe address access to transportation...not having a vehicle can greatly impact students access to fresh food to prepare at the dorm or at a friends place (consider time/convenience if bus travel is added). Question #8(d) - not sure what "local store" means, is this a campus store or an off campus store? That pretty much sums up my notes. Good luck on your research project.

Cognitive complexity as a measure is very confusing. It seems to hit on many of the concepts from the other questions but does not ask a single question. I'm not sure how to use it as a measure. Please throw these responses out. #5 - Some people may have more than 1 "main meal." #8 a- Please give an example #9 - is this too subjective? Wording on most questions needs to be clarified

Looks Great!

Very good survey and well thought out. Some of the questions I did not feel were as relevent as some of the otheses, but for the purposes of your study, they may be very helpful, simply depending on what you are going to be looking at and how you will be using and analyzing the data. Overall I would say you did a good job on this and good luck with your research!

1. Some of the questions are very long - could be shortened without reducing clarity. First question: Are you on a special diet (allergies, weight control, vegetarian, diabetes, etc.)? If so, please describe. It is unclear how this relates to cooking skills. 2. There is a large gap in many of the response choices. For example, between 5 and 10x a month for eating in dining hall and between 5-12 times a year in Question 20. Is there a reason for this? 3. If the target audience is students living on campus, Question 5 may be unclear when it refers to meals eaten at home. Is home the dorm room? Might be misinterpreted as times they go home to eat with their family... 4. The time frame for several of the questions might yield more accurate responses if it were shorter, for example, week in Question 5 and month in Question 7. 5. Question 8 part d - Are you sure you want to include the information in parentheses (where you shop)? The selection of foods in local stores may be a problem and they may not shop there because of this. This affects the clarity of the question. 6. I have concerns about Questions 10 and 11. They may have high self-efficacy for good food safety practices, but not actually have correct information on food safety. It is here that I think knowledge questions may be helpful. 7. Consider adding a response choice in Question 12, I do not cook. 8. Are there studies that show that knowledge of the number of cups of margarine in a stick or ounces of liquid in a cup are important determinants of cooking skills? I'm not sure how the knowledge items were determined. I also thought the response choices in the food safety question (washed apple and raw sprouts) lent themselves to discussion but not multiple choice. Yes, you should wash your apple but there are other issues worthy of discussion that college students would be interested in.

Code: _____

I would reword question #1 and the order of "vegetarian diet" in the question, or leave that "diet" out. I would also define "main meal" to the students taking the survey so that they know exactly what meal you are referring to. For question 8c, I'm not sure if it's necessary to list out kitchen utensils such as spoons etc. to them. I would consider rewording question 20e also when listing off raw protein choices. Other than that, the survey looks great! Good luck with your thesis!

APPENDIX K**COOKING SKILLS QUESTIONNAIRE EVALUATED FOR FACE VALIDITY**

Think about your typical dietary choices and please indicate the response that best describes your diet.

Food Habits:

1. Are you on a special diet, (e.g. allergies, weight control, vegetarian, diabetes etc.)?

_____ yes

_____ no

c. If yes, describe the special diet you follow?

2. How often do you eat at a university dining hall in a month?

_____ never

_____ 1-2 times

_____ 3-5 times

_____ at least twice per week

_____ daily

3. How often do you eat outside of your place of residence (e.g. house, apartment, dorm room, apartment) other than the university dining hall in a month?

_____ never

_____ 1-2 times

_____ 3-5 times

_____ at least twice per week

_____ daily

4. How often do you eat fast foods prepared by quick service restaurants (e.g. McDonalds, Chipotle, or Burger King) in a month?

_____ never

_____ 1-2 times

_____ 3-5 times

_____ at least twice per week

_____ daily

5. How often do you eat your main meal at your place of residence in a month?

_____ never

_____ 1-2 times

_____ 3-5 times

_____ at least twice per week

_____ daily

6. How many of those main meals eaten at home were take-out or mostly foods prepared outside of the home even though they were consumed at home?

- | | |
|------------|-----------------|
| _____ none | _____ 6-7 |
| _____ 1-2 | _____ 8 or more |
| _____ 3-5 | |

7. How often do you cook an entire dinner for 2 or more people (including yourself) during the year?

- | | |
|-----------------|-------------------------------|
| _____ never | _____ at least once per month |
| _____ 1-2 times | _____ at least once per week |
| _____ 3-5 times | _____ daily |

8. Indicate the extent to which each of the following affects the meals you consume:

a. Cooking skills

- | | |
|------------------|--------------------|
| _____ not at all | _____ moderately |
| _____ slightly | _____ very much so |

b. Money available to buy food

- | | |
|------------------|--------------------|
| _____ not at all | _____ moderately |
| _____ slightly | _____ very much so |

c. Access to a kitchen equipped with major appliances such as a range and refrigerator, pots and pans and utensils such as knives, spatulas, spoons, can openers used in food preparation

- | | |
|------------------|--------------------|
| _____ not at all | _____ moderately |
| _____ slightly | _____ very much so |

d. Foods available in local stores where you shop

- | | |
|------------------|--------------------|
| _____ not at all | _____ moderately |
| _____ slightly | _____ very much so |

e. Time available to prepare food

- | | |
|------------------|--------------------|
| _____ not at all | _____ moderately |
| _____ slightly | _____ very much so |

Culinary Literacy:

9. Do you consider your cooking skills to be:

_____ poor
_____ average

_____ good
_____ excellent

10. How aware are you of the food safety measures you should follow to ensure food you prepare is safe to eat?

_____ not at all
_____ slightly

_____ moderately
_____ very much so

11. How aware are you of the food safety measures you should follow when storing food for future consumption?:

_____ not at all
_____ slightly
_____ moderately
_____ very much so

12. How often do you try a new recipe?:

_____ once per year or less
_____ several times per year
_____ monthly
_____ several times per month

_____ weekly
_____ several times per week
_____ I do not use recipes

13. Where do you find new recipes?:

_____ cookbook
_____ family member
_____ friend
_____ internet
_____ cooking classes

_____ TV
_____ magazine
_____ other _____ (please list)
_____ I do not use recipes

14. How many fluid ounces are in a one-cup liquid measuring cup?

_____ 4 fluid ounces
_____ 6 fluid ounces
_____ 8 fluid ounces

_____ 10 fluid ounces
_____ don't know

15. One stick of margarine or butter is equal to:

- | | |
|----------------------------------|-------------------------------------|
| <input type="checkbox"/> 1 cup | <input type="checkbox"/> 1/2 cup |
| <input type="checkbox"/> 1/4 cup | <input type="checkbox"/> don't know |
| <input type="checkbox"/> 1/3 cup | |

16. How many teaspoons are in a tablespoon?

- | | |
|-------------------------------------|-------------------------------------|
| <input type="checkbox"/> 2 teaspoon | <input type="checkbox"/> 6 teaspoon |
| <input type="checkbox"/> 3 teaspoon | <input type="checkbox"/> don't know |
| <input type="checkbox"/> 4 teaspoon | |

17. Which of the following foods is potentially hazardous?

- | | |
|--|-------------------------------------|
| <input type="checkbox"/> refrigerated ketchup | <input type="checkbox"/> don't know |
| <input type="checkbox"/> commercial mayonnaise | |
| <input type="checkbox"/> fresh, raw seed sprouts | |

18. You can plan accordingly to the cooking times for each meal component, so that all of the items in the meal are completed and served at the same time?

- | | |
|------------------------------------|--|
| <input type="checkbox"/> never | <input type="checkbox"/> often |
| <input type="checkbox"/> sometimes | <input type="checkbox"/> all of the time |

Food Preparation Activity:

19. If a recipe calls for a specific herb or spice and there is none available what would you do?

- | |
|--|
| <input type="checkbox"/> would not make the recipe |
| <input type="checkbox"/> would leave out and prepare recipe with remaining ingredients |
| <input type="checkbox"/> would substitute with a spice or herb that tastes similar or is found in similar dishes |
| <input type="checkbox"/> I do not use recipes |

20. In the past 12 months, how often have you done the following:

a. Made a grocery list

- | | |
|------------------------------------|--|
| <input type="checkbox"/> never | <input type="checkbox"/> at least once per month |
| <input type="checkbox"/> 1-2 times | <input type="checkbox"/> at least once per week |
| <input type="checkbox"/> 3-5 times | <input type="checkbox"/> daily |

b. Bought packaged pre-cut fresh vegetables, other than salad for convenience

- | | |
|------------------------------------|--|
| <input type="checkbox"/> never | <input type="checkbox"/> at least once per month |
| <input type="checkbox"/> 1-2 times | <input type="checkbox"/> at least once per week |
| <input type="checkbox"/> 3-5 times | |

c. Other than packaged pre-cut vegetables, have you bought fresh vegetables such as broccoli, carrots, and onions

_____ never
_____ 1-2 times
_____ 3-5 times

_____ at least once per month
_____ at least once per week

d. Other than packaged pre-cut fruits, have you bought fresh fruits such as melons, pineapple, and apples

_____ never
_____ 1-2 times
_____ 3-5 times

_____ at least once per month
_____ at least once per week

e. Have you bought raw meat (beef, pork lamb), poultry (chicken or turkey) or fish including shellfish like shrimp to prepare?

_____ never
_____ 1-2 times
_____ 3-5 times

_____ at least once per month
_____ at least once per week

APPENDIX L

PARTICIPANT GENERATED RE-WORDING OF QUESTIONS FOR FACE VALIDITY

1. Are you on a special diet, (e.g. allergies, weight control, vegetarian, diabetes etc.)? ___yes ___no --- a. If yes, describe the special diet you follow?

Text Response

No The question is asking if the subject has any dietary restrictions. Rather than saying "special diet" you could ask "Do you have any dietary restrictions?"

Do you follow a diet regimen whether for personal preference or due to medical necessity? (aka. do you consider yourself a vegetarian and/or do you follow a specific diet for diabetes) yes no if yes, describe the parameters of the diet.

Are you a particular diet that causes you to be careful with your eating habits?

Do you follow a special diet, (e.g. allergies, weight control, vegetarian, diabetes, gluten-free, vegan etc.)? ___yes ___no If yes, please describe the diet.

Do you have any dietary restrictions or special dietary needs? If so, please describe the diet that you follow.

2. How often do you eat at a university dining hall in a month? ___never ___1-2 times ___3-5 times ___at least twice per week ___daily

Text Response

never This question is asking how frequently the subject eats in a university dining hall.

Do you ever eat at the University Dining Hall? If so, how often? never everyday 3-5 times a week 1-2 times a week < 4 times a month

How man times in a month do you eat at the dining hall?

About how frequently do you eat at one of the university dining commons in a month?

3. How often do you eat outside of your place of residence (e.g. house, apartment, dorm room or apartment) other than the university dining hall in a month?

never 1-2 times 3-5 times at least twice per week daily

Text Response

3-5 times This question asks how often the subject eats out. You said "apartment" twice.

How often do you eat somewhere other than your place of residence (where you live and sleep), excluding the times that you eat at the University dining halls? never everyday 1-2 times a week 3-5 times a week < 4 times a month

Besides the dining hall, how many times do you eat out of your place of residence in a month?

How often do you eat at other places besides your place of residence, such as a dorm room or apartment, or a university dining commons each month?

4. How often do you eat fast foods prepared by quick service restaurants (e.g. McDonalds, Chipotle, or Burger King) in a month?

never 1-2 times 3-5 times at least twice per week daily

1-2 times This question is asking how often the subject eats at fast food restaurants.

How often do you eat fast food? (including any kind of "drive-thru" or quick service restaurant) never everyday 1-2 times a week 3-5 times a week < 4 times a month

How often do you eat fast foods in a month?

How frequently do you consume fast food/quick service food each month? This includes restaurants like McDonalds, Subway, Barbaritos, etc.

5. How often do you eat your main meal at your place of residence in a month?

never 1-2 times 3-5 times at least twice per week daily

Text Response

3-5 times This question seems to be asking how often the subject eats dinner or their largest meal at home. The PDF mentioned this but I agree that "main meal" is a little unclear. If you are referring to dinner, then the term "dinner" would be better. If you just mean whatever meal is the largest/most hearty, then use a term like that.

How often is the largest meal of the day consumed at your home (where you live and sleep)? never everyday 1-2 times a week 3-5 times a week

How often do you eat dinner at your place of residence in a month?

How often do you eat your main meal at your place of residence each month?

6. How many of those main meals eaten at home were take-out or mostly foods prepared outside of the home even though they were consumed at home? _____ none _____ 1-2 _____ 3-5 _____ 6-7 _____ 8 or more

Text Response

none This question is asking how often the subject eats take-out. This question is a little wordy. It might sound better if you take out the part that reads "even though they were consumed at home."

Of the large meals that you consumed at home (where you live and sleep) what percentage of those meals were mostly or completely prepared by someone else in some other place than your home? (How much was take-out or ready made food that you didn't cook yourself?) 0% 100% 10% 25% 50% 75% 90%
**This might be a bit excessive, but percentages seem like an easier way to answer this question

How many of the meals for dinner eaten at home are take-out or mostly already made?

About how many of the meals eaten at your place of residence were take-out or pre-prepared?

7. How often do you cook an entire dinner for 2 or more people (including yourself) during the year? _____ never _____ 1-2 times _____ 3-5 times _____ at least once per month
_____ at least once per week _____ daily

Text Response

1-2 times This question is asking how often the subject cooks for a group of people rather than just for them self.

How many times a month do you cook a meal for 2 or more people including yourself? never everyday at least once a month at least once a week 1-2 times a month 3-5 times a month

Would leave this question as is.

How frequently do you prepare/cook dinner for 2 or more people (including yourself) during the year?

8. Indicate the extent to which each of the following affects the meals you consume: a. **Cooking skills** _____ not at all _____ slightly _____ moderately _____ very much so

Text Response

moderately This question is asking if cooking ability affects what the subject eats.

How much do you think knowledge of cooking techniques (or lack of knowledge) affects the way that you eat? not at all a little bit a good amount very much so

Cooking abilities

8. Indicate the extent to which each of the following affects the meals you consume: b. Money available to buy food _____ not at all _____ slightly _____ moderately _____ very much so

Text Response

not at all This question is asking if money/income has any effect on food choices.

How much does the amount of money that you have affect the way that you eat? not at all a little bit a good amount very much so

Money

8. Indicate the extent to which each of the following affects the meals you consume: c. Access to a kitchen equipped with major appliances such as a range and refrigerator, pots and pans and utensils such as knives, spatulas, spoons, can openers used in food preparation _____ not at all _____ slightly _____ moderately _____ very much so

Text Response

slightly This question is asking if the subject's choice of food is affected by the equipment available to them.

How much does your access (or no access) to a kitchen and all of the appliances normally in a kitchen affect the way that you eat? not at all a little bit a good amount very much so

Access to a fully equipped kitchen consisting of appliances and cooking tools

8. Indicate the extent to which each of the following affects the meals you consume: d. Foods available in local stores where you shop _____ not at all _____ slightly _____ moderately _____ very much so

Text Response

not at all This question seems to be asking if the subject is facing any food insecurity.

How much does the availability (or unavailability) of certain foods in the stores close to you affect the way that you eat? not at all a little bit a good amount very much so

Availability of food in local grocery stores

8. Indicate the extent to which each of the following affects the meals you consume: e. Time available to prepare food _____ not at all _____ slightly _____ moderately _____ very much so

Text Response

moderately This question is asking if the subject's schedule/time constraints play any role in food selection.

How does the amount of time that you have (or don't have) affect the way that you eat? not at all a little bit a good amount very much so

Available time to prepare meals

9. Do you consider your cooking skills to be:
_____ **poor** _____ **average** _____ **good** _____ **excellent**

Text Response

good This question asks the subject how well they can cook This question might read better if it said "How would you rate your cooking skills?"

When you examine your cooking skills and techniques would you say that they are... poor average good excellent

Leave the question as is.

10. How aware are you of the food safety measures you should follow to ensure food you prepare is safe to eat? _____ not at all _____ slightly _____ moderately _____ very much so

Text Response

very much so This question is asking about the subject's knowledge of general food safety practices.

How educated do you feel on food safety techniques including proper handling, sanitation, and storage? not at all a little bit a good amount very much so

How much food awareness do you take to ensure safety of food for eating?

11. How aware are you of the food safety measures you should follow when storing food for future consumption?: _____ not at all _____ slightly _____ moderately _____ very much so

Text Response

very much so This question is asking about the subject's knowledge of general food safety practices.

Do you feel educated on safe food storage techniques and on when something is no longer safe to consume? not at all a little bit a good amount very much so

How much food safety awareness do you take when storing food?

12. How often do you try a new recipe: _____ once per year or less _____ several times per year _____ monthly _____ several times per month _____ weekly _____ several times per week _____ I do not use recipes

Text Response

several times per month This question asks about how often the subject experiments with new foods.] This question needs a "?"

When you do cook, how often do you attempt a new recipe? I don't use recipes a few times a year monthly a few times per month weekly a few times per week

How often do you experiment a new food recipe?

13. Where do you find new recipes: _____ **cookbook** _____ **family member** _____ **friend**
_____ **internet** _____ **cooking classes** _____ **TV** _____ **magazine** _____ **other** _____ (please
list) _____ **I do not use recipes**

Text Response

cookbook, family member, friend, internet, magazine This question asks what sources the subject gets new recipes from. This question needs a "?"

Where do your new recipes normally come from? friends family internet magazine cookbook cooking show/tv cooking class i don't use recipes other (please list)

Where do your new recipes come from?

14. How many fluid ounces are in a one-cup liquid measuring cup? _____ **4 fluid ounces** _____ **6 fluid ounces** _____ **8 fluid ounces** _____ **10 fluid ounces** _____ **don't know**

Text Response

8 fl oz

A one-cup liquid measuring cup is equal to how many fluid ounces? don't know 4 fl oz 6 fl oz 8 fl oz 10 fl oz

How many fluid ounces are in a one-cup liquid measuring cup?

15. One stick of margarine or butter is equal to: _____ **1 cup** _____ **1/4 cup** _____ **1/3 cup** _____ **1/2 cup** _____ **don't know**

Text Response

1/2 cup

One regular sized stick of butter or margarine is equal to how many cups? 1 1/4 1/3 1/2 I don't know

Leave the question as is.

16. How many teaspoons are in a tablespoon? _____ **2 teaspoon** _____ **3 teaspoon** _____ **4 teaspoon** _____ **6 teaspoon** _____ **don't know**

Text Response

3 teaspoons "teaspoon" needs to be plural in all of these This and the above questions test the subject's understanding of basic kitchen conversions

How many teaspoons are there in one tablespoon? 2 3 4 6 I don't know

How many teaspoons are in one tablespoon?

17. Which of the following foods is potentially hazardous? _____ refrigerated ketchup _____ commercial mayonnaise _____ fresh, raw seed sprouts _____ don't know

Text Response

fresh, raw seed sprouts this tests the subject's knowledge of food spoilage

Which of these foods could be potentially hazardous if consumed under unsafe circumstances?
refrigerated ketchup commercial mayonnaise fresh, raw seed sprouts I don't know

Leave the question as is.

18. You can plan according to the cooking times for each meal component, so that all of the items in a meal are completed and served at the same time. _____ never _____ sometimes _____ often _____ all of the time

Text Response

often This question doesn't make sense. It needs to be reworded so that it is actually asking a question.

Is it possible to plan out cooking times for each item in a meal so that the entire meal is completed at the same time? yes no I don't know

Would you plan each of the individual dish for a meal according to the cooking time to complete and serve all at the same time?

19. If a recipe calls for a specific herb or spice and there is none available what would you do? _____ would not make the recipe _____ would leave out and prepare recipe with remaining ingredients _____ would substitute with a spice or herb that tastes similar or is found in similar dishes _____ I do not use recipes

Text Response

would substitute with a spice or herb that tastes similar or is found in similar dishes This question asks about the subject's ability to problem solve if they don't have an ingredient

If you are following a recipe and you run out of a spice that the recipe calls for what would you do?
would not make the recipe would just leave out the component that I am missing would try to find a substitute for the component by looking for items that taste similar I do not use recipes

What would you do if you do not have the specific herb or spice asked for in a recipe?

20. In the past 12 months, how often have you done the following: a. Made a grocery list _____ never _____ 1-2 times _____ 3-5 times _____ at least once per month _____ at least once per week _____ daily

Text Response

3-5 times This question asks about the subject's organization and strategy for grocery shopping This question needs a "?"

How often do you make a grocery list before grocery shopping? never always half of the time only sometimes most of the time

Leave the question as is.

20. In the past 12 months, how often have you done the following:
b. Bought packaged pre-cut fresh vegetables, other than salad for convenience
 _____ never _____ 1-2 times _____ 3-5 times _____ at least once per month _____ at least once per week _____ daily

Text Response

1-2 times This question asks how often the subject buys the more convenient product This question needs a "?"

How often do you buy pre-cut fresh vegetables (excluding salad or salad mix) or convenience? never always half of the time only sometimes most of the time

Bought fresh vegetables pre-cut and packaged, besides a salad

20. In the past 12 months, how often have you done the following:
c. Other than packaged pre-cut vegetables, have you bought fresh vegetables such as broccoli, carrots, and onions
 _____ never _____ 1-2 times _____ 3-5 times _____ at least once per month _____ at least once per week _____ daily

Text Response

at least once per week this question asks how often the subject buys fresh produce this question needs a "?"

How often, when buying vegetables, do you buy fresh whole vegetables (not pre-cut or pre-packaged) ? never always half of the time only sometimes most of the time

Bought fresh vegetables (such as broccoli, carrots, and onions) besides the packaged ones

20. In the past 12 months, how often have you done the following:
d. Other than packaged precut fruits, have you bought fresh fruits such as melons, pineapple, and apples
 _____ never _____ 1-2 times _____ 3-5 times _____ at least once per month _____ at least once per week _____ daily

Text Response

at least once per week this question asks how often the subject buys fresh produce This question needs a "?"

How often, when buying fruit, do you purchase fresh whole fruits (not pre-cut or pre-packaged) ? never always half of the time only sometimes most of the time

Bought fresh fruits (such as melons, pineapple, and apples), besides the packaged ones

20. In the past 12 months, how often have you done the following:
e. Have you bought raw meat (beef, pork lamb), poultry (chicken or turkey) or fish including shellfish like shrimp to prepare? _____never _____1-2 times _____3-5 times _____at least once per month _____at least once per week _____daily

Text Response

at least once per week this question asks how often the subject buys raw meat

How often, when buying meats, do you purchase raw, uncooked meats (that must be cooked before consumption) including fish, shellfish, poultry, beef, pork etc. ? never always half of the time only sometimes most of the time

Bought raw meat (beef, pork, lamb), poultry (chicken or turkey), or fish including shellfish (shrimp)

APPENDIX M

COOKING SKILLS QUESTIONNAIRE EVALUATED FOR RELIABILITY

Think about your typical dietary choices and please indicate the response that best describes your diet.

Food Habits:

1. Are you on any type of special diet, (e.g. allergies, weight control, vegetarian, diabetes etc.)?

yes no

d. If yes, describe the special diet you follow?

2. How often do you eat at a university dining hall in an average month?

never
 1-2 times at least twice per week
 3-5 times daily

3. How often do you eat outside of your place of residence (e.g. house, apartment, or dorm room) other than the university dining hall in an average month?

never
 1-2 times at least twice per week
 3-5 times daily

4. How often do you eat fast foods prepared by quick service restaurants (e.g. McDonalds, Chipotle, Burger King) in an average month?

never at least twice per week
 1-2 times daily
 3-5 times

5. During the academic school year, how often do you eat your largest meal(s) at your place of residence in an average month?

- | | |
|------------------------------------|--|
| <input type="checkbox"/> never | <input type="checkbox"/> at least twice per week |
| <input type="checkbox"/> 1-2 times | <input type="checkbox"/> daily |
| <input type="checkbox"/> 3-5 times | |

6. How many of those main meals eaten at home were take-out or mostly foods prepared outside of the home?

- | | |
|-------------------------------|------------------------------------|
| <input type="checkbox"/> none | <input type="checkbox"/> 6-7 |
| <input type="checkbox"/> 1-2 | <input type="checkbox"/> 8 or more |
| <input type="checkbox"/> 3-5 | |

7. How often do you cook an entire dinner for 2 or more people (including yourself) during the year?

- | | |
|------------------------------------|--|
| <input type="checkbox"/> never | <input type="checkbox"/> at least once per month |
| <input type="checkbox"/> 1-2 times | <input type="checkbox"/> at least once per week |
| <input type="checkbox"/> 3-5 times | <input type="checkbox"/> daily |

8. Indicate the extent to which each of the following affects the meals you consume:

a. Cooking skills

- | | |
|-------------------------------------|---------------------------------------|
| <input type="checkbox"/> not at all | <input type="checkbox"/> moderately |
| <input type="checkbox"/> slightly | <input type="checkbox"/> very much so |

b. Money available to buy food

- | | |
|-------------------------------------|---------------------------------------|
| <input type="checkbox"/> not at all | <input type="checkbox"/> moderately |
| <input type="checkbox"/> slightly | <input type="checkbox"/> very much so |

c. Access to a kitchen equipped with major appliances such as a range and refrigerator, pots and pans, and utensils such as knives, spatulas, spoons, can openers used in food preparation

- | | |
|-------------------------------------|---------------------------------------|
| <input type="checkbox"/> not at all | <input type="checkbox"/> moderately |
| <input type="checkbox"/> slightly | <input type="checkbox"/> very much so |

d. Foods available in local stores where you shop

- | | |
|-------------------------------------|---------------------------------------|
| <input type="checkbox"/> not at all | <input type="checkbox"/> moderately |
| <input type="checkbox"/> slightly | <input type="checkbox"/> very much so |

e. Time available to prepare food

_____ not at all
_____ slightly

_____ moderately
_____ very much so

Culinary Literacy:

9. Do you consider your cooking skills to be:

_____ poor
_____ average

_____ good
_____ excellent

10. How aware are you of the food safety measures you should follow to ensure food you prepare is safe to eat?

_____ not at all
_____ slightly

_____ moderately
_____ very much so

11. How aware are you of the food safety measures you should follow when storing food for future consumption?:

_____ not at all
_____ slightly
_____ moderately
_____ very much so

12. How often do you try a new recipe?:

_____ once per year or less
_____ several times per year
_____ monthly
_____ several times per month

_____ weekly
_____ several times per week
_____ I do not use recipes

13. Where do you find new recipes?:

_____ cookbook
_____ family member
_____ friend
_____ internet
_____ cooking classes

_____ TV
_____ magazine
_____ other _____ (please list)
_____ I do not use recipes

14. How many fluid ounces are in a one-cup liquid measuring cup?

4 fluid ounces
 6 fluid ounces
 8 fluid ounces

10 fluid ounces
 don't know

15. One stick of margarine or butter is equal to:

1 cup
 1/4 cup
 1/3 cup

1/2 cup
 don't know

16. How many teaspoons are in a tablespoon?

2 teaspoon
 3 teaspoon
 4 teaspoon

6 teaspoon
 don't know

17. Which of the following foods is potentially hazardous?

refrigerated ketchup
 commercial mayonnaise

fresh, raw seed sprouts
 don't know

18. How often when you plan a meal, are all of the items ready to be served at the same time?

never
 sometimes

often
 all of the time

Food Preparation Activity:

19. If a recipe calls for a specific herb or spice and there is none available what would you do?

would not make the recipe
 would leave out and prepare recipe with remaining ingredients
 would substitute with a spice or herb that tastes similar or is found in similar dishes
 I do not use recipes

20. In the past 12 months, how often have you done the following:

a. Made a grocery list

never
 1-2 times
 3-5 times

at least once per month
 at least once per week
 daily

b. Bought packaged pre-cut fresh vegetables, other than salad for convenience

<input type="checkbox"/> never	<input type="checkbox"/> at least once per month
<input type="checkbox"/> 1-2 times	<input type="checkbox"/> at least once per week
<input type="checkbox"/> 3-5 times	

c. Other than packaged precut vegetables, have you bought fresh vegetables such as broccoli stalks or crowns, or whole unpeeled carrots and onions

<input type="checkbox"/> never	<input type="checkbox"/> at least once per month
<input type="checkbox"/> 1-2 times	<input type="checkbox"/> at least once per week
<input type="checkbox"/> 3-5 times	

d. Other than packaged precut fruits, have you bought fresh fruits such as uncut melons, pineapple, or apples

<input type="checkbox"/> never	<input type="checkbox"/> at least once per month
<input type="checkbox"/> 1-2 times	<input type="checkbox"/> at least once per week
<input type="checkbox"/> 3-5 times	

e. Have you bought raw meat (beef, pork lamb), poultry (chicken or turkey) or fish including shellfish like shrimp to prepare?

<input type="checkbox"/> never
<input type="checkbox"/> 1-2 times
<input type="checkbox"/> 3-5 times
<input type="checkbox"/> at least once per month
<input type="checkbox"/> at least once per week