

7-8-2008

Health Decision Behaviors: Appropriateness of Dietary Choice

Daryle Hermelin Wane
University of South Florida

Follow this and additional works at: <https://scholarcommons.usf.edu/etd>

 Part of the [American Studies Commons](#)

Scholar Commons Citation

Wane, Daryle Hermelin, "Health Decision Behaviors: Appropriateness of Dietary Choice" (2008). *Graduate Theses and Dissertations*.
<https://scholarcommons.usf.edu/etd/551>

This Dissertation is brought to you for free and open access by the Graduate School at Scholar Commons. It has been accepted for inclusion in Graduate Theses and Dissertations by an authorized administrator of Scholar Commons. For more information, please contact scholarcommons@usf.edu.

Health Decision Behaviors: Appropriateness of Dietary Choice

by

Daryle Hermelin Wane

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
College of Nursing
University of South Florida

Major Professor: Jason W. Beckstead, Ph.D.
Mary E. Evans, Ph.D.
Gwendolyn P. Quinn, Ph.D.
Mary S. Webb, Ph.D.

Date of Approval:
July 8, 2008

Keywords: Preference, snack foods, nutrition, college students, food
knowledge

© Copyright 2008, Daryle Hermelin Wane

Dedication

To my husband, Robert and my children, Brandon and Derek, who have seen my “work in progress” and have supported me throughout the journey. They now can share in seeing the realization of many years of hard work and perseverance.

To my parents, Audrey and Murray (who is smiling from above) who taught me the importance of learning and teaching and that I should always try to improve my knowledge base.

To the other members of my family and friends, without you helping me along the way, none of this would be possible.

Acknowledgements

I would like to thank the following individuals for their expertise, assistance and guidance through out this process.

Mary E. Evans, Ph.D. for believing in me from the first interview into the program to my last student day.

Gwendolyn P. Quinn, Ph.D. for her amazing expertise in manuscript revisions and teaching me the importance of a matrix content area table.

Mary S. Webb, Ph.D. for lending me support throughout the program and sharing in the journey.

Maya Pakhomova for her assistance with graphic imaging and learning together how to master sigma plots.

And finally, Jason Beckstead, Ph.D., who opened up a whole new world of advanced statistics for me and then graciously and expertly guided me through the pathway to allow me to become part of this world. For this, I will be forever in his debt.

Table of Contents

List of Tables.....	iii
List of Figures.....	v
Abstract	vi
Chapter One: Introduction	1
Identification of the Problem – Background & significance.....	1
Studying College Students.....	6
How Judgment Research can offer Information	6
Statement of the Purpose	7
Specific Study Aims & Hypotheses.....	7
Summary	9
Chapter Two: Review of Literature	11
Nutritional Aspects	12
Dietary Choice Characteristics	12
Dietary Choice Findings.....	16
Food Knowledge	21
Food Knowledge Findings.....	24
Nutrition as a significant Health Indicator.....	25
Weight status & Disease Progression	26
Dieting Behavior History	27
Decision Making Conceptual Frameworks	27
Factors Affecting the Decision Making Process	28
Food Choice Models	31
Social Judgment Theory and the Lens Model.....	34
Food Preference	40
Preference Scaling	41
Summary	44
Chapter Three: Design and Method	45
Participants.....	45
Recruitment: Inclusion & Exclusion Criteria	45
Characteristics of PHCC	45
Materials	47

The Food Choice Questionnaire (FCQ).....	47
The Nutrition Knowledge Questionnaire (NKQ & the Food Knowledge Questionnaire (FNQ)	48
The Need for Cognition Scale (NFC)	50
The Paired Comparison Task	51
The Demographic Questionnaire	53
Institutional Review Board Procedures	56
Procedures	56
Data Analysis Plan	57
Summary	59
Chapter Four: Results.....	60
Preliminary Data Analysis	60
FCQ Findings	63
FNQ Findings	64
NFC Findings.....	65
Determining Snack Food Preferences.....	65
Hypothesis Test/Research Questions	79
Multi Level Modeling Analysis	79
Supplemental Analysis.....	90
Other Demographic Findings	90
Summary	95
Chapter Five: Discussion.....	96
Purpose Statements-Hypotheses.....	96
Other Findings.....	100
Limitations.....	102
Implications for Future Nursing Practice	107
Recommendation	109
Conclusion.....	112
References	113
Appendices	149
Appendix A: Matrix Content Areas Table	150
Appendix B: Nutritional Aspects Articles.....	151
Appendix C: Dietary Choice Characteristics.....	175
Appendix D: Student Participation Letter.....	181
Appendix E: Survey Part Submissions.....	182
Appendix F: Nutrition Survey.....	183
About the Author	End Page

List of Tables

Table 1	Modification of FCQ Convenience	52
Table 2	Appropriateness Index of Snack Foods	53
Table 3	Instrument Comparison of Variables and Reliability Measures	55
Table 4	Multilevel Modeling	58
Table 5	Age Group Frequencies by Ranges	62
Table 6	BMI Range Information	63
Table 7	Food Choice Motives (FCQ) Descriptives	64
Table 8	Food Knowledge Questionnaire (FNQ) Descriptives.....	65
Table 9	Differences Found in the Scaling of Ten Items by 102 Judges	67
Table 10	BMI Tertile Relationship Categories	69
Table 11	Differences Found in the Scaling of Ten Items by 34 Judges – Low BMI.....	69
Table 12	Differences Found in the Scaling of Ten Items by 34 Judges – Medium BMI	70
Table 13	Differences Found in the Scaling of Ten Items by 34 Judges – High BMI.....	71
Table 14	Differences Found in the Scaling of Ten Items by 34 Judges – Low Correct Choice.....	75
Table 15	Differences Found in the Scaling of Ten Items by 31 Judges – Medium Correct Choice	76

Table 16	Differences Found in the Scaling of Ten Items by 37 Judges – High Correct Choice	77
Table 17	Characteristics of Multi-level Modeling Level 1	80
Table 18	Characteristics of Multi-level Modeling Level 2	80
Table 19	Food Motives Cue Weight Slopes and Effects of Nutrition Knowledge	82
Table 20	Variance Components without Level 2 Moderators	87
Table 21	Variance Components with Level 2 Moderators	89

List of Figures

Figure 1	Logic Model	11
Figure 2	Lens Model Adapted from Cooksey (1996)	36
Figure 3	Single Sided Lens Model Adapted from Cooksey (1996)	40
Figure 4	Preference Structure for total sample as a function of BMI	68
Figure 5	Preference Structure for total sample and as a function of Correct Choice.....	73
Figure 6	Single Sided Lens Model Showing Cue Weights	81
Figure 7	Individual Effects of Health on Preference	87
Figure 8	Individual Effects of Mood on Preference	88
Figure 9	Individual Effects of Familiarity on Preference.....	89

Health Decision Behaviors: Appropriateness of Dietary Choice

Daryle Hermelin Wane

ABSTRACT

Dietary choice is a complex mechanism that is influenced by multiple internal and external factors that impact individuals across the life span. The study was designed to examine how individuals make snack food choices based on integration of food motives (cues), appropriateness (nutritional index) as functions of nutritional knowledge, food-related motives, and information processing styles. Community college students participated in a multi part on line survey that ascertained food motives (FCQ), nutrition knowledge (FNQ), information processing (NFC), food pairing task and demographic background data. The single sided Lens model was used to determine the regression weights of the nine food motives. Familiarity, convenience and mood were noted as being important in the judgment process. Price and natural content were viewed as negatively affecting the judgment process. Food preference structures were analyzed as a function of selected variables (age, body mass index and number of correct choices on the food pairing task). With respect to preference, the high BMI group demonstrated the most distinct ranking structure.

Hierarchical linear model (HLM) modeling was used to determine the influence of various food motives. Health, mood and food familiarity were all found to have significant random effects. Health concerns and mood were also noted to have significant fixed effects.

Based on the observations the following results are noted: (1) nutrition knowledge/background was not a significant factor in improving dietary choice scores; (2) different preference structures were exhibited on the paired comparison task as a function of BMI, number of correct choices and age and (3) information processing style was not associated with correct food choices or utilization of more dimensions to choose food options. Finally, a recommendation was provided to improve health outcomes of community college students in improving their ability to make healthier dietary choices.

Chapter One: Introduction

Identification of the Problem- Background & Significance

Established trends in the United States reflect the majority of the population as being overweight with a propensity towards obesity (Surgeon General's Call to Action, 2001; Center for Disease Control Behavioral Risk Factor Surveillance System, 2006). This has led to an increase in weight gain related medical diagnoses such as hypertension, cardiac disease, and diabetes and has even led to the diagnostic delineation of obesity itself as being a medical disease (Dausch, 2001). Clinical evidence of obesity related health issues have merged with public health policy concerns leading to the formulation of political action policies to help prevent and stop this escalating pattern (A nation at risk, 2005; Kersh & Morone, 2002; Koplan, Dietz & William, 1999; Nestle, 2003; Nestle & Jacobson, 2000). Therefore, a need exists for judgment research in the area of dietary choices which will provide necessary information to help reverse the trend towards acceptance of "bigger is better" to one of "healthier is better".

Several clinical indicators noted in Healthy People 2010 revolved around the core concept of obesity and weight control (Healthy People,

2000). Federal programs such as the Obesity Education Initiative (OEI) and the Weight-control Information Network, started by the National Heart, Lung and Blood Institute of the National Institutes of Health (NIH) and the National Institute of Diabetes & Digestive & Kidney Diseases (NIDDK) organizations, are focusing their efforts on health promotion and supportive evidence based practice research (Obesity Education Initiative, n.d.; Weight Control Information Network, n.d.).

Even though there is ample medical evidence to note that being overweight and obese are significant health problems, a parsimonious approach has not been found to resolve this complex dilemma (Prentice, 2004). Changing lifestyle behaviors can be difficult. Vinson (2002) noted there are several challenges to changing behavior with respect to dietary choices, most notably: (1) obesity is a chronic problem that can not be solved in a short amount of time; (2) the element of small changes as being clinically significant in terms of distribution and penetration of a given population; (3) the need for clinicians to be actively involved in research issues and (4) the need for a more comprehensive environmental/social approach that can include increasing physical activity and decreasing caloric intake. Therefore, researchers must look at a multitude of factors that

influence dietary choice and the expression of health decision behaviors in this area.

An additional concern related to escalating weight gain is the cost, both direct and indirect. Direct costs can be calculated relative to healthcare costs (health insurance and illness) but they may not capture the scope of the problem as the individual's economic ability to maintain support for himself and/or his family may be compromised due to loss of productivity as a result of being overweight or obese (Kuchler & Ballenger, 2002).

According to the report published by the Surgeon General in 2001 and the Governor's Task Force on the Obesity Epidemic in Florida in 2004, several critical factors emerged with respect to the documented weight of Americans: (1) almost 2/3 of Americans were considered to be overweight or obese; (2) obesity costs were estimated at \$117 billion each year in health-care and related costs; (3) the typical American diet contributed to morbidity and mortality leading to an increased risk potential for many disease states and (4) that unhealthy eating habits and physical inactivity were the leading causes of disability and loss of independence (Obesity in Florida, 2004; Surgeon's General Call to Action 2000). In collaboration with the American Heart Association, the Robert Wood Johnson Foundation identified bigger portions, inadequate nutritional information, eating

out more, lack of physical activity, school and technology as factors contributing to Americans tipping the scales towards being overweight (A nation at risk, 2005).

The National Health and Nutrition Examination Survey 2003-2004 data (NHANES) revealed 66% of adults are either overweight or obese and the highest regional prevalence of obesity is found in the southern portion of the United States (American Health Rankings 2005 edition). Trended data from the Behavioral Risk Factor Surveillance System (CDC BRFSS, 2006) during the years of 1990, 1995 and 2005 indicated the majority of states showed an increase in the number of people who had a BMI \geq 30 or were 30 pounds overweight (10-14% - 1990, 14-19% - 1995 and 20-24% in 2005). The state of Florida was identified in those categories. Overweight and obesity prevalence crosses cultural and ethnic boundaries with an increased obesity rate seen in African American, Hispanic and Native American groups as compared with their white counterparts (AOA Fact Sheets, 2005; Obesity still a major problem, 2006).

How individuals make dietary choices is a complex subject based on the interplay of numerous factors ranging from nutrition knowledge, cultural integration, environment, economic constraints, attitudes and beliefs. Even though one may have sufficient knowledge regarding nutritional concepts, the resulting dietary choice may not be

based solely on knowledge. Most individuals “eat on the go” and therefore they don’t realize how many calories they consume on a daily basis. Data from 2004, compiled by the National Center for Health Statistics (NCHS), showed that both men and women are consuming more calories as compared to thirty years ago but women are consuming three times as much as their male counterparts leading to an increased risk potential for the entire population (Calorie consumption on the rise in the United States, particularly among women. National Center for Health Statistics Fact Sheet, 2004). A single meal at a restaurant or a single gourmet coffee “drink” may contain a day’s worth of calories based on the required food label that uses 2,000 calories as the reference point for dietary reference intake calculations.

Individuals are often unaware that serving sizes have increased throughout the years leading to a pattern of eating more in terms of caloric value but yet thinking they are eating less because they are packaged into portable “serving size” containers (Prince, 2004; Young & Nestle, 2002). Trends have been reported indicating Americans are eating larger food portions thereby increasing caloric intake. Without an increase in physical activity, such behavior leads towards Americans being overweight and risk obesity just by following available consumption patterns exhibited in society (Nielsen & Popkin, 2003;

Nielsen, Siega-Riz & Popkin, 2002). The physical environment in which food is eaten also plays a pivotal role in increasing weight gain as individuals are more likely to eat more outside of the home (Binkley, Eales & Jekanowski, 2000). Wansink (2006) reported that individuals make "200 food choices per day".

Studying College Students

The emergence of the "Freshman 15", the idea that college students will gain 15 pounds during their first year of college life as a result of environmental stressors affecting their dietary choice, continues to play a pivotal role in the establishment of life long dietary practices (Morrow, Heesch, Dinger, Hull, Kneehans & Fields, 2006; Levitsky, 2005, & Hoffman, Policastro, Quick & Lee, 2006 & Levitsky & Youn, 2004). Even though current research shows a more modest weight gain during this time period, the college years still represent a significant point during which lifestyle behaviors become more firmly established. Therefore, the college student population is especially well suited to explore health decision behaviors of appropriate dietary choice.

How Judgment Research can Offer Information

Judgment research can help to explore behavioral cues (motives) that affect decision-making processes. Researchers may be able to gain insight into the individuals' perception of value in relation

to a judgment task and may identify significant motives to incorporate them in health promotion strategies leading towards better health outcomes in the area of dietary choice.

Statement of the Purpose

The purpose of the proposed study is to examine how individuals make snack food choices based on physiological characteristics of foods. Specifically, snack food choices are seen as involving how foods fulfill motives such as convenience, cost, familiarity, etc.

Specific Study Aims & Hypotheses

Specific Aim 1: To identify cue utilization (i.e. weighting) strategies for each participant as they choose among snack food options.

This aim will be addressed by measuring regression weights obtained from a paired comparison task noting the relationship between food motives and actual snack food choice. Snack food motives will be operationally defined using sub scale scores obtained from the modified version of the Food Choice Questionnaire (FCQ_m) that focus on the areas of health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity and ethical concern (Scheibehenne, Miesler & Todd, 2007).

Hypothesis 1: Individuals with more nutrition knowledge will put more weight on health, natural content, weight control and ethical concern motives than individuals with less nutrition knowledge.

Specific Aim 2: To assess appropriateness of snack food choices made by each participant.

Based on the objectively determined nutritional value of each of the 10 snack food options, appropriateness will be operationally defined as the “better” or more appropriate food option in each pair presented. The 45 responses from the paired comparison task will be coded to indicate whether the participant chose the more appropriate option on each pairing. The number of “correct” choices will be tallied to provide a score for each participant. Appropriateness will be based on the actual nutritional value of each food option by deriving an index formed from calories from fat, sodium content, cholesterol content and carbohydrate content.

Hypothesis 2: Individuals with more nutrition knowledge will make more appropriate choices (greater number of “correct” choices out of 45 possible) on the food paired comparison task.

Specific Aim 3: To relate cue utilization strategies and appropriateness score to individual differences in nutritional knowledge, food-related motives, and information processing styles.

Hypothesis 3A: Individuals with more nutrition knowledge background will have higher scores on the Food Knowledge

Questionnaire (FNQ) than individuals with less nutrition knowledge background.

Hypothesis 3B: High need for cognition individuals will use more dimensions to choose their food options than will low need for cognition individuals.

Nutrition knowledge background will be operationally defined by using the Food Knowledge Questionnaire (FNQ - that focuses on knowledge of portion size, fat, salt, sugar, protein and fiber content and a composite score generated from the answers to the nutrition knowledge background question in the demographic section of the nutrition survey instrument. The Need for Cognition Scale (NFC) (Cacioppo & Petty, 1982) will be used to assess the interaction of intuitive and analytic thought that individuals use to form decisions. Individuals with a higher score on the NFC scale are more likely to process information in more detail than lower scoring individuals. Refer to Appendix A for Matrix Content Areas Table.

Summary

Obesity is a problem in the United States. Food choices contribute to this problem. Understanding how people make these choices can provide insight for developing behavioral change interventions. This study will examine how food characteristics

influence snack food choices made by college students and how nutritional knowledge affects these choices.

Chapter Two: Review of Literature

The review of literature for this complex topic is categorized into two distinct focus areas: (1) nutritional aspects and (2) decision making conceptual frameworks. Each focus area will be reviewed separately and then viewed as an integrative body of work for its relative contributions in the area of health decision behaviors and the appropriateness of dietary choice.

Pub Med was used as the initial source with multiple search listings ranging from dietary/food/appropriate choice, nutrition knowledge/education, and health/food decision behaviors. From that initial point of reference, related links were explored along with archives of the various articles. Figure 1 denotes the logic model that served as the guiding framework for this research.

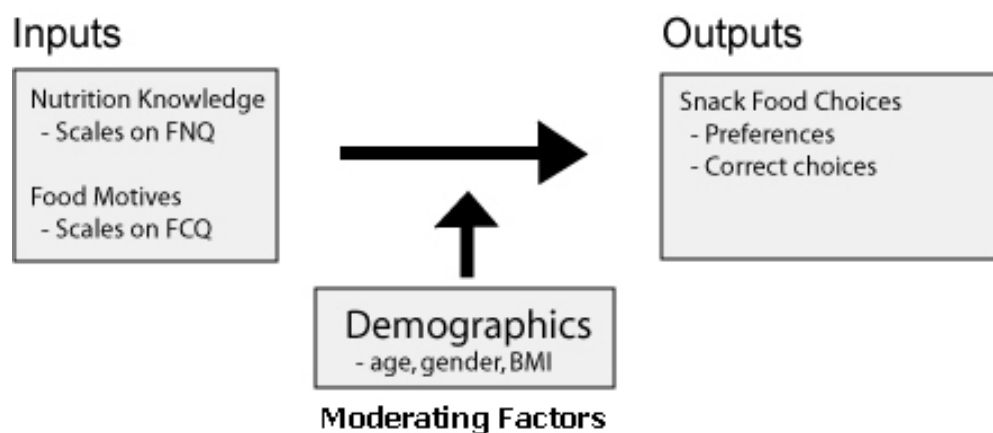


Figure 1. Logic Model

Nutritional Aspects

Nutritional aspects identified consist of research/information in the dietary choice characteristics and food knowledge. Appendix B contains information that denotes the articles reviewed. The majority of articles reviewed were under the category of dietary choice characteristics (n=77, 78%) with the remainder in the category of food knowledge (n=22, 22%). Based on this content representation there has been more research conducted on dietary choice characteristics than requisite food knowledge.

Dietary Choice Characteristics

There is evident confusion as to what label to give to the actual elements that compose the action of dietary choice. The Food Choice Questionnaire (FCQ) is used to assess motives that affect dietary choice. These motives consist of factors and/or attributes that individually and/or collectively impact dietary choice. These terms are noted in the nutrition research literature and are used interchangeably to represent dietary choice thereby adding to terminology confusion.

With respect to the identified dietary choice characteristics to be used in this study (convenience, timing, affordability, atmosphere/ambiance, personal preference, tastiness and cultural influence) the majority of articles examined all of these factors noting

a complex interactive effect among the characteristics that could not be easily separated into component effects (Refer to Appendix C). Twenty four (24%) of the articles reviewed examined all of the dietary choice characteristics as having relative influence; 3% (n=2) looked at six of the characteristics; 4% (n=3) looked at five of the characteristics; 11% (n=8) looked at four of the characteristics; 25% (n=19) looked at three of the characteristics; 25% (n=19) looked at two of the characteristics and 11% (n=8) looked at only one of the characteristics as being the most significant indicating that the process of dietary choice involves multiple motives/factors and/or attributes that affect the judgment (decision making) process.

For purposes of clarity, the dietary choice characteristics are operationally defined to enhance the discussion and listed in the rank order of predominance found in the articles reviewed in this section. Due to the complexity of dietary choice, no one variable can account for an individual's dietary choice. At best, the individual dietary characteristics form a composite base from which relative importance can be extracted and analyzed; each contributing to the overall dietary choice but affected by contextual variables that the individuals experience throughout their lifetime.

Personal preference received the most research in terms of dietary choice (84%, n=65). Culture (74%, n=57) was the next most

frequently identified and is defined as those influences based on one's family, ethnic and/or societal group that affects one's feelings regarding any food item or dietary practice. Culture includes both internal and external influences that could affect dietary choice.

Atmosphere/ambiance (51%, n=39) and tastiness (49%, n=38) were the next most frequent characteristics to be researched.

Tastiness is defined as the sensory aspect of any food item involving taste, sight and smell, and atmosphere/ambiance is defined as the physical/social environment that is present when making food selections. Convenience (42%, n=32) is defined as the ease of obtaining any food item followed by affordability (35%, n=27) defined as the cost of any food item. Lastly, timing (35%, n=27) was noted as an important characteristic and is defined as those influences related to time management as well as the time of day associated with typical dining patterns such as breakfast, lunch, dinner and/or snacks.

It is interesting to note that while timing and affordability were less often studied these characteristics do exert substantial influence overall dietary choice (A nation at risk, 2005; AOA Fact Sheet, 2005; Binkley, Eales, & Jekanowski, 2000; Healthy People 2010, 2006; Kuchler & Ballenger, 2000 and Morin, Stark & Searing, 2004).

Of the seventy-seven articles reviewed in this area, 36% (n=28) noted a relationship between nutrition and overall health status (Refer

to Appendix C). Research has provided the linkage between nutrition and health but due to the complexity of dietary choice, efforts to mediate change in this area have not been effective and/or have had limited positive outcomes (ADA Position, 2002); A nation at risk, 2005 and Binkley, Eales & Jekanowski, 2000).

Eleven of the articles evaluated the dietary choice patterns of college students examining food preferences, frequency patterns, gender differences, attitudes, body image and stress applied to the environmental context of being a college student (Cantin & Dube, 1998; Cason & Wenrich, 2002; Davy, Bense & Driskell, 2006; Drewnoski & Hann, 1999; Georgiou, Betts, Hoerr, Keim, Peters et al. 1997; Levi, Chan & Pence, 2006; Levitsky & Youn, 2004; Lewis, Sims & Shannon, 1989; Malinauskas, Raedele, Aeby, Smith & Dallas, 2006; Sentyrz & Bushman, 1998 and Zellner, Lozano, Gonzalez, Pita, Morales, Pecora & Wolf, 1987).

With respect to assessing and evaluating the identified dietary choice characteristics, both quantitative (food frequency instruments) and integrated quantitative/qualitative (focus group/interviews) methods have been used to account for the complexity of influencing variables. Researchers in the field noted that no one method or analysis could explain the complexity of dietary choice given the context of individual growth and expression throughout the life span

(ADA Position, 2002; Adamson & Mathers, 2004; Buttriss, Stanner, McKeivty, Nugent, Kelly, Phillips et al., 2004; CDC Behavioral Risk Factor Surveillance System (BRFSS), 2006 and Healthy People 2010, 2000).

Dietary Choice Findings

In reviewing the reported findings for the dietary choice characteristic studies, the following key points are noted with respect to the adult population: (1) The area of dietary choice is recognized as a complex decision making process that requires collaborative interventions that take into account the family, social, cultural, economics and environment of the group and/or individuals in order to affect dietary change (Adamson & Mathers, 2004); (2) Eating healthy is viewed by many people as being a complicated procedure thereby leading to barriers in food decision making choices (Dinkins, 2000); (3) Although adults in the United States may be aware of food guidelines (and/or the food pyramid), they may not be able to incorporate such measures into their daily eating patterns (Dixon, Cronin & Krebs-Smith, 2001); (4) Healthier food intake in adults is associated with a higher level of nutrition knowledge (Wardle, Parmenter & Waller, 2000); and (5) International studies in Europe note differences in nutrition knowledge and economics affect dietary

consumption patterns thereby influencing dietary choice (Drewnoski & Darmon, 2005; Thiele, Mensink & Beitz, 2004).

In reviewing the reported findings for the dietary choice studies, the following key points are noted with respect to food portions, consumption and selection: (1) Findings related to increased food portion size and increased food consumption are consistent across all research studies suggesting that this is a universal problem for the entire population (Diliberti, Bordi, Conklin, Roe & Rolls, 2004); (2) Patterns of food consumption are influenced by food preference and by the frequency of food consumption thus supporting that affective sensory input has a significant influence on dietary choice (Drewnoski & Ham, 1999; Letarte, Dube & Troche, 1997; Stunkard & Kaplan, 1977); (3) Studies that examine a specific food selection as the expression of dietary choice may not be representative of true dietary choice situations due to the restriction imposed by the food choice selection (Dube & Cantin, 2000); (4) Females are more likely to show an interest in healthier food consumption, weight control and health beliefs as compared to their male counterparts (Westenhoefer, 2005); (5) Gender differences exist in the choice of foods eaten during a stressful experience with females being more affected than males in terms of sweet snack consumption (Grogan, Bell & Conner, 1997); (6) Stress influences food consumption for those individuals who perceive

themselves as being stressed or associate their food intake as an emotional response (Oliver, Wardle & Gibson, 2000); (7) Individuals who perceive stress as a stimulus for eating are likely to have dieting behaviors as part of their food history (Zellner, Loaiza, Gonzalez, Pita, Morales, Pecora & Wolf, 1987) and (8) Economics plays a role in the type of food product selection and consumption (Guenther, Jensen, Batres-Marques & Chen, 2005; Horgen & Brownell, 2002).

The following key points are noted with respect to college students: (1) Multiple influences affect dietary choice such as affective input, time constraints, peers, class ranking and environmental aspects of availability (Aikman & Crites, Jr., 2005; Cantin & Dube, 1998; Cason & Wenrich, 2002); (2) Significant gender differences exist with female college students reported as having greater nutrition knowledge and belief in the relationship between diet and health, increased awareness of diet and health relationships and that they are more likely to acknowledge a dieting history pattern than their male counterparts (Davy, Benes & Driskell, 2006; Levi, Chan & Pence (2006; Levitsky & Youn, 2004; Lewis, Sims & Shannon, 1989; Malinauskas, Raedeke, Aeby, Smith & Dallas, 2006); (3) Young adults who attend college make healthier dietary choices and are less likely to be overweight than young adults who do not attend college (Georgiou, Betts, Hoerr, Keim, Peters et al., 1997) and (4) Recognition

of gender based differences in dieting behaviors suggests that nutrition education would be more beneficial for females as they are prone to diet during this time period (Malinauskas, Raedeke, Aeby, Smith & Dallas, 2006).

The dietary choice characteristic research presented revealed consistent findings in the majority of the studies that were reviewed with respect to complexity, comparative group analysis (layperson vs. health professional), food parameter variables (portion, consumption and environment) and life cycle variables (college student and adult population). Studies based on the "Stage of Change Theory" were consistent in their findings suggesting that readiness to change and motivation as a stimulus for the behavior were important but perhaps of more critical value in realizing the change was the stage of change at which the individual found him or herself in at the time of the experience (Furst, Connors, Bisogni, Sobal & Winter Falk, 1996; Gedrich, 2003; Kristal, Hedderson, Patterson & Neuhauser, 2001; Murcott, 1995; Shepherd, 2005; Shepherd & Shepherd, 2002; Woolcott, 2000).

There were some discrepancies noted with respect to how affective measurements such as taste and preference were defined which may have affected interpretation of results in understanding dietary choices (Yeomans & Symes, 1999). Although there were

substantial information reported with respect to adults and gender issues, there was limited research in areas such as ethnicity and alternate types of dietary lifestyles such as vegetarianism (Henry, Reimer, Smith & Reicks, 2006; Kraak & Pelletier, 1998; Phillips, 1999; Schlundt, Hargreaves & Buchowski, 2003). Lack of consensus in the area of stress associated eating behaviors may contribute to an increase in eating, even without factoring in the reported gender differences.

Experimental studies noting the effect of manipulation of the food environment (atmosphere, ambiance, presentation) show consistently that dietary intake can be increased without individuals being aware of increased caloric intake. This indicates that consumption patterns are not solely mediated by hunger and preference but are also affected by availability and convenience (Painter, Wansink & Hieggelke, 2002; Wansink, 2004; Wansink, 1996; Wansink & Chandon, 2006; Wansink & Kim, 2005; Wansink, Painter & North, 2004; Wansink, van Ittersum & Painter, 2006; Wansink, Westgren & Cheney, 2005; Weber, King & Meiselman, 2004). Therefore, variation of the external environment can lead to alterations in food consumption patterns. If one is more aware of how food is presented (food atmosphere) he or she may become more aware of its role in food selection and be more cognizant of external environmental

cues. Studies noting the complexity of determinant of choice and motivation to change reveal that multiple factors influence one's individual expression of dietary choice. This suggests that a simplistic approach is not feasible in order to understand and/or change dietary patterns of behavior (Shepherd, 2005 and Shepherd & Shepherd, 2002).

Food Knowledge

Food knowledge refers to information that a person possesses regarding diet-planning principles (adequacy, balance, kcalorie control, nutrient density, moderation and variety) that forms the framework for the selection of foods and is an integral component of nutrition education (Whitney & Rolfes, 2005). While everyone consumes food as part of his or her dietary choice, not everyone has received education in the area of nutritional science. Research indicates that education in this area can be effective in short term changes, however education alone will not effectively change dietary choice patterns (ADA Position, 2002; Anderson, 1994; Brunstrom, 2004; Crites, Jr. & Aikman, 2005; Papakonstantinou, Hargrove, Huang, Crawley & Canolty, 2002 and Wansink, Westgren & Cheney, 2005).

The inclusion of nutritional science in the curriculum of healthcare professionals (nursing and medical school) is an important factor in helping to prepare practitioners to meet the healthcare needs

of their clients (Barratt, 2001; Camire & Dougherty, 2005; Cordery, 2006; Makowske & Feinman, 2005; Novick, 2000 and Wardle, Parmenter & Waller, 2000). Even though health professionals are thought to have more nutrition knowledge than people who are not clinically trained, Cordery (2006) noted that dietitians have the most nutrition knowledge followed by psychiatrists. This may be explained by the fact that psychiatrists are often involved in the treatment of clients with disordered eating behaviors. Clinical psychologists and nurses tend to have no better nutrition knowledge than the general public.

Of the twenty two articles reviewed in this area (Refer to Appendix B), 41% (n=9) addressed nutrition education among college students from various perspectives: teaching, gender-based, food labels, weight gain prevention and knowledge (Cotugna & Vickery, 1994; Cousineau, Goldstein & Franko, 2004; Marietta, Welshimer & Anderson, 1999; Crites, Jr. & Aikman, 2005; Matvienko, Lewis & Schafer, 2001; Mitchell, 1990; Poppell Anderson, Stanberry, Blackwell & Davidson, 2001; Smith, Taylor & Stephen, 2000 and Unklesbay, Sneed & Toma, 1998). The use of varied presentation methods ranging from typical classroom instruction to the use of Internet interactive activities suggests that in order for education strategies to be effective they must address the student's needs and values

(Cousineau, Goldstein & Franko, 2004). Matvienko, Lewis & Schafer (2001) noted that a college nutrition course placed in the freshman year might act as a deterrent to weight gain for some college students. The timing of a nutrition intervention program may be equally as important as the conveyed message for promoting life style behavior changes.

The use of nutrition labels, as mandated by the 1990 Nutrition Labeling and Education Act, had a positive effect on college students diets in that they acknowledged use of the label in making food choices (fats and calories) although they did not understand all of the nutrition information presented (Marietta, Welshimer & Anderson, 1999). Females were noted as using food labels in helping to make dietary choices more than their male counterparts (Smith, Taylor & Stephen, 2000).

The effectiveness of including a nutrition course in the college curriculum has been mixed (Mitchell, 1990; Poppell Anderson, Stanberry, Blackwell & Davidson, 2001 and Unklesbay, Sneed & Toma, 1998). Shive & Morris (2006) noted that the effectiveness of a social marketing campaign to improve fruit consumption for community college students was successful but that economic constraints affected some of the participants' food consumption. This suggests that factors other than knowledge affect dietary choice. Wansink, Westgren &

Cheney (2005) noted that even though scoring higher on a nutrition test might indicate increased knowledge it did not mean that a food behavior would be changed. Rather, results showed that knowledge had to be linked to attitudes and consequence in order to be effective.

Food Knowledge Findings

The interplay between dietary characteristics and food knowledge illustrates the complexity of influences that ultimately affect dietary choice. Although personal preference is reported to be the most studied characteristic, the impact of culture as a significant variable cannot be overlooked. Atmosphere/ambiance and tastiness are linked together, which is understandable given the context of sensory and physiological stimuli for the eyes see what the mouth tastes as evidenced by increased salivation. Convenience, timing and affordability are linked together in terms of available time, money and opportunity. All of these aspects can influence one's dietary choices and the pattern of choice may not be consistent but rather may be influenced by the continual interplay within the individual as he or she proceeds through their lifespan.

Food knowledge can be increased by education and interventions but often they are self - limiting in their effect unless the individual associates a perceived value with the instruction. Food knowledge should be assessed and demonstrated for all individuals who work in

the health professions so as to maximize their effectiveness when counseling clients.

The research studies in food knowledge revealed consistent findings in terms of the need for nutrition to be incorporated into the educational curriculum for both laypersons and/or professional health care workers. However, the studies differed in how they approached the problem. Experimental research examining addictive behaviors (such as smoking) recognize that even with conclusive evidence that the activity can lead to serious health complications, the behavior is not easy to obliterate (Surgeon's General's 2004 Report).

Nutrition as a Significant Health Indicator

The increasing trend towards being overweight and obese in the United States has placed the topic of nutrition in the spotlight among government agencies and health foundations (A nation at risk, 2005; A New American Plate, 2004; AOA Fact Sheets, 2005; Binkley, Eales & Jekanowski, 2000; Butchko & Petersen, 2004; Calorie consumption is on the rise in the United States, particularly among women, 2006; BRFSS, 2006; Dausch, 2001; Healthy People 2010, 2000; Jakicic & Otto, 2005; Kuchler & Ballenger, 2002; Mills, 1999; Morin, Stark & Searing, 2004; NHANES, 1998; NIH, 1998; Nestle & Jacobson, 2000; Obesity Education Initiative, n.d.; Obesity in Florida, 2004; Prentice, 2004; Rolls, 2003; Surgeon's General Call to Action to prevent and

decrease overweight and obesity, 2001; Wansink & Huckabee, 2005 and Young & Nestle, 2002).

Weight Status & Disease Progression

Correlations exist between increased weight gain and chronic diseases such as hypertension, diabetes and osteoarthritis (A nation at risk, 2005; BRFSS, 2006; Butchko & Petersen, 2004; Healthy People 2010, 2000; Jakicic & Otto, 2005; Koplan & Dietz, 1999; NHANES, 1998; NIH, 1998; Obesity in Florida, 2004 and Surgeon's General Call to Action to prevent and decrease overweight and obesity, 2001).

Obesity is recognized as a public health issue in that loss of productivity and increasing health costs affect a significant proportion of Americans (Butchko & Petersen, 2004; Dausch, 2001; Kersh & Morone, 2002; Kuchler & Ballenger, 2002; Morin, Stark & searing, 2004; Nestle, 2003; Obesity in Florida, 2004 and Surgeon General's Call to Action to prevent and decrease overweight and obesity, 2001). Prentice (2004) invokes the use of Occam's razor suggesting that reducing obesity is the most parsimonious approach to prevent medical problems associated with weight gain patterns.

Healthcare professionals recognize the need for improved nutritional assessment measures and intervention programs (Calfas, Marion, Zabinski & Rupp, 2000; McGaghie, Van Horn, Fitzgibbon, Telser, Thompson, Kushner & Prystowsky, 2001; Jakicic & Otto, 2005;

Nestle & Jacobson, 2000; Prentice, 2004 and Taren, Thomson, Koff, Gordon, Marian, Bassford, Fulginiti & Ritenbaugh, 2001). Increases in portion size over the years have led to an expansion of the dining plate as well as the waist line (A New American Plate, 2004; Rolls, 2003 and Young & Nestle, 2002).

Dieting Behavior History

Empirical research has found that a significant proportion of the United States adult population has at one time been on a diet with the latest reported figure of 33% in 2004 yet, most information associated with dieting behavior focuses on the area of individuals who are diagnosed as having eating disorders (Trends & Statistics, 2006).

According to prevalence data reported by BRFSS for the state of Florida in 2002, 45% of the population stated they were trying to lose weight whereas 58.3% of the population were focused on maintaining their weight and/or not gaining weight thus illustrating that the majority of the population at that time was substantially involved in dieting behavior (BRFSS Prevalence Data, 2002).

Decision Making Conceptual Frameworks

This section reviews work in decision-making related to health behaviors. The context of both individual and group decision-making has significant impact within the scope of society, culture and environment (Drewnoski, 2000; Rozin, 2000 and Van den Heuvel,

van Trijp, Gremmen, Jan Renes & van Woerkum, 2006). Cooksey (1996) noted fourteen theoretical frameworks to approach decision-making behaviors of which economic and mathematical origins were included in addition to the traditional psychological theories for decision-making. Terminology again plays a role in how one approaches the area of health decision behaviors, as there is ambiguity between one's understanding of making a judgment or making a decision. Judgment involves the analysis of reflective thought that is based on the integration of internal and external stimuli and/or experience that leads to a decision. Judgment is therefore a multi step pathway that incorporates reasoning, intellect and the ability to discern/assess a situation to come to a logical conclusion or decision. Decision is the active processing of a judgment.

Factors Affecting the Decision Making Process

Upon initial review, the issue of dietary choice is considered to be a simplistic exercise. One eats because he is hungry, or one eats breakfast because it is morning, etc. All of these statements have an inherent simplicity, but are they really that simple? Research suggests dietary choice is a complex decision making process that is not completely understood due multiple stimuli impacting a single action (ADA Position, 2002; Adamson & Mathers, 2004; Buttriss, Stanner, McKeivity, Nugent, Kelly, Phillips et al., 2004; CDC Behavioral Risk

Factor Surveillance System (BRFSS), 2006 and Healthy People 2010, 2000). Taking into account the dietary choice characteristics reviewed earlier (convenience, timing, affordability, atmosphere/ambiance, personal preference, tastiness and cultural) these do not exist in isolation but rather have an interactive effect that results in changes in one's decision making pattern based on the relative importance of how each of these characteristics are perceived by the individual. How one learns about diet related behaviors might in itself be the result of a complex series of integration stimuli occurring during the maturational process that cannot be easily identified (Brunstrom, 2005).

There are other factors that can affect the dynamics of dietary choice other than the ones listed above. In addition to the personal and interpersonal factors affecting dietary choice, there are external societal factors such as economic costs of the food industry and scientific methods associated with food development/ food science that must be addressed as having potential impact on dietary choice behaviors (Buttriss, Stanner, McKeivith, Nugent, Kelly, Phillips & Theobald, 2004 and Carr, 1986). The importance of social factors, such as the family as a moderating variable in dietary choice should not be overlooked (Kaplan, Kiernan & James, 2006; Stratton & Bromley, 1999 and Devine, Connors, Sobal & Bisogni, 2003).

Research in dietary choice has focused mainly on the incorporation of individualized methods to measure changes, identification of risk factors, and effectiveness of interventions in quasi-controlled settings. However this has not led to generalization of results leading to a change in clinical practice (Glanz, 1999 and Glasgow, Klesges, Dzewaltowski, Bull & Estabrooks, 2004). Although the relationship between nutrition and health has been established, the purported change in dietary behaviors has not led to significant effects, for many people still state that personal preference is a major motivator for their dietary choice selection (Mendelson, 2000).

Research has shown that those who consider themselves to be “healthy” have different perceptions of their food choices than those who do not consider themselves to be healthy eaters. Definitions of healthy eating include a multi –dimensional cluster approach that adults use to conceptualize the process (Povey, Conner, Sparks, James & Shepherd, 1998 and Winter Falk, Sobal, Bisogni, Connors, & Devine, 2001).

Research related to food choice has also noted gender differences. Females are more likely to participate in diet and nutritional practices (Chung, Hoerr, Levine & Coleman, 2006 and Rozin, Bauer, & Catanese, 2003). A nutrition behavioral change study by Woolcott (2000) found that 60% of the women in the study

(n=500) had complex decision-making processes that translated into major dietary changes.

Findings from animal studies indicate that whereas a consistent diet may be considered to be mundane in the real world environment for humans; certain animals such as leks find that alternate or diverse choices may not be the answer to increase the likelihood of changing food choice patterns (Hutchinson, 2005). If indeed, variety is perceived as the spice of life, then humans may inherently seek different foods as part of their psychological conditioning. This may then predispose them to eat a greater number of foods that offsets efforts to reduce overall intake.

Food Choice Models

Examination of the literature reveals that several food choice models have been proposed to account for how people make dietary choices. The complexity of the task itself is a factor in trying to take into account all the relative inputs that affect dietary choice (Hamilton, McIlveen & Strugnell, 2000). Of all of the food choice models reviewed, one model is consistently addressed as a basis for explaining the process of food choice. The food choice model purported by Furst (1996) identifies three components: life course, influences and personal systems that collectively lead to the development of strategies thus shaping the direction of the individuals' food choice.

Inherent in this model is the contextual richness of the life cycle experience, the incorporation of the relative inputs that serve to moderate the choice (ideals, personal factors, resources, social framework and food context) and the perceived weighted values that facilitate the choice (sensory perceptions, monetary consideration, convenience, health and nutrition, managing relationship and quality), each of them having impact on the expression of dietary choice (Furst, 1996).

In a review of food choice models, Stafleu, deGraaf & van Staveren (1991) noted many psychosocial models utilized weighted value comparisons to explain food decision behaviors, thus providing a statistical framework to discuss and interpret results. Multi attribute utility theory was used by Glanz, Basil, Maibach, Goldberg & Snyder (1998) to explain decision making in food choice behaviors based on a valued perception by individuals that a belief in a food being healthy and having nutritional value would lead to increased consumption of the food product. Their study reported that although taste was a predominant consideration in food consumption it was not significant in the final analysis. This indicates other factors, such as health and nutrition concerns, were perhaps more important in how individuals make food choice behaviors (Glanz, Basil, Maibach, Goldberg & Snyder, 1998).

The eating behavior food model proposed by Eertmans, Baeyens & Van den Bergh (2001) illustrates a three step approach that incorporates food contextual stimuli (internal and external), liking mediated by anticipated consequences and eating behavior manifested by influencing factors (choice, selection and preference) that result in food intake. Mela (2001) suggested a food choice model based on how the individual evaluated the relative value of one's current internal state (psychophysiological cues), liking (hedonic anticipation) and perceived appropriateness (situational cues) as affecting the desire to select a food (p. 250S). Pollard, Kirk & Cade (2002) proposed a food choice framework that distinguished between factors affecting what an individual can consume (availability, economics and timing) and those influencing what an individual does consume (timing, sensory appeal, familiarity, social interactions, personal ideology, media/advertising and health) noting that timing affected both the possibility and the reality of the food choice.

The stage of change theory has also been used in several studies to explain an individuals' dietary changes based on perception, identification and readiness for change. However, this theory does not address the relative weighted impact of those motives, factors, or attributes specifically on a daily basis with each food choice (Nothwehr, Snetselaar, Yang & Wu, 2006; Povey, Conner, Sparks,

James & Shepherd, 1999). Proponents of the transtheoretical model and the theory of planned behavior are often cited as representing “classic studies” in the area of dietary choices but there are still limitations that exist in any proposed theoretical model. To date, no single food choice model can accurately predict all choices made by all individuals.

A newer perspective focuses on the concept of time scarcity as being a prime influence affecting the life cycle in terms of finances and social behavioral aspects (Jabs & Devine, 2006). Time itself becomes part of the problem in that individuals in society are not only multi-tasking but also have less time and adequate resources to accomplish many of the same activities (inadequate food preparation time and limited finances). Whereas time may also become part of the solution, efforts are made to recognize that many people need to re-organize their commitments and responsibilities in order to meet their goals.

Social Judgment Theory and the Lens Model

The current study will employ Social Judgment Theory. The evolution of social judgment theory is based on the initial work of Egon Brunswik who considered the contextual relationship between the individual and the environment as being pivotal to define probabilistic functionalism (Cooksey, 1996). The key issue was that discussion of an individual’s judgment (or decision) could not be separated from the

environmental context in which he/she existed and that the relationship was at best somewhat unpredictable given the likelihood of intervening environmental variables. Brunswik noted principles to help clarify his idea of probabilistic functionalism that included delineation of distal criteria and proximal cues that were processed by the individual leading to an achievement response (Cooksey, 1996). Distal criteria refer to issues that the individual must cope with, given the context of the environment relationship. Proximal cues are the internalization of issues that an individual perceives as having relative value. Achievement reflects the individual's ability to utilize proximal cues that could be correlated with the distal criteria based on the individual's perceived value as evidence of validity (Cooksey, 1996). All of these factors presented by Brunswik led to the development of the Lens model that is a graphic representation of the general concepts of probabilistic functionalism (Cooksey, 1996). Refer to Figure 2.

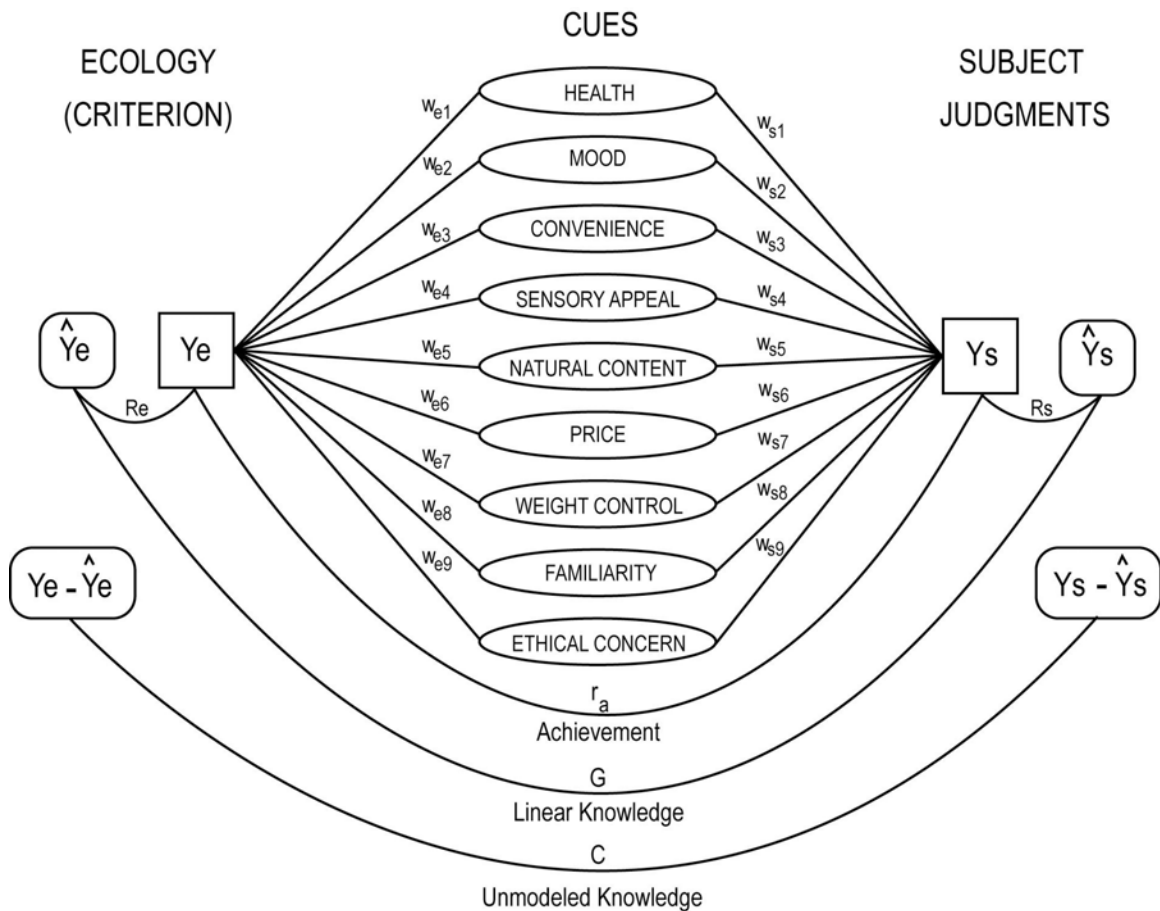


Figure 2. Lens Model adapted from Cooksey (1996)

Hammond (Hammond, Hursch & Todd, 1964) added to the Lens model by introducing the concept of functional form relationships that could be addressed by employing multiple regression techniques to examine cue weights, line formation relationships and principles of organization based on the individual utilizing the most important pieces of perceived information to make a judgment (Cooksey, 1996). The Lens model as proposed by Hammond depicts the central role of the proximal cues (X_1, X_2, \dots, X_n) that reflect the variables that provide information to the individual (or judge). The right hand side depicts

the judgment task itself. The judgment (Y_s) is the actual expression of the decision making process whereas the Y_s designated with a $\hat{\ }^$ above it indicates a predicted judgment based on a regression model. For each of the judgments and predicted judgment tasks, R_s can be calculated based on cue utilization coefficients (r_s or β_s) that provide an index of the cognitive control of the individual (Goldstein, 2004; Cooksey, 1996). One can also look at the residuals of the judgment task ($Y_s - \hat{Y}_s$) to account for error sources possibly related to alterations in the type and quality of the presenting cues and/or environmental alterations that might affect how the information is analyzed or perceived (Cooksey, 1996). On the left side of the figure is the ecology criterion (Y_e) that serves as a criterion for the judgment task and can have both a predicted value as well as an actual value (Goldstein, 2004; Cooksey, 1996). Again, using multiple regression techniques ecological validities ($r_{e1}, r_{e2}, \dots r_{en}$) and criterion residuals can be calculated to account for sources of error that might affect the judgment process (Goldstein, 2004).

A measure of achievement (r_a), how well the individual's judgments correlate with the criteria can be calculated that describes the correlation between the ecology criterion (Y_e) and the person's judgment (Y_s). The model further provides a correlation coefficient that is concerned with the linear knowledge relationship between the

environment and predicted judgment (G) as well as a correlation value (C) that is concerned with the relationship between the residual coefficients of the environment and judgments (Smith, Gilhooly & Walker, 2003).

Collectively these correlation coefficients make up the Lens model equation (LME) originally developed by Hammond, Hursch & Todd (1964) and subsequently refined by Tucker (1964) used to illustrate the component parts of the model for statistical analysis:

$$r_a = GR_eR_s + C [(1 - R_e^2) (1 - R_s^2)]^{1/2}$$

The equation indicates that achievement is composed of two multiplication procedures: the first component (GR_eR_s) denotes the linear aspect modeling of the ecology and judgment processes and the second component ($C [(1 - R_e^2) (1 - R_s^2)]$) denotes the configural or unmodeled aspect that addresses the residual elements of the ecology and judgment processes (Cooksey, 1996). Since the equation is based on the additive process of the linear and configural (unmodeled) components, in order to exact a specific value of achievement based on the expressed linear model, one would have to realize a zero value of C thereby leading to a parsimonious expression of: Performance = knowledge x task predictability x cognitive control (Cooksey, 1996).

The terminology of judgment and decision-making also presents conflicts due to the circular intuitive description that includes both

terms in the definition process. Baron (2004) states that the “term ‘judgments’ include decisions which are judgments about what to do” (pg. 19). At best, the literature itself has grasped the complexity of this type of discussion even when trying to describe itself with simplicity. Judgment typology helps to clarify some of this confusion by providing explanations of the dimensional components of task familiarity and task congruence that are interpreted by the interface of familiarity and unfamiliarity and concrete and abstract thinking (Cooksey, 1996). When discussing dietary choice (judgment) individuals are faced with a concrete and familiar task, for they are used to making these decisions on a repeated basis and they are aware of the information that is provided in the ecology environment.

Variations of the lens model exist when there is no objective criteria available leading to a single sided lens model system. Because there is no ecology criterion available for food preference, the single sided lens model will be used in the current study (See Figure 3).

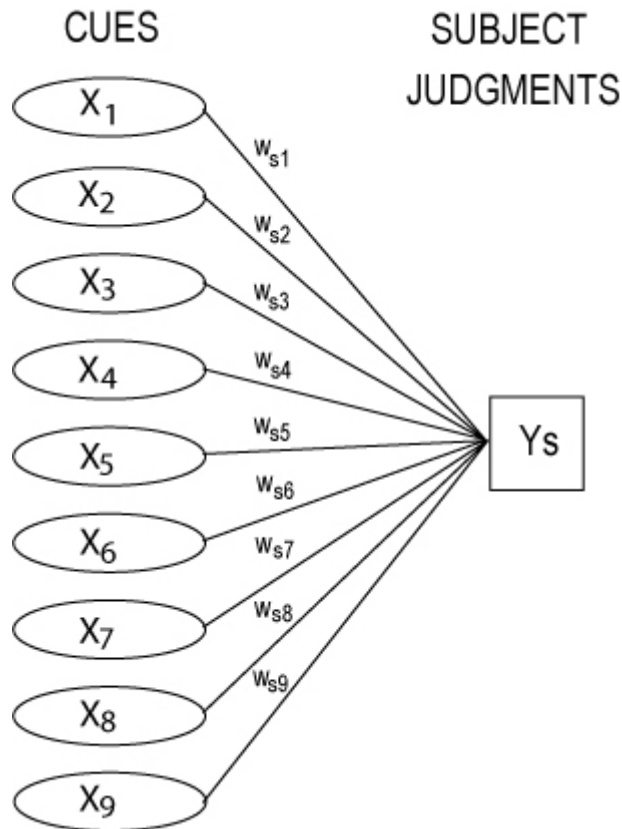


Figure 3. Single Sided Lens model adapted from Cooksey (1996)

Food Preference

Research literature has provided evidence that there are multiple factors that affect an individual's food preference such as genetic predetermination as well as physiological mechanisms of taste/perception (Tepper & Ulrich, 2002). Environmental exposure can also contribute to food preference development as part of learned behaviors (Birch, 1999) that can be further categorized as contextual psychological reaction responses (Wansink, Cheney & Chen, 2003). The majority of literature addressing this subject focuses on the food

preferences of children in an attempt to translate their preferences into a basis for future adult food choices.

Wansink, Cheney & Chen (2003) examined the aspect of food preference by gender and across the lifespan using a “comfort food” category that included several snack food items. Younger children and females were more likely to prefer “snack-related” foods than their male counterparts who preferred more substantial meals (Wansink, Cheney & Chen, 2003). Research provided by the Snack Food Association (Wilkes, 2002) as well as the CHIPS Study (French, Jeffrey, Story, Breitlow, Baxter, Hannan, & Snyder, 2001) focus on snack food consumption and marketing strategies as being critical elements in determining food preferences. As noted previously in the literature review, the majority of studies focus on food frequency consumption rather than determination of food motives or preferences.

Preference Scaling

In a review of the effectiveness of eighteen pair wise comparison methods for capturing preferences, Choo & Wedley (2004) noted the simple normalized column sum method provided reliable results based on ease of closed form formula calculation and minimized error calculation. The rank sum scaling method (Dunn-Rankin & King, 1969) is an example of this type of method. This method allows for linear

transformation of summed ranks pair wise tasks into interval scores that provide a basis of comparison (Dunn-Rankin & King, 1969).

Based on a selected alpha level and number of items, it is possible to estimate the number of judges needed so as to determine whether any two-food items differ (Dunn-Rankin & King, 1969).

Results are tabulated from the paired comparison task thus establishing a preference matrix for each judge. Then the individual scores of each judge are totaled into a frequency matrix. Minimum and maximum values are established on a common scale from 0 to 100 providing a frame of reference for interpretation.

According to Dunn Rankin, the number of judges that would be needed for a comparison task is calculated using the formula: $J = Q_a^2 (I) (I + 1) / 12$, at a .05 Q_a value would be 4.474 and at a .10 Q_a value would be 4.129 resulting in 184 and 156 judges respectively when using a 10 item comparison. A critical range value can be calculated for each judged score by multiplying the expected deviation for rank scores by values scores (Dunn-Rankin & King, 1969). Critical range values for each judge can be obtained using the formula:

$$S = \sqrt{J(I)(I + 1)/12}$$

Solving for S, the critical range can be determined by the following formula, $CR = S Q_a$. Scalability index (SI) can be generated that expresses the degree of distinctiveness among the food items by

comparing the ratio of significant good item pairs divided by the total number of possible pairs using the formula $SI = \# \text{ of significantly different pairs} / I(I-1)/2$ (Dunn-Rankin & King, 1969). Interpretative values for the scalability index range from 0 to 1 where a value of 0 indicates that there are no significant different pairs and a value of 1 indicates perfect scalability in that all of the pairs are significantly different (Dunn-Rankin & King, 1969).

Before proceeding with data analysis of paired comparison task, the principle of transitivity must be addressed to determine if the obtained preferences exhibit reliability rather than random choices (Gacula, 2004; Kernan, 1967; Pelto, Pelto & Messer, 1989). When transitivity is exhibited, the following relationship is obtained:

a is preferred to b, and b is preferred to c, then a is preferred to c.

If there is violation of the principle of transitivity, then a circular triplet can occur suggesting that the choice being made is random, and therefore unreliable. Statistically speaking, a certain amount of random choice would be expected in any paired comparison task however, according to the literature, a violation of transitivity is defined when the number of circular triplets is greater than 25% of total triplets (Hendel, 1977; Kernan, 1967; Scheibehenne, Miesler & Todd, 2007). Of interest is research conducted by Scheibehenne, Miesler & Todd (2006, 2007), who used paired comparison task to

assess preferences among 19 food court choices. On this task, the vast majority of people showed transitivity in food preferences.

Summary

This chapter has reviewed the empirical literature in nutrition on food choice research. Key points include: food choice (preference) is an important variable to consider in order to understand dietary behaviors. Models of food choice include both food characteristics and individual difference variables. Social judgment theory and its associated regression based judgment analysis can provide insight into how food preferences are formed.

Chapter 3: Design and Method

Participants

This study used a cross sectional questionnaire design. A convenience sample of college students was recruited at Pasco Hernando Community College (PHCC) during the fall 2007 semester. According to the Pasco-Hernando Community College (PHCC) Institutional Fact Book 2005, for the academic year of 2004-5, 20,241 persons attended the college (PHCC, 2005). Enrollment for the fall 2007 semester was 7,077 students.

Recruitment: Inclusion & Exclusion Criteria

Inclusion criteria were individuals between the ages of 18 to 64 who attended the community college either as a part time, full time or transient student. Exclusion criteria were individuals who were taking dual enrollment classes, as they would most likely be below the defined age limit. Dual enrollment classes are composed of high school students who are taking advanced placement courses (college level courses) while still in high school.

Characteristics of PHCC

A community group was established (using the inclusion criteria) in the ANGEL platform. The students were asked to participate in

completing the on line survey. ANGEL is a web-based learning management system used by many academic institutions as a framework for on line and distance learning courses (Angel learning, 2006). Using the ANGEL system as a portal, the survey was uploaded and the responses downloaded into an Excel spreadsheet for statistical analysis using the SPSS program.

Student participation was voluntary. An invitation was sent via e-mail to all those students who met the inclusion criteria (Appendix D). All students in the community group were offered a chance to enter a drawing for the possibility of winning a \$10.00 gift certificate from a local eatery establishment. There were ten opportunities for a student to win the drawing. Identifying information consisting of the student's name and e-mail were the only information connected to the lottery drawing. Students who won were notified via e-mail following the end of the survey period.

The survey remained open for three weeks during the fall 2007 semester. Completed surveys were reviewed on a weekly basis in order to assess accrual rate and whether or not additional time and/or other adjustments (incentives) might be required in order to achieve a significant sample size. Using 9 predictors (food choice motives) to model preference with regression based approach, a sample size of 200 was estimated to be adequate for testing for significant at alpha

=.05, with power = .80 and an effect size of $R^2 = .10$. This represents a medium effect size based on conventions provided by Cohen (1988).

The nutrition survey consisted of five distinct parts: (1) Food Choice Questionnaire (FCQ), (2) Food Knowledge Questionnaire (FNQ), (3) Need for Cognition Scale (NFC), (4) Paired Comparison Task and (5) Demographic questionnaire that included questions specific to age, gender, race/ethnicity, height/weight, occupation, dieting behavioral history, food allergies, and past medical history.

Due to the graphic loading capability of the ANGEL learning management system, part 4 of the survey instrument, the Paired Comparison Task, was subdivided into multiple sections to allow for respondents to visualize the specific graphics associated with each food item. Respondents were asked to complete a modified version of the Food Choice Questionnaire (FCQ_m) prior to beginning the paired food comparison task. Appendix E contains a copy of the Nutrition Survey.

Materials

The Food Choice Questionnaire (FCQ)

The Food Choice Questionnaire (FCQ) was developed by Steptoe, Pollard and Wardle (1995) and consists of a 36 item self-report query. The instrument was developed using factor analysis to arrive at nine identified sub scales (health, mood, convenience, sensory appeal,

natural content, price, weight control, familiarity and ethical concern). For each question respondents selected an answer from a Likert type scale of 1 (not important at all) to 4 (very important). Items are combined to form subscale scores with higher scores indicating greater importance of the 9 motives. Cronbach's alphas range from .74 to .86.

The FCQ demonstrated convergent validity using related measurements with other established scales (Health as a Value Measure, Dutch Eating Behavior Questionnaire and the Marlowe Crowne social desirability scale). In addition, a rank order question was asked to denote the relative importance of dietary characteristics (convenience, timing, affordability, atmosphere/ambiance, personal preference, tastiness and cultural influence) as having impact on the act of dietary choice.

The Nutrition Knowledge Questionnaire (NKQ) & The Food Knowledge Questionnaire (FNQ)

The Nutrition Knowledge Questionnaire (NKQ) was developed by Parmenter and Wardle (1999) and consists of four sections. The first section asks the respondent to consider what information health experts in the area of food and nutrition provide to them. Additional questions are used in this section to determine the individual's understanding. The second section asks the respondent to consider food groups. Additional questions are used in this section to

determine the individual's understanding of food groups. The third section asks the respondent to make specific food choices based on what they should do in terms of the correct nutritional choice even if they might not choose that food item due to preference and/or other motivating issues. The fourth section asks the respondent to consider the relationship between diet and disease. Questions in this area focus on the individual's awareness of three content areas: (1) health problems or diseases related to specific food consumption patterns with the follow up of an open-ended question to ascertain further clarification if needed, (2) food consumption related to cancer and heart disease and (3) knowledge and identification of antioxidant vitamins. Construct validity was determined by providing the instrument to two groups who differed in their nutritional background (dietetic students and computer science students) and by using test-retest reliability measures (Parmenter & Wardle, 1999). Cronbach's level of 0.7 was reported along with test-retest correlation of 0.98.

Modification of the NKQ instrument was done to include comparable food items as certain foods used in the original instrument developed in the United Kingdom do not translate to the United States population for they are not considered to be a mainstay of the American diet (e.g. kippers and digestive biscuits). Substitutions were based on food comparable values noted on food composition tables.

The modified NKQ consists of a series of questions that look at a specific dimension of food choice: portion size, fat content, salt content, sugar content, protein content and fiber content. There is only one correct answer for each question based on information from the food pyramid, food composition tables and Dietary Guidelines for Americans (Getting stated, 2006; Dietary Guidelines for Americans 2005, 2005 and Nutrient data laboratory home page, 2006). Maximum scoring for the series of questions is 30 points.

The Need for Cognition Scale (NFC)

The Need for Cognition Scale (NFC) was developed by Cacioppo & Petty (1982) and has been used as a predictive measurement assessment to ascribe how individuals use pieces of information to form decisions. The short form version of the scale consists of 18 items to which the individual denotes a response based on a continuum of 1 (extremely uncharacteristic of me) to 5 (extremely characteristic of me). Scoring for the scale is based on the obtained number responses with 8 of the statements reverse scored. Cronbach's level of .90 is reported for this scale (Cacioppo & Petty, 1982). Research has shown that individuals who have higher scores on the NFC scale (higher need for cognition individuals) used more information to make dietary choices than those individuals who have lower scores on the NFC scale (lower need for cognition individuals)

with respect to fruit and vegetable consumption (Williams-Piehota, Navarro Silvera, Mowad & Salovey, 2006). The NFC scale may moderate individual differences in cue weighting strategies and appropriateness of food choices.

The Need for Cognition Scale (NFC) was used to assess individual differences in the extent to which people engage in analytical vs. intuitive information processing styles. Appropriateness scores were regressed onto those variables (nutritional knowledge, 9 food-related motives and NFC score) in multiple-regression analysis. Similarly, these 11 variables were used to predict the number of cues used by each participant and the relative weights given to each of the 9 cues.

The Paired Comparison Task

As college students usually have hectic school and work schedules that often lead to the consumption of “food on the go” behaviors, snack foods were the focus of this study. Snacks foods were defined as a portable food unit consumed by an individual outside of the typical meal environment setting of breakfast, lunch or dinner. The snack foods used in this study were: Nature Valley Trail mix fruit & nut bar (TM), Granny Smith Apple (AP), Dole peeled mini carrots (CR), Betty Crocker Fruit Roll-ups Blastin’ Berry Hot Colors (FR), Orville Redenbacher’s Smart Pop Butter Mini Bags (PC), Starbucks Coffee

Frappuccino (SB), Nabisco Oreo Sandwich Cookies Mini Bite Size Snak Sak (CK), Frito-Lay Lay's Potato Chips, Classic flavored, small bag (CH), Chocolate Glazed Cake Donut –Dunkin' Donuts (DN), and McDonald's vanilla reduced fat ice cream cone (IC). These particular snack foods were selected based on observation of typical snack foods seen eaten on campus by college students. The participants were asked the extent to which each food fulfilled each of the 9 choice motives using a modified version of the FCQ (FCQ_m).

Modifications to the convenience motive items, similar to Scheibehenne, Mieseler & Todd (2007) were made (See Table 1).

Table 1

Modification of FCQ Convenience

Original item wording	Modification
Is easy to prepare	Can be prepared at the food location in a short amount of time
Can be cooked very simply	Can be eaten quickly
Takes no time to prepare	Can be consumed easily
Can be bought in shops close to where I live or work	Can easily be carried to class
Is easily available in shops and supermarkets	Is considered an "on the go" food

In addition, for each snack food item a measure of relative appropriateness was calculated based on the nutritional value. An index was formed from calories, calories from fat, sodium content,

cholesterol content and carbohydrate content. Z -score transformation of the nutritional values based on the five characteristics provided scores on a common metric prior to their summation. Refer to Table 2.

Table 2

Appropriateness Index of Snack Foods

Snack Food	Z- score index	Ranking Best to Worst
Apple	-.72	1
Carrot	-.68	2
Fruit Roll up	-.60	3
Trail Mix	-.32	4
Cookie	-.10	5
Ice cream	-.04	6
Starbuck's	.22	7
Popcorn	.52	8
Chips	.82	9
Donut	.87	10

The participants were provided with pictures of each snack food and asked to complete the modified FCQ_m. Participants were provided with all possible pairs of snack foods and asked, "Which snack would you prefer?" A total of 45 pairs were used.

The Demographic Questionnaire

The demographic questionnaire asked participants to provide their age, gender and race/ethnicity. Height and weight information was obtained in order to calculate BMI. Physical activity was evaluated by one question adapted from the International Physical Activity Questionnaire: How would you describe your current activity level on a

day-today basis (IPAQ, n.d.). Respondents selected from low, moderate or vigorous level activity statements.

Questions were asked to ascertain the individual's health status, whether or not they have been diagnosed with a health problem and whether or not they were taking medications (prescribed, over the counter and/or supplements). Subsequent questions were asked to determine if the individual had received nutritional counseling as part of their medical care and the setting (hospital or office) in which they received the counseling intervention.

Additionally, a series of questions was asked to determine the individual's dietary behavioral history pattern focusing on whether or not the person has a food allergy and the identification of the food allergy. Subsequent questions were asked related to whether or not the individual has ever been on a diet, noting the frequency of the dieting pattern, whether or not the diet was self-imposed, physician advised or a supervised program.

Lastly, a series of questions were asked concerning the individuals' occupational status and nutritional knowledge background. The individuals' work status was obtained (occupation and full/part time status). Additionally, student status (full or part time enrollment) was noted along with the student's specified major field of study. Finally, two questions were asked specifically about how the individual

had obtained their nutritional knowledge in terms of formal or informal methods and the individuals were asked to identify the most common three sources of their nutrition information considering multimedia sources, personal and professional contacts, etc. Table 3 summarizes the variables, instrumentation and psychometric properties.

Table 3

Instrument Comparison of Variables and Reliability Measures

Variables	Instruments	Reliability Measure
Food Motives Dietary Choice characteristics	Food Choice Motive Questionnaire (FCQ)	0.87 – total 0.74-0.86 – sub scales
Food knowledge	Food Knowledge Questionnaire (FNQ)	NA
Complexity of thought Intuitive thought	Need for Cognition Scale (NFC)	0.90
Food Choice Paired Comparison	Modified Food Choice Motive (FCQ _m)	0.87
Socio-demographic (Age, gender, race, ethnicity, BMI, physical activity, medical history, nutritional counseling, dietary behavioral history, occupation, student status, nutrition knowledge background and nutrition information sources)	Demographic Questionnaire	Self report

Institutional Review Board Procedures

The project was reviewed and approved by the University of South Florida Institutional Review Board. The project also was reviewed and approved from PHCC since the research was considered off site. A letter of support was submitted with the Institutional Review Application from the Vice President of Instruction/Provost West Campus .

Procedures

Based on the inclusion and exclusion criteria, a data set was constructed by the Director of Management Information Services at the institution and then entered into the learning community group. An instruction page was provided outlining the sequence of the nutrition survey and its respective parts. As the survey was arranged in multiple parts, each student proceeded at their own pace towards completion. The survey was set up sequentially so that one could proceed to the next part if all the questions had been answered in the prior part. Each part of the survey had a one-time submission. As the survey was open over a three week time period, participants could proceed at their own pace throughout the various parts of the survey. Once each part of the survey was completed, the participant received a message indicating that they had successfully completed that portion of the survey. They were then able to proceed to the next part of the

survey. Surveys were submitted anonymously. All members of the data set had access to e-mail communication in case any questions arose related to the survey.

Data Analysis Plan

Frequencies, means and standard deviations are reported for the demographic variables of body mass index, gender and age.

Frequencies are also reported for other demographic information such as occupation, food allergy and dieting behavioral history. Correlations determined by Pearson r values are analyzed for each of the subscale measurements of the FCQ. Linear multiple regression techniques were used to evaluate the impact of instrument (subscale) scoring with respect to BMI, age, gender and other selected demographic variables.

Multiple regression techniques were utilized to model appropriateness scores on nutritional knowledge, 9 food-related motives and the NFC score. Multi-level modeling was used to analyze preferences developed from the paired comparison task. The multi-level relationships among variables are shown in Table 4.

Table 4

Multi-level Modeling

Level 1	Level 2
Preference scores (Dependent Variable)	Age
9 food motives specific to each of 10 foods	Rating on 9 general food motives (FCQ)
	Nutrition Knowledge (FNQ)
	Number of correct choices on paired-comparison task
	NFC

Multi level analyses were conducted using HLM software (HLM, 2004). In HLM, the relationship of food preference to the 9 motives is expressed as a level 1 equation:

$$Y_{ij} = \beta_{0j} + \beta_{1j}HE_j + \beta_{2j}MO_j + \beta_{3j}CO_j + \beta_{4j}SE_j + \beta_{5j}NA_j + \beta_{6j}PR_j + \beta_{7j}WE_j + \beta_{8j}FA_j + \beta_{9j}ET_j + r_{ij}$$

where Y_{ij} is the i^{th} preference of individual j , β_{0j} = intercept (regression constant) for individual j , β_{1j} is the regression weight for the health motive (HE) and β_{2j} through β_{9j} corresponds to the remaining motives, where HE_j is the health motive variable for the individual i and subsequently MO, CO, SE, NA, PR, WE, FA and ET correspond to the rest of the specific food motive variables and r_{ij} is a residual error term representing the unexplained variance.

In HLM each beta weight may also be represented by level 2 equations:

$$\beta_{0j} = \gamma_{00} + u_{1j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}Z_{1j} + u_{1j}$$

For example β_{1j} is associated with the HE motive can be written as β_{1j} where γ_{10} is the average slope relating food preference to HE and where u_{1j} is a random component quantifying individual differences in HE slopes across subjects. Level 2 predictors such as nutrition knowledge that are hypothesized to moderate the influence of a motive can be included (represented by Z_{1j}) and their influence estimated by the γ_{11} parameter.

Summary

This chapter addressed issues with respect to research design, data collection methodology and data analysis procedures. It provided an overview of how the research was carried out in terms of procedural methods and reported reliability measures of instruments.

Chapter Four: Results

This chapter summarizes the results obtained from the Nutrition Survey to answer questions presented in chapter 1. The results section will be divided into the following areas: preliminary data analysis; data analysis of the paired comparison task to establish snack food preferences; hypothesis tests/research questions and supplemental analysis.

Preliminary Data Analysis

As the survey was set up in a sequential design based on completion of parts, 391 students initially started the survey, indicating a 5.0% response rate among the 7,700 members of the community group. Appendix E illustrates the number of participants who completed each part of the survey. Appendix F contains a modified form of the survey. As the survey continued, there was a decrease in completion of subsequent parts resulting in 281 surveys being submitted. However, part 4A8 and 4A9 contained 277 completions. Thus the preliminary data analysis examined 277 responses. Therefore the response rate based on the initial student interaction was 71%. Checking for missing data (unanswered questions in several parts of the survey) in each part of the survey,

100 subjects (56.5%) were deleted from the analysis bringing the sample size to 177. Omissions were also found in the demographic section with respect to missing height, weight measurements and reported age values. Attention was then directed to checking for violations of the transitivity principle. As noted previously in Chapter 2, violations of transitivity $\geq 25\%$ could result in circular triplets (a is preferred to b, and b is preferred to c, then a is preferred to c) indicating random choice. Thirty-three subjects (18.6%) were deleted due to violation of the transitivity principle. Finally, the completed surveys were analyzed for patterned responses and/or invalid responses. If a subject exhibited a patterned response (straight line item selection across a part of the survey) in any survey part, they were deleted from the analysis. When checking for patterned responses, an absolute value of 0 was used to omit any subject who had exhibited any type of patterned response regardless of whether it was positive or negative on any part of the survey. An additional 42 (23.7%) subjects were deleted due to the fact that choices showed no variance. Based on these data analysis procedures, the final sample size was 102 participants.

Of the 102 participants included in data analyses, 78.4% (n=80) were female and 21.6% (n=22) were male. The age range for

respondents was 18 to 57, with a mean age of 32 years (SD=10.066 years). Table 5 lists the age group frequencies by ranges.

Table 5

Age Group Frequencies by Ranges

Age Group	Number	%
18-19	12	11.8
20-29	29	28.4
20-24	14	
25-29	15	
30-39	37	36.3
30-34	21	
35-39	16	
40-49	18	17.6
40-44	10	
45-49	8	
50-60	6	5.9
50-54	4	
55-60	2	

Eight three percent were Caucasian (n=85), 8% were Hispanic (n=8), 3% were Asian/Pacific Islander (n=3), 2% were African American (n=2) and 4% reported their ethnicity as other category (n=4). Multicultural backgrounds were reported in the other category. The majority of subjects were born in the United States (92.2%, n=94).

BMI measurements were computed based on self reported height and weight from subjects. BMI ranged from 17.2 to 57.2 with a mean value of 27.33 (SD=7.596). According to BMI classification, half

of the respondents were categorized as having a healthy weight (51=50%) with the remainder categorized as being clinically obese (26=25.5%), overweight (22=21.6%) or underweight (3=2.9%). Refer to Table 6. In terms of physical activity, the majority of respondents reported themselves as being moderately active (67=65.7%) or having a low activity level (22=21.6%) as compared to having a vigorous activity level (13=12.7%).

Table 6

BMI Range Information

Classification	Range	Number	%
Underweight	<18.5	3	2.9
Healthy weight	18.5-24.9	51	50.0
Overweight	25-29.9	22	21.6
Obese	≥ 30	26	25.5

FCQ Findings

For the general food motive questionnaire (Part I of the Survey), the following results are reported. Each subscale was rescaled so as to be on a common metric with a minimum value of 1 and a maximum value of 4. Price had the highest mean score (3.02) and ethical concern had the lowest mean score (1.82). Refer to Table 7 for descriptive statistics for each of the 9 food choice motives. In Part I of the survey, two additional questions asked the subject to identify

which factor provided the most influence with respect to food choice as well as the converse of the statement, which factor provided the least influence when making a food choice. For the total sample personal preference (47.1%) had the most influence and culture was indicated as being the least important (55.9%).

Table 7

Food Choice Motives (FCQ) Descriptives

Motive	Mean	Standard Deviation	Frequency 1	Frequency 2	Frequency 3	Frequency 4
Health	2.91	.73	3(2.9%)	23(22.6%)	46(45.1%)	30(29.4%)
Mood	2.08	.74	19(18.6%)	52(51.0%)	25(24.5%)	6(5.9%)
Convenience	2.97	.65	3(2.9%)	16(15.7%)	61(59.8%)	22(21.6%)
Sensory Appeal	2.98	.70	1(0.9%)	21(20.6%)	48(47.1%)	32(31.4%)
Natural Content	2.38	.84	16(15.7%)	46(45.1%)	28(27.5%)	12(11.7)
Price	3.02	.72	4(3.9%)	14(13.7%)	58(56.9%)	26(25.5%)
Weight Control	2.82	.81	8(7.8%)	31(30.4%)	36(35.3%)	27(26.5%)
Familiarity	2.29	.75	16(15.7%)	45(44.1%)	34(33.3%)	7(6.9%)
Ethical	1.82	.75	41(40.2%)	44(43.2%)	14(13.7%)	3(2.9%)

FNQ Findings

A total knowledge score was computed from the component parts of the FNQ. The sample had a mean score of 13 with a standard

deviation of 2.85. The scores ranged from 6 to 21 indicating that the subjects found this to be somewhat of a difficult test in terms of nutritional content. The highest possible score to be earned was a 30. With respect to component parts of the FNQ, portion size and sugar content showed the highest scores. Protein content had the lowest score category. FNQ descriptives are found in Table 8.

Table 8

Food Knowledge Questionnaire (FNQ) Descriptives

Content Area	Mean Score	Standard Deviation	Possible Score
Portion	2.7	1.11	5
Fat	2.3	1.12	5
Salt	1.9	.98	5
Sugar	2.7	1.13	5
Protein	1.4	.93	5
Fiber	2.0	.96	5
Total	13	2.85	30

NFC Findings

Results of the NFC scale indicated a mean score of 63.8 with a standard deviation of 9.25. The scores ranged from 30 to 83.

Determining Snack Food Preferences

The following method was used to determine preferences from paired comparison data. The number of times each food was chosen

over another were tallied. Minimum and maximum values for each snack food item were used as an interpretative framework for snack food scaling (Dunn-Rankin, Knezek, Wallace & Zhang, 2004). Defined scale limits were formed using a linear transformation to rescale tallies between zero and 100 (Dunn-Rankin, Knezek, Wallace & Zhang, 2004). For the total sample of 102, $J(I-1) = 918$. Calculation of rescaled critical distance was also done so that the information would be on the same interpretative scale ($100 * 137 / 918 = 14.92$). For example, the reported difference between apple and fruit roll ups was 27.01. This value exceeded the critical value range indicating that college students preference for these two snack food items was significantly different. This was the largest difference. There were 13 significant pairs based on the differences among the scale values of the ten snack food items. Scalability index of .29 indicated that college students displayed a moderate preference structure for the snack food items. To summarize with respect to apple, significant differences were noted between apple and fruit roll ups, cookies, chips and donut. Table 9 lists the differences found in the scaling of ten items by 102 judges.

Table 9

Differences Found in the Scaling of Ten Items by 102 Judges

Items	TM	AP	CR	FR	PC	SB	CK	CH	DN	IC
TM	-									
AP	13.39	-								
CR	2.73	10.66	-							
FR	13.62	27.01*	16.35*	-						
PC	10.02	3.37	7.29	23.64*	-					
SB	1.30	12.09	1.43	14.92*	8.72	-				
CK	9.37	22.76*	12.10	4.25	19.39*	10.67	-			
CH	10.24	23.63*	12.97	3.38	20.26*	11.54	.87	-		
DN	6.87	20.26*	9.60	6.75	16.89*	8.17	2.50	3.37	-	
IC	7.18	6.21	4.45	20.80*	2.84	5.88	16.55*	17.42*	14.05	-

*Significant at .05 level; Critical range = 14.92; SI=13/45=.29

When analyzing food preference, the data were analyzed from several different perspectives, as a function of BMI, correct choices and age. The data presented in Figure 4 represents the preference structure for snack foods used in this study as a function of BMI.

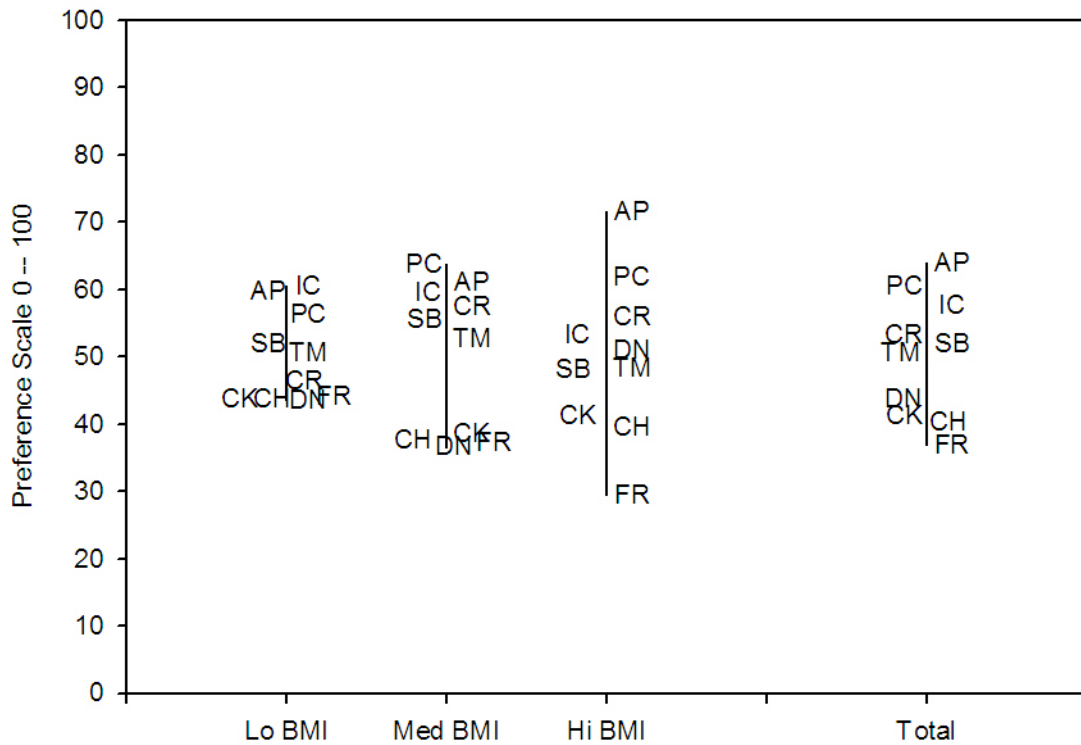


Figure 4. Preference Structure for total sample and as a function of BMI

BMI measurements were split into tertiles in order to evaluate the degree of distinctiveness of snack food preferences. There were 34 subjects in each tertile. Tertile 1 (low BMI group) had a BMI range of 17.2 – 22.80 with a mean score of 20.99, tertile 2 (medium BMI group) had a BMI range of 22.81 –27.5 with a mean score of 24.86 and tertile 3 (high BMI group) had a BMI range of 27.9-57.2 with a mean score of 36.15. BMI Tertile relationship categories are listed in Table 10. Table 11–13 contain critical range scaling for judges based on BMI tertiles.

Table 10

BMI Tertile Relationship Categories

Tertile Category	Range	BMI Mean
1	17.2-22.80*	20.99
2	22.81-27.5*	24.86**
3	27.9-57.2	36.15***

*Calculation noted at the hundredth decimal level to note the difference between the two groups.

**BMI mean range is in the BMI category attributed to normal weight range.

***BMI mean range is in the BMI category attributed to obese weight range.

Table 11

Differences Found in the Scaling of Ten Items by 34 Judges- Low BMI

Items	TM	AP	CR	FR	PC	SB	CK	CH	DN	IC
TM	-									
AP	8.50	-								
CR	4.24	12.74	-							
FR	6.53	15.03	2.29	-						
PC	5.56	2.94	9.80	12.09	-					
SB	1.31	7.19	5.55	7.84	4.25	-				
CK	6.86	15.36	2.62	.33	12.42	8.17	-			
CH	1.31	15.36	2.62	.33	12.42	8.17	0	-		
DN	7.19	15.69	2.95	.66	12.75	8.50	.33	.33	-	
IC	9.81	1.31	14.05	16.34	4.25	8.50	16.67	16.67	.17	-

*Significant at .05 level; Critical range = 25.81; SI=0/45=0.

Table 12

Differences Found in the Scaling of Ten Items by 34 Judges- Medium

BMI

Items	TM	AP	CR	FR	PC	SB	CK	CH	DN	IC
TM	-									
AP	8.50	-								
CR	4.91	3.59	-							
FR	15.36	23.86	20.27	-						
PC	11.12	2.62	6.21	26.48*	-					
SB	2.95	5.55	1.96	18.31	8.17	-				
CK	14.05	22.55	18.96	1.31	25.17	17.00	-			
CH	15.03	23.53	19.94	.33	26.15*	17.98	.98	-		
DN	16.01	24.51	20.92	.65	27.13*	18.96	1.96	.98	-	
IC	6.87	1.63	1.96	22.23	4.25	3.92	20.92	21.90	22.88	-

*Significant at .05 level; Critical range = 25.81; SI=3/45=.06.

Table 13

Differences Found in the Scaling of Ten Items by 34 Judges- High BMI

Items	TM	AP	CR	FR	PC	SB	CK	CH	DN	IC
TM	-									
AP	23.20	-								
CR	7.51	15.69	-							
FR	18.96	42.16*	26.47*	-						
PC	13.40	9.80	5.89	32.36*	-					
SB	.33	23.53	7.84	18.63	13.73	-				
CK	7.19	30.39*	14.70	11.77	20.59	6.86	-			
CH	8.83	32.03*	16.34	10.13	22.23	8.50	1.64	-		
DN	2.61	20.59	4.90	21.57	10.79	2.94	9.80	11.44	-	
IC	4.91	18.29	2.60	23.87	8.49	5.24	12.10	13.74	2.30	-

*Significant at .05 level; Critical range = 25.81; SI=5/45=.11.

For each tertile, the critical range value and scalability index were calculated. The critical range value for the low BMI group was 25.81. College students with a low BMI did not exhibit any coherent preferences. The scalability index for the low BMI group was zero. The critical range value for the medium BMI group was 25.81. Three significant differences were noted between fruit roll ups and popcorn (26.48), popcorn and chips (26.15) and popcorn and donut (27.13). Scalability index was .06 indicating that college students in the

medium BMI group may distinguish the best from the worst but not much more.

The critical range value for the high BMI group was 25.81. Five significant pairs were observed: apple and fruit roll ups (42.16), cookies and chips (30.39); carrots and fruit roll ups (26.47) and fruit roll ups and popcorn (32.36). Scalability index was .11. The results indicate that high BMI college students exhibit a more coherent preference structure than do those who weigh less.

Prior research has focused on attributing increased food consumption patterns as a function of disordered thinking (National Task Force, 2000). Current findings revealed that people with greater BMI show more distinct preference structure for snack foods than people with lower BMI suggesting that educational approaches as well as treatment interventions may have to be altered to account for perceptual differences.

The total sample was also divided into correct choice tertiles to examine if there were any distinct differences with respect to preference structures. Using the appropriateness score (nutritional content index), the correct answer for each of the 45 snack food pairs was determined. For each individual subject, the number of correct answers was calculated. Correct choice was defined as the number of correct answers on the paired comparison task. Tertile 1 consisted of

34 subjects with a range of 12 to 21 correct answers and a mean score of 17. Tertile 2 consisted of 31 subjects with a range of 22 to 26 correct answers and a mean score of 24. Tertile 3 consisted of 37 subjects with a range of 27 to 37 correct answers and a mean score of 30. The data presented in Figure 5 represents the preference structures for the snack foods as a function of correct choice.

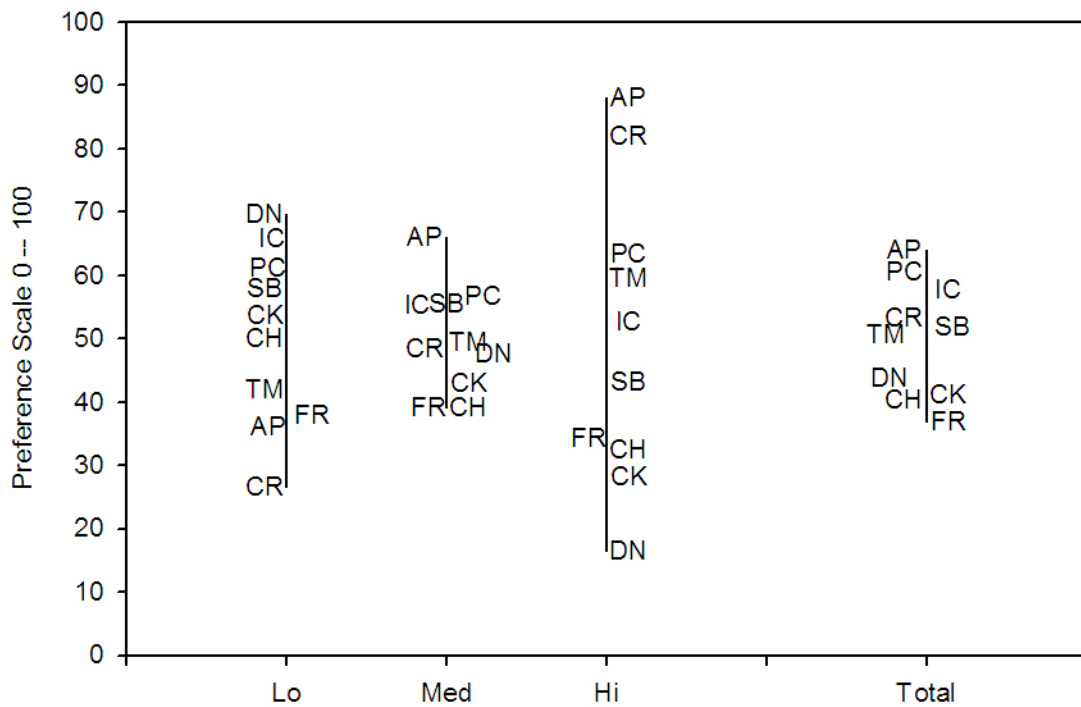


Figure 5. Preference Structure for total sample and as a function of Correct Choice

All of the correct choice groups exhibited some coherence in snack food preferences. Critical range values and scalability index

were determined for each of the correct choice tertiles and preference matrixes are provided indicating significant pair relationships (See Tables 14-16). The critical range for the low correct choice group was 25.81 with a scalability index of .22. Ten pairs were noted as being significantly different: trail mix and donut (27.78); apple and donut (33.66); apple and ice cream (29.74); carrot and popcorn (34.64); carrot and Starbucks (31.37); carrot and cookies (27.12); carrots donut (43.14); carrots and ice cream (39.22); fruit roll ups and donut (31.70) and fruit roll ups and ice cream (27.78). Results indicate that students who had a low score on the paired comparison task showed a modest amount of distinct preference with regard to snack food items. Apples and carrots were perceived as being distinctly different in relationship to various other snack food items.

The critical range for the medium correct choice group was 26.88 and the scalability index was .04. Only two significant differences were noted: apple and fruit roll ups (26.88) and apple and chips (26.88). The medium correct choice group showed only a slight preference structure with respect to apple. The medium nutrition correct choice group showed no distinction between fruit roll ups and chips (0) indicating that they perceived no difference between these two snack food items.

The critical range for the high correct choice group was 24.62 and the scalability index was .51. Twenty-three significant differences were noted indicating that students who had high scores on the paired comparison task showed a substantial amount of distinct preference with regard to multiple snack food items. Distinct preferences were shown between trail mix, apple, carrots and popcorn and the other snack food items.

Table 14

Differences Found in the Scaling of Ten Items by 34 Judges- Low Correct Choice

Items	TM	AP	CR	FR	PC	SB	CK	CH	DN	IC
TM	-									
AP	5.88	-								
CR	15.36	9.48	-							
FR	3.92	1.96	11.44	-						
PC	19.28	25.16	34.64*	23.20	-					
SB	16.01	21.89	31.37*	19.93	3.27	-				
CK	11.76	17.64	27.12*	15.68	7.52	4.25	-			
CH	8.17	14.05	23.53	12.09	11.11	7.84	3.59	-		
DN	27.78*	33.66*	43.14*	31.70*	8.50	11.77	16.02	19.61	-	
IC	23.86	29.74*	39.22*	27.78*	4.58	7.85	12.10	15.69	3.92	-

*Significant at .05 level; Critical range = 25.81; SI=10/45=.22.

Table 15

Differences Found in the Scaling of Ten Items by 31 Judges- Medium Correct Choice

Items	TM	AP	CR	FR	PC	SB	CK	CH	DN	IC
TM	-									
AP	16.49	-								
CR	1.07	17.56	-							
FR	10.39	26.88*	9.32	-						
PC	7.17	9.32	8.24	17.56	-					
SB	6.10	10.39	7.17	16.49	1.07	-				
CK	6.45	22.94	5.38	3.94	13.62	12.55	-			
CH	10.39	26.88*	9.32	0	17.56	16.49	3.94	-		
DN	1.79	18.28	.72	8.60	8.96	7.89	4.66	8.60	-	
IC	5.74	10.75	6.81	16.13	1.43	.36	12.19	16.13	7.53	-

*Significant at .05 level; Critical range = 26.88; $SI=2/45=.04$.

Table 16

Differences Found in the Scaling of Ten Items by 37 Judges- High Correct Choice

Items	TM	AP	CR	FR	PC	SB	CK	CH	DN	IC
TM	-									
AP	28.53*	-								
CR	22.52	6.01	-							
FR	25.23*	53.76*	47.75*	-						
PC	3.90	24.63*	18.62	29.13*	-					
SB	16.22	44.75*	38.74*	9.01	20.12	-				
CK	31.23*	59.76*	53.75*	6.00	35.13*	15.01	-			
CH	27.03*	55.56*	49.55*	1.80	30.93*	10.81	4.20	-		
DN	42.94*	71.47*	65.46*	17.71	46.84*	26.72*	11.71	15.91	-	
IC	6.90	35.43*	29.42*	18.33	10.80	9.32	24.33	20.13	36.04*	-

*Significant at .05 level; Critical range = 24.62; SI=23/45=.51.

Of interest is the comparison between correct choice groups and the appropriate score index. Based on the appropriateness index, the correct choice of snack food items would be apple, carrots, fruit roll ups, trail mix, cookies, ice cream, Starbuck's, popcorn, chips and donut. Examining the preference scores of the high correct choice group showed a preference order of apple, carrots, popcorn, trail mix, ice cream, Starbuck's, fruit roll ups, chips, cookies and donut. Using

Spearman's rank order correlation, the preference order for the high correct choice group correlated .636 with the order of foods on the appropriateness index. In contrast, the preference order of the low correct group correlated -.527 with this index. The preference orders of these two groups correlated -.830. The preference order for the middle tertile correlated with the appropriateness index .188.

Age was split into tertiles to examine differences in snack food preferences. Tertile 1 contained 33 subjects ranging in age from 18 to 27 years and a mean age of 21.27. Tertile 2 contained 36 subjects ranging in age from 28 to 36 with a mean age of 31.94. Tertile 3 contained 33 subjects ranging in age from 37 to 57 with a mean age of 44.12. Critical range values and scalability indexes were calculated for all age group tertiles. The critical range for the low age group was 26.26 with an SI index of .04. The critical range for the medium age group was 25.00 with an SI index of .04. Two significant pairs were observed in the low and medium age groups whereas three significant pairs were observed in the high age group. The low age group showed a distinct difference between Starbucks and cookies (27.94) and Starbucks and chips (27.27). The medium age group showed a distinct difference between fruit roll ups (32.10), Starbucks (26.85) and apple. The critical range for the high age group was 26.26 with an SI index of .07. The high age group showed a distinct preference between fruit

roll ups and the following snack food items: apple (30.64), popcorn (32.66), and ice cream (31.99). The low age group corresponds to the 20's, the medium age group corresponds to the 30's and the high age group corresponds to the 40's. Thus one could infer that age demonstrated only a small amount of influence in preference structures.

Hypothesis Test/ Research Questions

Hypothesis 1: Individuals with more nutrition knowledge will put more weight on health, natural content, weight control and ethical concerns motives than individuals with less nutrition knowledge.

This hypothesis was addressed by conducting HLM model modeling to examine how level one slopes (cue weights) of the nine motives were affected by the level two variable nutrition knowledge.

Multi Level Modeling Analysis

The level 1-predictor variables were the nine motives reported for each food. The level 2-predictor variables were general food motives, number of correct choices, nutrition knowledge and NFC. Restricted maximum method of estimation was used. All level 1 predictors were mean centered. Means and standard deviations on predictor variables are shown in Tables 17 and 18.

Table 17

Characteristics of Multi-level Modeling- Level 1

Characteristic	Mean	SD
Preference	4.50	2.67
HE	2.63	0.90
MO	1.95	0.81
CO	2.80	0.85
SE	2.92	0.80
NA	2.47	0.98
PR	2.96	0.84
WE	2.66	0.96
FA	2.26	0.85
ET	1.69	0.76

Minimum range for preference is 0 and maximum range =9.
 All minimum and maximum ranges for attributes are the same (Minimum=1 & Maximum=4). Number of observations total was 1020.

Table 18

Characteristics of Multi-level Modeling- Level 2

Characteristic	Mean	SD	Minimum	Maximum
ALLRT	23.87	5.90	12	37
KNOWLTOT	12.97	2.85	6	21
NFC	63.84	9.25	30	83
AGE	32.43	10.07	18	57
HEALTH	2.91	0.73	1.17	4
MOOD	2.08	0.74	1	4
CONV	2.97	0.65	1	4
SENS	2.98	0.70	1.25	4
NATU	2.38	0.84	1	4
PRICE	3.02	0.72	1	4
WEIGHT	2.82	0.81	1	4
FAMIL	2.29	0.75	1	4
ETHICAL	1.82	0.75	1	4

N = 102 subjects, ALLRT = number of correct choices, KNOWLTOT=nutrition knowledge

The hypothesized model with 9 level 1 predictors will be discussed first as represented by the equation:

$$Y_{ij} = \beta_{0j} + \beta_{1j}HE_j + \beta_{2j}MO_j + \beta_{3j}CO_j + \beta_{4j}SE_j + \beta_{5j}NA_j + \beta_{6j}PR_j + \beta_{7j}WE_j + \beta_{8j}FA_j + \beta_{9j}ET_j + r_{ij}$$

Preference was modeled as a function of an intercept term plus 9 regression weights for motives of health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity, ethical concern and the residual term. Parameter estimates (β) from the level 1 equation are shown in Figure 6.

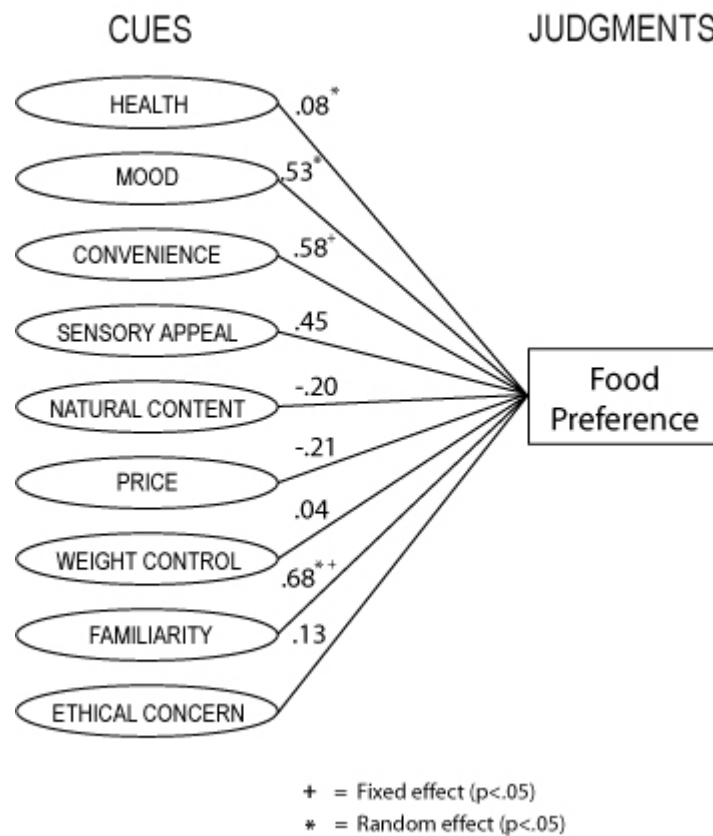


Figure 6. Single Sided Lens model Showing Cue Weights

Support for the hypothesis will be indicated by significant nutrition knowledge coefficients as a moderating effect and increased cue weights for health, natural content and ethical concerns. The results of the analysis are shown in Table 19. Table 19 provides information related to cue weight slopes and effects of nutrition knowledge.

Table 19

Food Motives Cue Weight Slopes and Effects of Nutrition Knowledge

Food Motive (cue)	Weight Coefficients	Nutrition Knowledge Coefficients	Nutrition Knowledge Effect on Cue Weight
Health	.085007*	.029244	Increased
Mood	.600906*	-.061915	Decreased
Convenience	.507417*	-.065217	Decreased
Sensory Appeal	.386732	.091486	Increased
Natural Content	-.116215	.217650	Increased
Price	-.236966	-.018009	Decreased
Weight Control	.033302	-.175030	Decreased
Familiarity	.341508*	.008069	Increased
Ethical Concern	.330825	.141637	Increased

* - $p < .05$

The slope for health was .085007 and the effect of nutrition knowledge on the slope was .029244, indicating this cue weight becomes larger as nutrition knowledge increases; the slope for natural content is -.116215 and the effect of nutrition knowledge on the slope is .217650, indicating that the absolute value of this cue weight becomes larger as nutrition knowledge increases; the slope for weight control is .033302 and the effect of nutrition knowledge on the slope is -.175030 indicating that this cue weight decreases in absolute value. As nutrition knowledge increases (.141637), cue weight for ethical concerns (.330825) increases in absolute value. Thus the hypothesis was not supported by the analysis. The cue weights of health, natural content and ethical concern became larger as nutrition knowledge increased. However, none of the nutrition knowledge coefficients were significant. When considering the slopes of the other food motives not specified in the hypothesis, as nutrition knowledge increases both sensory appeal and familiarity were found to have larger cue weights (sensory appeal slope .386732 with effect of nutrition knowledge .091486 and familiarity slope .341508 with effect of nutrition knowledge .008069). Individuals with less nutrition knowledge gave more weight to mood, convenience and weight control and placed less weight on price. The largest reported motive cue weight was mood (.600906).

Hypothesis 2: Individuals with more nutrition knowledge will make more appropriate choices (greater number of “correct” choices out of 45 possible) on the food paired comparison task.

This hypothesis was initially addressed by conducting multiple regression procedure predicting the number of correct choices from nutrition knowledge score and indicators of nutrition background. Support for this hypothesis will be indicated by significant regression coefficients. No significant linear relationship was observed, $F(2,99)=1.593, p<.209$. The sample multiple correlation was .031. The hypothesis was not supported by regression analysis but was partially supported by correlations of preference orders and appropriateness index.

Hypothesis 3A: Individuals with a nutrition knowledge background will have higher scores on the Food Knowledge Questionnaire (FNQ) than individuals who did not have a nutrition knowledge background.

The support for this hypothesis will be indicated by subjects with a nutrition knowledge background having significantly higher mean scores on the FNQ as compared to reported mean scores for subjects without a nutrition background. Nutrition knowledge background was computed as a composite score based on the nutrition background question in the Demographic section of the survey. Since it was a

select all that apply question, students were able to select from the following options: formal nutrition course in High School, integrated nutrition information during High School, formal nutrition course in college undergraduate, formal nutrition course in college graduate, no formal or informal nutrition classes during schooling, or other.

Seventy-six subjects (74.5%) reported that they had a nutrition background. FNQ results for this group ranged from 6 to 21 with a mean score of 13.05 (SD 2.76). Compared with the group that did not report a nutrition knowledge background (n=26, 25.5%), the range was the same (6 to 21) but the mean score was 12.73 (SD 3.13). The *t* test on group means were not significant ($t=-.496, p=.621$). Based on these results, the hypothesis was not supported. There was only a small difference between scoring among groups and that the effect of nutrition knowledge background was not significant.

Hypothesis 3B: High need for cognition individuals will use more dimensions to choose their food options than will low need for cognition individuals.

The intended approach to test hypothesis 3B was to use the HLM analysis as above but split the sample at the median on NFC scale. However, as this would yield sub samples of 51, the HLM method would not yield stable estimates. An alternative method is to compare mean scores on the 9 general food motives for high and low NFC

subjects. For each of the 9 general food motives a *t*-test was done to determine if any of the motives were significant with respect to NFC. None of the motives had significant *t* tests. Thus the hypothesis was not supported, as there were no significant differences seen between groups formed by high vs. low NFC scores.

The effects of the predictors on the outcome, preference, averaged over all subjects are known as fixed effects. Fixed effects can be used to estimate cue weights for the total sample. The fixed effects indicated that convenience ($\beta=.58, p<.02$) and familiarity ($\beta=.68, p<.05$) made a significant contribution to determining snack food preference. For every unit increase in convenience and familiarity motives, preference went up by .58 and .68 respectively. Examination of the variance components indicated health, mood and familiarity had significant random effects. The values indicate that there is significant variability in health, mood and familiarity slopes across subjects. Familiarity was the only motive to be significant as both a fixed and random effect. The Snijders & Bosker (1999) method was used to estimate the percentage of explained variance. This method used level 1 variance estimates:

$$1-[(\sigma^2_b + \tau_b)/ (\sigma^2_a + \tau_b)]$$

Substituting values for the analysis, $1 - [(6.16105 + 0) / (7.15309 + 0)] = 1 - [0.8613] = 0.139$. Thus, this model explains 14% of the level 1 variance. Estimation of variance components is depicted in Table 20.

Table 20

Variance Components without Level 2 Moderators

Random Effect	Variance Component	Standard Deviation	χ^2	<i>p</i> value
HE, slope	1.04888	1.02415	119.153	0.001
MO, slope	3.26123	1.80589	118.390	0.001
FA, slope	2.45312	1.56624	101.462	0.013
Residual	6.16105	2.48215		

There was significant variability in the effect of health motive on preference (1.04888). As illustrated in Figure 7, the health motive had a positive relationship to preference for some subjects, but a negative relationship for others. The net effect for all individuals was a flat line.

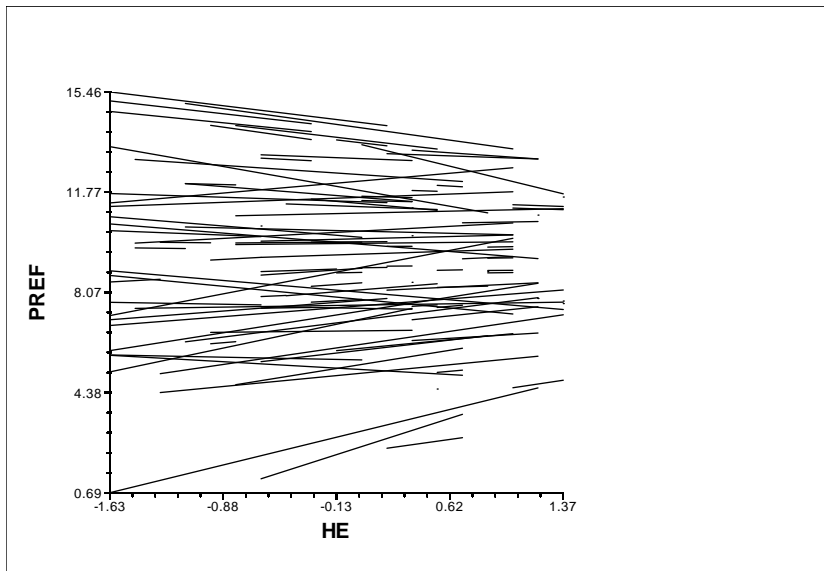


Figure 7. Individual Effects of Health on Preference.

There was also significant variance in the effect of the mood motive on preference. As illustrated in Figure 8, there was considerable heterogeneity in these slopes.

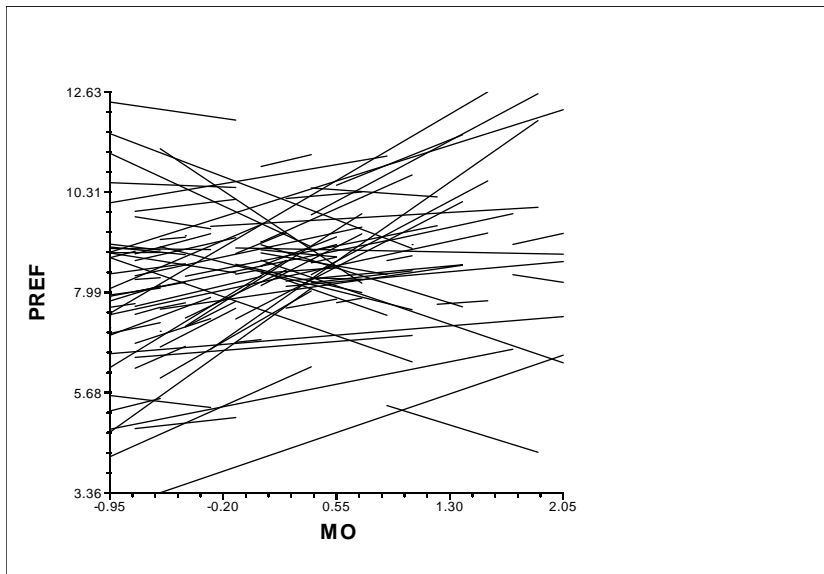


Figure 8. Individual Effects of Mood on Preference.

Finally, there was also significant variance in the effect of familiarity on preference. As illustrated in Figure 9, there was a scattered effect among the slopes for familiarity.

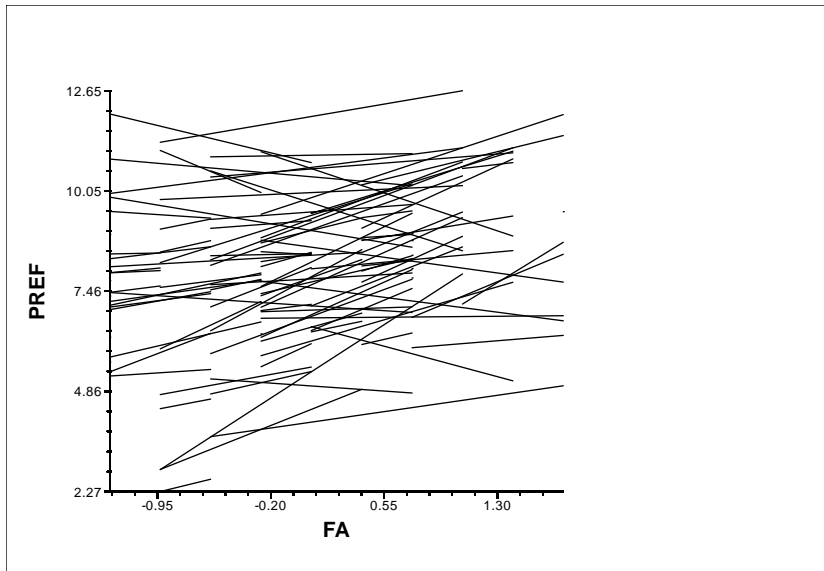


Figure 9. Individual Effects of Familiarity on Preference.

The number of correct choices, as a level 2 variable, was entered as a moderator of the effects of 3 motives (health, mood and familiarity) on the outcome variable of preference. The number of correct choices had a significant moderating effect on the health slope ($t=5.326, p.000$) and mood slope ($t=-2.725, p.008$). Estimation of variance components with Level 2 Moderators is listed in Table 21.

Table 21

Variance Components with Level 2 Moderators

Random Effect	Variance Component	Standard Deviation	χ^2	p value
HE, slope	0.12934	0.35963	97.975	0.019
MO, slope	1.63551	1.27887	111.650	0.002
FA, slope	1.50508	1.22682	97.632	0.020
Residual	6.27528	2.50505		

Comparing variance components in Tables 20 and 21 reveals how much of the variability in slopes (see Figures 7, 8 and 9) is explained by individual differences in correct choices:

$$\text{HE } (1.04888-0.12934)/1.04888 = .877 = 88\%$$

$$\text{MO } (3.26123-1.63551)/3.26123 = .498 = 50\%$$

$$\text{FA } (2.45312-1.50508)/2.45312 = .386 = 39\%$$

Supplemental Analysis

Using an exploratory approach, several regression models were run to look at relationships between selected variables and the number of correct choices on the paired-comparison task. The selected independent variables included nutrition knowledge (based on the FNQ score), food motives and NFC. Based on this exploratory process, a stepwise regression that included health, mood, sensory appeal, weight control and familiarity as independent variables was found to have a significant linear relationship, $F(5,96)=13.461, p<.000$. The multiple correlation coefficient was .642 with 42% of the variance of number of correct choices being accounted for by the five food motives (health, mood, sensory appeal, weight control and familiarity).

Other Demographic Findings

With respect to health history problems, the majority of respondents stated that they had no health problems (62=60.8%). The remaining respondents noted multiple health problems from the

provided list with the majority of the group having 2 co-morbid conditions (co-morbidity ranging from 2 to 5 conditions). Examining the reported co-morbid conditions, the most commonly occurring conditions were diabetes followed closely by hypertension. This finding is congruent with common health problems seen in the United States population. Allergies (8=7.8%) and the self-reported category of other (8=7.8%) were noted with equal frequency. However, since respondents were able to select all that apply, the total number of responses that included other was 16 (15.7%). With respect to the other category, the following categories were represented equally as being the most commonly occurring health problems: asthma, cardiac, endocrine and orthopedic diseases.

The majority of respondents (71.6%, n=73) stated that they did not follow any type of specific dietary pattern related to health problems. Of the individuals who reported following a dietary plan, 21.6% (n=22) stated that it was self-imposed. Although the majority of respondents did not follow any specific dietary pattern, 59.8% (n=61) reported that they had been on a diet. When considering food restriction as an effort to control weight, 72.6% (n=74) of the respondents indicated following some type of food restriction pattern even though 40.2% (n=41) of the students stated that they have never been on a diet.

With respect to medications, 47.1% stated that they did not take any medications (n=48). As this was a “select all that applies” question, subjects reported taking medications in several categories, prescription (19.6%, n=20), over the counter medications (4.9%, n=5) and supplements (10.8%, n=11) as well as combinations of all three categories.

The majority of respondents reported that they never received nutritional counseling as part of their medical course of treatment (87=85.3%). When asked about identifying sources who provided nutritional counseling, the respondents identified counseling from their primary care physician as being their primary source of information (8=7.8%) followed by a dietician (7=6.9%) and lastly by a nurse practitioner (4= 3.9%). Most of the visits occurred in the office setting across all levels of healthcare providers. Three individuals selected other as their source of nutrition counseling citing migraine web site, Orian nutrition counseling, and job.

Specific to food allergies, the overwhelming majority of respondents stated that they did not have a food allergy (88=86.3%). The most reported item was lactose intolerance. As this was a “select all that applies” question, many of the respondents indicated that they had multiple allergy profiles ranging from one to up to three reported food allergies. However, the other category had the highest reported

frequency (7=6.86%). Several of the responses noted non-food related allergies such as seasonal, environmental and medication. The only specified food related allergies were to milk, citrus fruits, aged cheese and monosodium glutamate (MSG).

Data related to occupational status revealed the majority of respondents (80=78.4%) worked outside the home either in a full time (46=45.1%) or part time basis (34=33.3%) with 22 (21.6%) students who stated that they did not work outside the home. Combining the self-reported occupation into four general categories, the following areas were identified: service/business (n=50) 49%, health care (n=32) 31.37%, home/student (n=20) 19.6 %. The service business category included customer service and business administration jobs. The health care category included medical office/hospital/ social work, certified nursing assistants, nurses and fire fighter/paramedic jobs. The majority of students who participated in this study were considered to be full time students (59=57.8%) with the overwhelming majority in the health program fields (75=73.5%).

Data related to how the respondents obtained their nutrition knowledge background revealed the majority of respondents had a formal nutrition course in college at an undergraduate level (35=34.3% reported frequency with summation score of 54 = 52.9%). The second highest reported category was no formal nutrition classes

during schooling (26=25.5% reported frequency with summation score of 29=28.4%). Since this was a select all that apply question, the data for each individual was coded as a summation score across all of the options listed. Nutrition education reported during the High School years was noted as being formal (16=15.7%) or integrated (11=10.8%). Nutrition courses on a graduate level were cited on a limited basis (3=2.9%). Several respondents indicated continuing education activities (8=7.8%) provided their nutrition knowledge background. Four respondents selected the other category but eleven responses were provided in the category box. The majority of respondents who selected other indicated that they were self-taught with respect to their nutritional background.

The top three identified nutrition information sources by the respondents were family and friends, magazine and healthcare provider (n=8=7.8%). Of the 11 reported other entries the majority noted the Internet as a source of nutrition information. Respondents were directed to select the top three items but many of the respondents did not follow the directions either selecting a single item or more than three items thus the question can not be evaluated completely given these constraints.

Summary

This chapter addressed the results obtained from the Nutrition Survey instrument. Attention was focused on preliminary data analysis with a detailed analysis of the paired comparison task and resultant preference structures. Subsequently, hypothesis tests/research questions and supplemental data analysis were presented.

Chapter 5: Discussion

The following chapter will provide interpretations of data analyses, limitations of research methods, implications for future nursing practice and recommendations to help improve health outcomes of young adults in the area of dietary choice. Examination of expected and unexpected outcomes will be considered in light of the literature reviewed.

Purpose Statements-Hypotheses

The present study was designed to examine how individuals made snack food choices based on food motives (cues). General food motives were determined prior to the food-pairing task and appropriateness scores were calculated based on selected nutritional parameters. Nutrition knowledge, specific food-related motives and information processing style (NFC) were analyzed for their relative impact on dietary choice and accuracy. The results of this study indicate that nutrition knowledge had limited impact on one's ability to make correct (healthier) snack food choices. Nutrition knowledge did not predict correct choice in the food-pairing task. However, the number of correct choices on the food paired comparison task did

show an interesting relationship to preference orders. This fact is well documented in the research literature as several studies have noted that nutrition knowledge is at best a poor predictor when applied to food selection activities or nutrition testing (ADA Position, 2002, Anderson, 1994, Brunstrom, 2004, Crites Jr. & Aikman, 2005, Papakon et al. 2002, Wansink, Westgren & Cheney, 2005).

Hypothesis 1 was not supported. It was hypothesized that individuals with more nutrition knowledge will put more emphasis on health, natural content, weight control and ethical concerns motives than individuals with less nutrition knowledge. Even though there were relative increases in several motive weights as a moderating effect of nutrition knowledge (health, sensory appeal, natural content, familiarity and ethical concern) and decreases in other food motives (mood, convenience, price and weight control), none of the moderating effects of nutrition knowledge were found to be significant.

Hypothesis 2 was partially supported. It was hypothesized that individuals with more nutrition knowledge will make more appropriate choices (greater number of "correct" choices out of 45 possible) on the paired comparison task. Regression analysis revealed no support for this hypothesis but correlations of preference orders and appropriateness index did. There was a moderately strong relationship between the preference order for the high correct choice group and the

order of the foods on the appropriateness index. While this correlation does not imply cause and effect, it still does represent a positive relationship between both variables. In contrast, the preference order for the low correct choice group showed a negative correlation.

Hypothesis 3A was not supported. It was hypothesized that individuals with a nutrition knowledge background will have higher scores on the Food Knowledge Questionnaire (FNQ) than individuals who did not have a nutrition background. There was a small difference in the means for each group, 13.05 for those with a nutrition background and 12.73 for those who did not have a nutrition knowledge background. This finding may have been influenced by several factors. The first being that the majority of the sample was enrolled in either a college nutrition class and/or enrolled in a health program therefore they were equally aware of nutrition as a content area. Another issue that may have affected the result was the way nutrition background was operationally defined. If subjects were categorized differently on nutrition background (based on individuals levels of the multiple select all that apply question) rather than as a composite measurement, perhaps there might have been more support for the hypothesis. In future research, a more accurate measure of nutrition knowledge background should be used. The final factor that may have influenced the result was the reliability of the

FNQ instrument. In the original study by Parmenter and Wardle (1999) reporting on the psychometrics of the NKQ, the instrument was used on a sample containing dietetic students and computer science students. The highest possible score on the section was 69. The average mean score for the dietetics was 62.2 and 40.4 for the computer science students. The average grade for the computer science student was 59% as compared to 90% for the dietetic students. Subsequently, the NKQ was used in a study on the general population in England. The reported scoring for this section was 45.6 out of a total 69 points indicating that the general population had an average score of 66% on this portion of the instrument (Parmenter, Waller & Wardle, 2000). The average score on the FNQ for the sample was 43%, which is considerably lower. Therefore, the measurement tool used to indicate nutrition knowledge was considered to be a difficult test. While the NKQ was used as the original source for the development of the FNQ, there are several critical differences that may affect comparative interpretation. The portion of the NKQ that was used contained twenty-one questions with several of them having multiple parts using likert type rankings of high, low and not sure. The FNQ by contrast contained only multiple choice items that asked respondents to make a single choice. The instrument needs revision if

it is to be used as a measurement of nutrition knowledge in future studies.

Hypothesis 3B was not supported. It was hypothesized that high need for cognition individuals will use more dimensions to choose their food options than will low need for cognition individuals. Comparison of mean scores on the 9 general food motives for high and low NFC subjects did not show any significance based on *t* test results.

Other Findings

Preference scaling analysis revealed distinct preference structures for the high BMI group as compared with the low BMI group. Individuals with high BMI viewed snack food items more consistently suggesting that BMI may play a role in perception of food choice. This is in contrast with other beliefs that high BMI individual's food selection is more likely to be associated with increased food consumption patterns independent of preference. Even though perception and consumption is not the same thing, the fact that the high BMI group showed a greater consistency in the paired food comparison task should be explored further for the use of possible behavioral approaches that may assist towards making healthier dietary choices for those individuals.

Preference scaling analysis also revealed distinct preference structures for the high correct choice group. The high correct choice

group had the largest scalability index (.51). As the number of correct choices was based on the appropriateness index, students used their nutrition knowledge to make distinct choices between the snack food items.

Analysis of the demographic portion of the survey noted some interesting results. Even though the majority of respondents indicated that they did not have a health history problem, those who did indicated multiple chronic disease processes (co-morbidities). As there was no specific question directed to ascertain general health status, the respondents were by default considered to be healthy even though some had reported health conditions. This is consistent with clinical evidence that health is perceived on a continuum rather than as a discrete entity.

The majority of respondents indicated that they took medications either prescribed, over the counter or supplements. Taking medication may not be associated with a medically defined diagnosis as individuals have access to over the counter medications that are indicated for specific types of medical problems without a prescription. Further inquiry would be needed to determine the relative effects of pharmacological interventions. Nutrition counseling was not seen as a significant part of the individual's plan of treatment. When nutrition

counseling was included, the primary source was the physician in the office setting.

The majority of individuals reported no food allergies. This fact was found to be somewhat surprising since food allergen identification is prevalent in the economic marketplace. The majority of the sample population indicated that they had experienced some degree of food intake restriction (72.6%) and had been on a diet (59.8%). Whether this is a general finding or specific to this sample population cannot be adequately addressed given that the demographic question design was more exploratory than confirmatory.

Limitations

There were several limitations encountered during the course of the research that can be categorized into the following areas: computer system problems, response rates, issues affecting power, sampling characteristics, respondent burden and issues relating to the survey instrument. Each of these areas will be discussed separately.

There were several computer system problems that occurred during the course of the data collection that were not anticipated. Even though the learning management system had the capability of running a survey, compiling and exporting results, there were additional operating glitches that occurred. The surveys were uploaded as separate distinct entities and programmed so that people

could not proceed to the next part without all of the questions being answered. Even with this set up being verified, there were still subjects that had non-sequential submissions.

Another issue of concern related to the learning management system was due to the fact there were multiple select all that apply questions in the survey. Some of the respondents did not follow the stated directions and selected none and other at the same time. The survey could not be set up to lock out participants who had selected none from making other choices in the select all that apply questions. Therefore, it was difficult to ascertain results for many of these select all that apply questions. Both of these issues suggest that while learning management systems may offer survey capability, it may be more prudent to only use systems that are designed specifically for survey delivery.

Another limitation encountered was poor response rate. Even though reminders to complete the survey were posted each week on the community board announcement page, there was not an appreciable increase in response rates as the survey proceeded. In addition, group e-mails were sent to all members of the community group letting them know that the survey was still available for completion. This may have been due to the fact that even though the convenience sample was substantially large (7,700), the student may

have not been familiar with how to access the community group site. Efforts to have eligible students link to a direct page outside of the community group site was not an available option on the learning management system. The only direct link that could be set up was inside the community group. Since a direct link was not available, directions for locating and accessing the community group site were provided in the e-mails sent to all group members.

The small sample size was viewed as a limitation in that it affected the amount of power obtained in some areas of analysis. This may be due in part to the fact that a large portion of the total survey (100) was not completed and therefore even though there were 278 completions for the paired comparison task (part 4B of the survey) the entire number could not be used for data analysis. Even though there were 177 completed surveys, preliminary data analysis checking for patterned response and violation of the principle of transitivity were necessary in order to verify that the respondent's choices were not random. In view of the total sample used for final data analysis, the research was underpowered.

Sampling characteristics proved to be another area of limitation. As there was a lack of diversity in the sample size, findings may not be generalizable to community college students in other areas of the country. The ethnicity of the sample was primarily Caucasian which

although is consistent with the ethnicity at this institution, it may not be reflective of the general public attending community colleges in other geographic areas. Another limitation found in sampling characteristics was that the majority of respondents were primarily students in health related areas. Again, this is consistent with this institution as health programs reflect a large majority of the available programs of study at this institution.

Respondent burden was noted as a limitation as the survey consisted of multiple sequential parts. It was thought that the length of time needed to complete the total survey might prove to be a factor in completion of submissions. Piloting of the length of time for the survey noted a completion time of 35 minutes with cable internet connection. Therefore the survey was set up so that an individual could complete the sections at different times during the data collection time frame. Since the survey was available over a period of several weeks and could be resumed at any time during the availability period, calculation of total time spent was not evaluated, as it would not represent a true measure of respondent burden. One could also suggest that respondent burden might be increased as a consequence of serial survey completions (stopping and starting often), however since the Internet connectivity was thought to be of greater concern

(loading of graphic images and multiple pages); the survey remained open with no time constraints during the period of availability.

The last limitation category to be addressed is issues related to the survey instrument. The first area of concern is the sequencing of the survey instrument. The survey proceeded in the same sequence for all respondents. This may have introduced bias such as increased likelihood to either not complete the survey or just select the same answer for different parts of the survey in order to get done faster. Therefore, this could have contributed to the occurrence of patterned responses and violations of the principle of transitivity. Even with randomization of survey parts, respondents still may have decided not to complete the entire survey. The final issue related to the survey instrument is that the FNQ did not prove to be a reliable measurement for nutrition knowledge. The tool examined application of nutritional principles with respect to food selection rather than general nutrition knowledge specific to portion size, fat, salt, sugar, protein and fiber content. However, one can speculate that perhaps the subjects had general nutrition knowledge related to these content areas but could not apply the information in application type questions. Future research in this area should focus on the development of a tool that can adequately address both general nutrition knowledge concepts as

well as application of nutritional principles with respect to food selection.

Implications for Future Nursing Practice

These findings confirm that dietary choice is a complicated procedure involving influences of multiple internal and external sources. While this research specifically addressed snack food options, the findings showed that there are different preference structures among groups based on age, BMI and the number of correct answers obtained on the food-pairing task. The concept of nursing practice includes the areas of clinical management, education and research. Each area will be addressed separately with respect to implications for future practice.

In the clinical area of nursing practice, nurses and nurse practitioners can incorporate nutritional counseling as part of their treatment protocol with clients. Nurses can incorporate nutritional principles into areas of primary prevention and health promotion strategies in order to improve client outcomes. For example, during nurse-client interactions, visualization of portion sizes can be used as a teaching/evaluation method in order to facilitate clients to make healthier food choices. This method utilizes common objects (such as a deck of cards to correspond to a one unit serving size of meat) as an indirect measurement of accurate portion for food items based on

serving size. Nurses will be able to directly observe a client's application of food choice based on the utilization of this method. This will serve as a point of reference for the client's understanding of portion size.

In the area of nursing education, nutrition courses are usually part of most health programs curriculum, either as a pre-requisite or co-requisite course. It is important to actively engage nursing students taking nutrition courses so that they incorporate nutrition principles as part of their professional training. The findings of this study suggested that most individuals obtain their nutrition information from family and friends, magazines and healthcare provider even though they had taken a nutrition course while at school. However, only a small portion of the sample indicated that they had received nutrition counseling as part of their medical care. It is therefore critically important to increase not only the amount of accurate nutrition information made available to students but to also incorporate nutrition as a significant curriculum thread in all education programs. While the sample consisted of primary students enrolled in health programs, all individuals need to have accurate nutrition information as part of the educational process. Nutrition education should focus on providing students with practical information related to nutrient composition thereby facilitating healthier food choices.

Nutrition information should continue to be integrated across the health programs curriculum so that students can update and apply information in their clinical practice settings. Additionally, information related to nutrition counseling and medical nutrition therapy should be included in health programs curriculum (Taren, Thomson, Koff, Gordon, Marian, et al., 2001). This type of therapy has proven to be effective in decreasing hospitalizations and medical costs associated with commonly occurring disease processes (A nation at risk, 2005).

With respect to research, nurses are in an excellent position to do clinical research in community and practice settings to examine the complex issues that affect dietary choice. The results of this study indicate that judgment theory may help nurse researchers to understand the complex decision making process of dietary choice. By becoming more involved in research that focuses on nutritional content related issues, nurse researchers will be able to add to the body of knowledge as diet and nutrition concerns are highly visible areas of public interest.

Recommendation

Based on the findings from this research, the following recommendation is provided to improve health outcomes of community college students. A campus wide health promotion program should be instituted based on providing information to

students concerning nutrient composition, improving accessibility of healthier food choices on campus and incorporating the appropriateness index to rank available snack foods on campus so that students can make an informed decision.

Students should be given information related to nutrient composition of popular snack foods to facilitate healthier choices. This can be accomplished by designing an interactive module with the factual information and placing it on the community college web site as an available resource to all enrolled students. Nurse educators can work with instructional technology designers to create a module for this purpose.

As nutrition knowledge is not the only factor in selecting appropriate foods, attention should also be directed to the accessibility of healthier foods. Therefore, healthy snack foods should be available in vending machines and cafeterias on college campuses. Without easy access to healthier food selections, students will not be able to act on their nutrition knowledge and will be more likely to eat unhealthier high carbohydrate and high fat foods.

Colleges should use the appropriateness index as part of a college wide health promotion program to make obtaining the healthiest snacks as convenient as the least healthy ones. The appropriateness index is easily constructed using four nutrient

categories (calories from fat, sodium, cholesterol and carbohydrate content) and interpreted as it provides a rank order listing. Food service departments in community colleges should be encouraged to actively seek healthier snack food choices for their student population.

Conclusion

Dietary choice represents a complex area of human behavior. There are no simple solutions whereby nutrition knowledge by itself correlates with better health outcomes. The decision making process utilizes both internal and external cues that are moderated by life cycle events (aging) and environment. Economic constraints although not specified as a significant contributory factor should be evaluated for their potential impact on food selection. The snack food choices that individuals make are in part a result of personal preference and convenience. Food marketing strategies already focus on these areas in order to promote sales of food products. Health care professionals should also focus on these areas in order to promote healthier food decisions.

It is important for nurses and others who provide nutrition counseling to understand that individuals exhibit differences in how they perceive individual foods. The primary function of food is as a fuel source to replenish nutrient stores. However, the intake of foods is also correlated with overall health status and impacted by other

factors beyond the need for nutrients. The type and nature of food intake is of particular importance in health assessments.

Understanding the motives that underlie food preferences can inform education and policy efforts to improve the health for all.

References

A nation at risk: Obesity in the US. A statistical source book. American Heart Association (AHA) & Robert Wood Johnson Foundation (RWJ), 2005.

<http://www.americanheart.org/downloadable/heart/1114880987205NationAtRisk.pdf>

A New American Plate. (2004). American Institute for Cancer Research. Retrieved May 25, 2008 from

<http://aicr.convio.net/site/DocServer/nap.pdf?docID=134&AddInterest=1421>

ADA Position: Total diet approach to communicating food and nutrition information. (2002). *Journal of the American Dietetic Association*, 102(1), 100-108.

Adamson, A.J. & Mathers, J.C. (2004). Effecting dietary change. *Proceedings of the Nutrition Society*, 537-547.

Aikman, S.N. & Crites, Jr., S.L. (2005). Hash browns for breakfast, baked potatoes for dinner: Changes in food attitudes as a function of motivation and context. *European Journal of Social Psychology*, 35,181-198.

Aiman-Smith, L., Scullen, S.E. & Barr, S.H. (2002). Conducting studies of decision making in organizational contexts: A tutorial for

policy-capturing and other regression-based techniques.

Organizational Research Methods, 5(4), 388-414.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Making Processes*, 50, 179-211.

American Health Rankings 2005 edition. Prevalence of Obesity.

Retrieved May 25, 2008 from

<http://www.unitedhealthfoundation.org/shr2005/components/obesity.html>

Anderson, J.E. (1994). What should be next for nutrition education? *Journal of Nutrition*, 124(9S), 1828S-1832S.

Angel Learning. (2006). Retrieved May 25, 2008 from

<http://www.angellearning.com/>

AOA Fact Sheets. Obesity in Youth. (2005). Retrieved May 25, 2008 from http://www.obesity.org/subs/fastfacts/obesity_youth.shtml

Balzer, W.K., Doherty, M.E. & O'Connor, Jr., R. (1989). Effects of cognitive feedback on performance. *Psychological Bulletin*, 106(3), 410-433.

Baranowki, T. (2006). Advances in basic behavioral research will make the most important contributions to effective dietary change programs at this time. *Journal of the American Dietetic Association*, 106(6), 808-811.

Baron, J. (2004). Normative models of judgment and decision making. In D.J. Koehler & N. Harvey (Eds.), *Blackwell Handbook of Judgment and Decision Making* (pp. 19-36). Malden, MA: Blackwell.

Barratt, J. (2001). Diet-related knowledge, beliefs and actions of health professionals compared with the general population: an investigation in a community trust. *Journal of Human Nutrition Dietetics*, 14, 25-32.

Bellisle, F. (1999). Food choice, appetite and physical activity. *Public Health Nutrition*, 2(3A), 357-361.

Binkley, J.K. Eales, J. & Jekanowski, M. (2000). The relation between dietary change and rising US obesity. *International Journal of Obesity Related Metabolic Disorders*, 24(8), 1032-1039.

Birch, L. L. (1999). Development of food preferences. *Annual Reviews in Nutrition*, 19, 41-62.

Birch, L. L. (1998). Psychological influences on the Childhood Diet. *The Journal of Nutrition*, 128, 407S-410S.

Brinberg, D., Axelson, M.L. & Price, S. (2000). Changing food knowledge, food choice, and dietary fiber consumption by using tailored messages. *Appetite*, 35(10) 35-43.

Brunstrom, J.M. (2005). Dietary learning in humans: directions for future research. *Physiology and Behavior*, 85(1), 57-65.

Brunstrom, J.M. (2004). Does dietary learning occur outside awareness? *Consciousness and Cognition*, 13(3), 453-470.

Buscher, L.A., Martin, K.A. & Crocker, S. (2001). Point-of-purchase messages framed in terms of cost, convenience, taste and energy improve healthful snack selection in a college foodservice setting. *Journal of the American Dietetic Association*, 101(8), 909-913.

Butchko, H.H. & Peterson, B.J. (2004). The obesity epidemic. Stakeholder initiatives and cooperation. *Nutrition Today*, 39(6), 235-244.

Buttriss, J., Stanner, S., McKeivith, B., Nugent, A., Kelly, C., Phillips, F., et al. (2004). Successful ways to modify food choice: lessons from the literature. *Nutrition Bulletin*, 29,333-343.

Cacioppo, J.T. & Petty, R.E. (1982). The need for cognition. *Journal of Personality and Social Psychology*, 42, 116-131.

Calfas, K.J., Zabinski, B.A. & Rupp, J. (2000). Practical nutritional assessment in primary care settings. *American Journal of Preventive Medicine*, 18(4), 289-299.

Calorie consumption on the rise in the United States, particularly among women. National Center for Health Statistics Fact Sheet.

(2004). Retrieved May 25, 2008 from

<http://www.cdc.gov/nchs/pressroom/04news/calorie.htm>

Camire, M.E. & Dougherty, M.P. (2005). Internet survey of claimed nutrition knowledge. *Journal of Food Science Education*, 4, 18-21.

Cantin, I. & Dube, L. (1999). Attitudinal moderation of correlation between food liking and consumption. *Appetite*, 32, 367-381.

Catt, C.J. (1986). The scientific base for decision making. *The American Journal of Clinical Nutrition*, 44, 571-575.

Cason, K. & Wenrich, T. (2002). Health and nutrition beliefs, attitudes and practices of undergraduate college students: A needs assessment. *Topics in Clinical Nutrition*, 17(3), 52-70.

CDC Behavioral Risk Factor Surveillance System (BRFSS). (2006). Overweight and obesity trends: US obesity trends 1985-2005. Retrieved May 25, 2008 from

<http://www.cdc.gov/nccdphp/dnpa/obesity/trend/maps/>

CDC Behavioral Risk Factor Surveillance System (BRFSS) Prevalence Data Florida – 1998 Weight Control. Are you now trying to lose weight? Retrieved May 25, 2008 from

<http://apps.nccd.cdc.gov/brfss/display.asp?cat=WC&yr=1998&qkey=4386&state=FL>

CDC Behavioral Risk Factor Surveillance System (BRFSS) Prevalence Data Florida – 1998 Weight Control. Are you trying to maintain your current weight, that is, to keep from gaining weight?

Retrieved May 25, 2008 from

<http://apps.nccd.cdc.gov/brfss/display.asp?cat=WC&yr=1998&qkey=4387&state=FL>

Chica, M. (2000). Food selection through life span: Discrete changes or continuous processes? *Food Selection: From genes to culture*. Retrieved May 25, 2008 from

http://www.danoneinstitute.org/publications/book/pdf/food_selection_06_chiva.pdf

Choo, E.U. & Wedley, W.C. (2004). A common framework for deriving preference values from pairwise comparison matrices.

Computers & Operations Research, 31, 893-908.

Chung, S.J., Hoerr, S., Levine, R. & Coleman, G. (2006). Processes underlying young women's decisions to eat fruits and vegetables. *Journal of Human Nutrition*, 19(4), 287-298.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences 2nd Edition*. New York: Lawrence Erlbaum Assoc. Inc.

Cooksey, R.W. (1996). *Judgment analysis. Theory, methods and applications*, California: Academic Press, Inc.

Cordery, H. (2006). Nutritional knowledge of health care professionals working in the eating disorders. *European Eating Disorder Review*, 14(6), 462-467.

Cotugna, N. & Vickery, C.E. (1994). College student's awareness, knowledge, and compliance with food guide pyramid

recommendations. *American Journal of Health Promotion*, 8(6), 417-419.

Coulston, A.M. (2001). The search continues for a tool to evaluate dietary quality (Editorial). *American Journal of Clinical Nutrition*, 74, 417.

Cousineau, T.M., Goldstein, M. & Franko, D.L. (2004). A collaborative approach to nutrition education for college students. *Journal of American College Health*, 53(2), 79-84.

Crites, Jr., S.L. & Aikman, S.N. (2005). Impact of nutrition knowledge on food evaluations. *European Journal of Clinical Nutrition*, 59, 1191-1200.

Cousineau, T.M., Goldstein, M. & Franko, D.L. (2004). A collaborative approach to nutrition education for college students. *Journal of American College Health*, 53(2), 79-84.

Crossley, M. & Khan, S. (2001). Motives underlying food choice: dentists, porters and dietary health promotion. *British Dentistry Journal*, 191(4), 198-202.

Dausch, J. (2001). Determining when obesity is a disease. *Journal of the American Dietetic Association*, 3, 293.

Davy, S.R., Benes, B.A. & Driskell, J.A. (2006). Sex differences in dieting trends, eating habits, and nutrition beliefs of a group of

midwestern college students. *Journal of the American Dietetic Association*, 106(10), 1673-1677.

Denig, P., Wahlstrom, R., Chaput de Saintonge, M., & Haaijer-Ruskamp, F. (2002). The value of clinical judgment analysis for improving the quality of doctor's prescribing decisions. *Medical Education*, 36, 770-780.

Devine, C.M., Connors, M.M., Sobal, J. & Bisogni, C.A. (2003). Sandwiching it in: spillover of work onto food choices and family roles in low-and moderate-income urban households, *Social Science & Medicine*, 56(3), 617-630.

Dietary guidelines for Americans 2005 (2005). Retrieved May 25, 2008 from <http://www.healthierus.gov/dietaryguidelines/index.html>

Diliberti, N., Bordi, P.L., Conklin, M.T., Roe, L.S. & Rolls, B. (2004). Increased portion size leads to increased energy intake in a restaurant meal. *Obesity Research*, 12(3), 562-568.

Dinkins, J.M. (2000). Beliefs & attitudes of Americans toward their diet. *Nutrition Insight*, 19, Retrieved May 25, 2008 from <http://www.usda.gov/cnpp/Insights/Insight19.PDF>

Dixon, L.B., Cronin, F.J. & Krebs-Smith, S.M. (2001). Let the pyramid guide your food choices: Capturing the total diet concept. *Journal of Nutrition*, 131, 461S-472S.

Drewnoski, A. (2000). Taste, genetics and food choices. *Food selection: From genes to culture*. Retrieved May 25, 2008 from http://www.danoneinstitute.org/publications/book/pdf/food_selection_02_drewnowski.pdf

Drewnoski, A. & Darmond, N. (2005). Food choices and diet costs: An economic analysis. *Journal of Nutrition*, 135,900-904.

Drewnoski, A. & Hann, C. (1999). Food preferences and reported frequencies of food consumption as predictors of current diet in young women. *American Journal of Clinical Nutrition*, 70, 28-36.

Dube, L. & Cantin, I. (2000). Promoting health or promoting pleasure? A contingency approach to the effect of informational and emotional appeals on food liking and consumption. *Appetite*, 35,251-262.

Dunn-Rankin, P. & King, F. (1969). Multiple comparisons in a simplified rank method of scaling. *Educational and Psychological Measurement*, 29, 513-329.

Dunn-Rankin, P., Knezek, G.A., Wallace, S.R. & Zhang, S. (2004). *Scaling Methods* 2nd edition. New Jersey: Lawrence Erlbaum Associates.

Eertmans, A., Baeyens, F. & Van den Bergh, O. (2001). Food likes and their relative importance in human eating behavior: review

and preliminary suggestions for health promotion. *Health Education Research Theory & Practice*, 16(4), 443-456.

Fila, S.A. & Smith, C. (2006). Applying the theory of planned behavior to healthy eating behaviors in urban Native American youth. *International Journal of Behavioral Nutrition and Physical Activity*, Retrieved May 25, 2008 from <http://www.ijbnpa.org/content/3/1/11>

Finckenor, M. & Byrd-Bredbenner, C. (2000). Nutrition intervention group program based on preaction-stage oriented change processes of the Transtheoretical model promoting long-term reduction in dietary fat intake. *Journal of the American Dietetic Association*, 100(3), 335-342.

Foote, J.A., Murphy, S.P., Wilkens, L.R., Basiotis, P.P. & Carlson, A. (2004). Dietary variety increases the probability of nutrient adequacy among adults. *Journal of Nutrition*, 134, 1779-1785.

French, S.A. (2003). Pricing effects on food choices. *Journal of Nutrition*, 133(3), 841S-843S.

French, S.A., Jeffrey, R.W., Story, M., Breitlow, K.K., Baxter, J.S., Hannan, P. & Snyder, M.P. (2001). Pricing and promotion effects on low-fat vending snack purchases: The CHIPS study. *American Journal of Public Health*. 91(1), 112-117.

Furst, T., Connors, M., Bisogni, C.A., Sobal, J. & Winter Falk, L. (1996). Food choice: A conceptual model of the process. *Appetite*, 26,231-238.

Gacula, Jr. M.C. (2004). *Design and Analysis of Sensory Optimization*. NY: Wiley-Blackwell.

Garson, G.D. (2006). Logistic regression. Retrieved May 25, 2008 from <http://www2.chass.ncsu.edu/garson/PA765/logistic.htm>

Gedrich, K. (2003). Determinants of nutritional behaviour: a multitude of levers for successful intervention? *Appetite*, 41(3), 231-238.

Georgious, C., Betts, N., Hoerr, S., Keim, K., Peters, P., Stewart, B. et al. (1997). Among young adults, college students and graduates practiced more healthful habits and made more health food choices than did nonstudents. *Journal of the American Dietetic Association*, 97(7), 754-759.

Getting Started (2006). Retrieved May 25, 2008 from http://www.mypyramid.gov/downloads/MyPyramid_Getting_Started.pdf

Gibson, E. (2006). Emotional influences on food choice: Sensory, physiological and psychological pathways. *Physiology & Behavior*, 89, 53-61.

Glanz, K. (1999). Progress in dietary behavior change. *American Journal of Health and Promotion*, 14(2), 112-117.

Glanz, K., Basil, M., Maibach, E., Goldberg, J. & Snyder, D. (1998). Why Americans eat what they do: Taste, nutrition, cost, convenience and weight control concerns as influences on food consumption. *Journal of the American Dietetic Association*, 98(10), 1118-1126.

Glasgow, R., Klesges, L., Dzewaltowski, D., Bull, S., & Estabrooks, P. (2004). The future of health behavior change research: What is needed to improve translation of research into health promotion practice? *Annals of Behavioral Medicine*, 27(1), 3-12.

Godin, G. & Kok, G. (1996). The theory of planned behavior: A review of its applications to health-related behaviors. *American Journal of Health Promotion*, 11(2), 87-98.

Goldberg, J.P., Belury, M.A., Elam, P., Finn, S.C., Hayes, D., Lyle, R., St. Jeor, S., Warren, M. & Hellwig, J.P. (2004). The obesity crisis: don't blame it on the pyramid. *Journal of the American Dietetic Association*, 104(7). 1141-1147.

Goldstein, W.M. (2004). Applying and extending Brunswik's probabilistic functionalism. In D.J. Koehler & N. Harvey (Eds.), *Blackwell Handbook of Judgment and Decision Making* (pp. 37-61). Malden, MA: Blackwell.

Green, S. & Watson, R. (2005). Nutritional screening and assessment tools for use by nurses: literature review. *Journal of Advanced Nursing*, 50(1), 69-83.

Greene, G.W. & Rossi, S.R. (1998). Stages of change for reducing dietary fat intake over 18 months. *Journal of the American Dietetic Association*, 98(5), 529-534, quiz 535-536.

Greene, G.W., Rossi, S.R., Reed, G.R., Willey, C. & Prochaska, J.O. (1994). Stages of change for reducing dietary fat to 30% of energy or less. *Journal of the American Dietetic Association*, 94(10), 1105-1110, quiz 1111-1112.

Greene, G.W., Rossi, S.R., Rossi, J.S., Velicer, W.F., Fava, J.L. & Prochaska, J.O. (1999). Dietary applications of the stages of change model. *Journal of the American Dietetic Association*, (6), 673-678.

Grogan, S.C., Bell, R. & Conner, M. (1997). Eating sweet snacks: Gender differences in attitudes and behaviors. *Appetite*, 28, 19-31.

Guenther, P.M., Jensen, H.H., Batres-Marquez, S.P. & Chen, C.F. (2005). Sociodemographic, knowledge, and attitudinal factors related to meat consumption in the United States. *Journal of the American Dietetic Association*, 105(8), 1266-1274.

Hamilton, J., McIlveen, H. & Strugnell, C. (2000). Educating young consumers – a food choice model. *Journal of Consumer Studies & Home Economics*, 24(20), 113-123.

Hammond, K.R., Hursch, C.J. & Todd, F.J. (1964). Analyzing the components of clinical inference. *Psychological Review*, 71, 438-456.

Harris-Davis, E. & Haughton, B. (2000). Model for multicultural nutrition counseling competencies. *Journal of the American Dietetic Association*, 100, 1178-1185.

Healthy People 2010: Understanding and improving health. (2000). Retrieved May 25, 2008 from http://www.healthypeople.gov/Document/html/uih/uih_4.htm#overandobese

Hendel, D. (1977). Intransitivity on paired-comparisons instruments: The relationship of the total circular triad score to stimulus circular triads. *Applied Psychological Measurement*, 1(3), 403-411.

Henry, H., Reimer, K., Smith, C. & Reicks, M. (2006). Associations of decisional balance, processes of change, and self-efficacy with stages of change for increased fruit and vegetable intake among low-income, African-American mothers. *Journal of the American Dietetic Association*, 106(6), 841-849.

HLM (2004) Hierarchical Linear and Nonlinear Modeling. SSI Scientific Software International (Version 6).

Hoffman, D.J., Policastro, P., Quick, V. & Lee, S.K. (2006). Changes in body weight and fat mass of men and women in the first year of college: A study of the "freshman 15". *Journal of American College Health*, 55(1), 41-45.

Horgen, K.B. & Brownell, K.D. (2002). Comparison of price change and health message interventions in promoting healthy food choices. *Health Psychology*, 21(5), 505-512.

Hurling, R. & Shepherd, R. (2003). Eating with your eyes: effect of appearance on expectations of liking. *Appetite*, 41(2), 167-174.

Hutchinson, J.M.C. (2005). Is more choice always desirable? Evidence and arguments from leks, food selection, and environmental enrichment. *Biological Reviews*, 80, 73-92.

Iniss, S., Bahlo, E. & Kardinaal, A. (1999). Beyond implementation: The role of physicians, healthcare professionals and consumers in the development and use of food products. *European Journal of Clinical Nutrition*, 53(S), S25-S29.

International Physical Activity Questionnaire (IPAQ). (n.d.). Retrieved May 25, 2008 from <http://www.ipaq.ki.se/>

Jabs, J. & Devine, C. M. (2006). Time scarcity and food choices: An overview. *Appetite*, 47(2), 196-204.

- Jackson, B., Cooper, L., Mintz, L. & Albino, A. (2003). Motivations to eat: Scale development and validation. *Journal of Research in Personality*, 37, 297-318.
- Jakicic, J. & Otto, A. (2005). Motivating change: Modifying eating and exercise behaviors for weight management. *Health & Fitness Journal*, 9(1), 6-12.
- Jeffrey, R. W. (2004). How can health behavior theory be made more useful in intervention research? Retrieved May 25, 2008 from <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=509286>
- Jeffrey, R.W. (1996). Does weight cycling present a health risk? *American Journal of Clinical Nutrition*, 63S, 452S-455S.
- Jones, J.M. (2004). Development of a nutritional screening or assessment tool using a multivariate technique. *Nutrition*, 20, 298-306.
- Jones, M. (2002). The methodology of nutritional screening and assessment tools. *Journal of Human Nutrition Dietetics*, 15, 59-71.
- Jones, M. (2004). Reliability of nutritional screening and assessment tools. *Nutrition*, 20(3), 307-311.
- Jones, M. (2004). Validity of nutritional screening and assessment tools. *Nutrition*, 20(3), 312-317.
- Kant, A. (2004). Dietary patterns and health outcomes. *Journal of the American Dietetic Association*, 104, 615-635.

Kaplan, M., Kiernan, N.E. & James, L. (2006). Intergenerational family conversations and decision making about eating healthfully.

Journal of Nutrition Education Behavior, 38(5), 298-306.

Kasila, K., Poskiparta, M. Karhila, P. & Kettunen, T. (2003).

Patient's readiness for dietary change at the beginning of counseling: a transtheoretical model-based assessment. *Journal of Human Nutrition & Dietetics*, 16(3), 159-166.

Kernan, J.B. (1967). Paired comparisons and graph theory.

Journal of Marketing Research, 4(1), 67-72.

Kersh, R. & Morone, J. (2002) The politics of obesity: Seven steps to government action. *Politics & Public Health*, 21(6), 142-153.

Koplan, J.P. & Dietz, W.H. (1999). Caloric imbalance and public health policy (Editorial). *Journal of the American Medical Association*, 282(16), 1579-1581.

Kraak, V & Pelletier, D.L. (1998). The influence of commercialism on the food purchasing behavior of children and teenage youth. *Family Economics and Nutrition Review*, 11(3), 112-125.

Kristal, A. R., Glanz, K., Tilley, B. & Li, S. (2000). Mediating factors in dietary change: understanding the impact of a worksite nutrition intervention. *Health Education Behavior*, 27(1), 112-125.

Kristal, A.R., Hedderson, M.M., Patterson, R.E. & Neuhouser, M. (2001). Predictors of self-initiated, healthful dietary change. *Journal of the American Dietetic Association*, 101(7), 762-766.

Kuchler, F. & Ballenger, N. (2002). Societal costs of obesity: How can we assess when federal interventions will pay? *Food Review*, 25(3), 33-37.

Letarte, A., Dube, L. & Troche, V. (1997). Similarities and differences in affective and cognitive origins of food likings and dislikes. *Appetite*, 28,115-129.

Levi, A., Chann, K.K., & Pence, D. (2006). Real men do not read labels: the effects of masculinity and involvement on college students' decisions. *Journal of American College Health*, 55(2). 91-98.

Levitsky, D.A. (2005). The non-regulation of food intake in humans: hope for reversing the epidemic of obesity. *Physiological Behavior*, 86(5), 623-632.

Levitsky, D.A. & Youn, T. (2004). The more food young adults are served, the more they overeat. *The Journal of Nutrition*, 134, 2546-2549.

Lewis, C.J., Sims, L.S. & Shannon, B. (1989). Examination of specific nutrition/health behaviors using a social cognitive model. *Journal of the American Dietetic Association*, 89(2), 194-202.

Lin, C., Lee, J. & Yen, S. (2004). Do dietary intake affect search for nutrient information on food labels? *Social Science Medicine*, 59(9), 1955-1967.

Lindmark, U., Stegmayr, B., Nilsson, B., Lindahl, B. & Johansson, I. (2005). Food selection associated with sense of coherence in adults. *Nutrition Journal*, 4(1), 1-7.

Logue, E.E., Jarjoura, D.G., Sutton, K.S., Smucker, W.D., Baughman, K.R. & Cap, C.F. (2004). Longitudinal relationship between elapsed time in the action stages of change and weight loss. *Obesity Research*, 12(9), 1499-1508.

Lozano, D., Crites, Jr., S.L. & Aikman, S.N. (1999). Changes in food attitudes as a function of hunger. *Appetite*, 32,207-218.

McGaghie, W., Van Horn, L., Fitzgibbon, M., Telser, A., Thompson, J., Kushner, R. et al. (2001). Development of a measure of attitude towards nutrition in patient care. *American Journal of Preventative Medicine*, 20(1), 15-20.

McKevith, B., Stanner, S. & Buttriss, J. (2005). Food choices in primary care: a summary of the evidence. *Nursing Times*, 101(40), 38-42.

McKie, L.J., Wood, R.C. & Gregory, S. (1993). Women defining health: food, diet and body image. *Health Education Research*, 8(1), 35-41.

Makowske, M. & Feinman, R. (2005). Nutrition education: A questionnaire for assessment and teaching. *Nutrition Journal*, 4(2), 1-17.

Malinausakas, B.M., Raedeke, T.D., Aeby, V.G., Smith, J.L. & Dallas, M.B. (2006). Dieting practices, weight perceptions, and body composition: a comparison of normal weight, overweight, and obese college females. *Nutrition Journal*, 31, 5-11.

Marietta, A.B, Welshimer, K.J. & Anderson, S.L. (1999). Knowledge, attitudes, and behaviors of college students regarding the 1990 Nutrition Labeling Education Act food labels. *Journal of the American Dietetic Association*, 99(4). 445-449.

Matvienko, O., Lewis, D.S. & Schafer, E. (2001). A college nutrition science course as an intervention to prevent weight gain in female college freshmen. *Journal of Nutrition Education*, 33(2), 95-101.

Mattes, R.D. (1997). Physiologic responses to sensory stimulation by food: nutritional implications. *Journal of the American Dietetic Association*, 97(4), 406-413.

Meiselman, H.L., Johnson, J.L., Reeve, W. & Crouch, J.E. (2000). Demonstrations of the influence of the eating environment on food acceptance. *Appetite*, 35(3), 231-237.

- Mela, D.J. (1999). Food choice and intake: the human factor. *Proceedings of the Nutrition Society*, 58, 513-521.
- Mela, D.J. (2001). Determinants of food choice: Relationships with obesity and weight control. *Obesity Research*, 9(4), 249S-255S.
- Mendelson, R. (2000). Barriers to changing food selection. *Food selection: From genes to culture*, Retrieved May 25, 2008 from http://www.danoneinstitute.org/publications/book/pdf/food_selection_08_mendelson.pdf
- Mills, B. (1999). Why is so much good dietary advice being ignored? *Nutrition Health*, 13(2), 95-101.
- Mitchell, S.J. (1990). Changes after taking a college basic nutrition course. *Journal of the American Dietetic Association*, 90(7), 955-961.
- Molasion, E.F. (2002). Stages of change in clinical nutrition practice. *Nutrition Clinical Care*, 5(5), 251-257.
- Morin, K.H., Stark, M.A. & Searing, K. (2004). Obesity and nutrition in women throughout adulthood. *Journal of Obstetrical Gynecological & Neonatal Nursing*, 33(6), 823-832.
- Morrow, M.L., Heesch, K.C., Dinger, M.K., Hull, H.R., Kneehans, A.W. & Fields, D.A. (2006). Freshman 15: Fact or fiction? *Obesity*, 14(8), 1438-1443.

Murcott, A. (1995). Symposium on 'psycho-social influences on food choice: implications for dietary change'. *Proceedings of the Nutrition Society*, 54,729-735.

National Health & Nutrition Examination Survey 2003-2004 (NHANES). Retrieved May 25, 2008 from http://www.cdc.gov/nchs/about/major/nhanes/nhanes2003-2004/nhanes03_04.htm

National Institute of Health. (1998). *Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults*. No. 98-4083. Retrieved May 25, 2008 from http://www.nhlbi.nih.gov/guidelines/obesity/ob_home.htm

National Task Force on the Prevention and Treatment of Obesity. (2000). Dieting and the development of eating disorders in overweight and obese adults. *Archives of Internal Medicine*, 160(17), 2581-2589.

Nestle, M. (2003). The ironic politics of obesity (Editorial). *Science*, 299, 781.

Nestle, M. & Jacobson, M. (2000). Halting the obesity epidemic: A public health policy approach. *Public Health Reports*, 115, 12-24.

Nielsen, S.J. & Popkin, B.M. (2003). Patterns and trends in food portion sizes, 1977-1998. *Journal of the American Medical Association*, 289(4), 450-453.

Nielsen, S.J., Siega-Riz, A.M. & Popkin, B.M. (2002). Trends in energy intake in U.S. between 1977 and 1996: similar shifts seen across age groups. *Obesity Research*, 10(5), 370-378.

Ni Mhurchu, C., Margetts, B.M. & Speller, V.M. (1997). Applying the stages-of-change model to dietary change. *Nutrition Review*, 55, 10-16.

Nothwehr, F., Snetselaar, L., Yang, J., & Wu, H. (2006). Stage of change for healthful eating and use of behavioral strategies. *Journal of the American Dietetic Association*, 106(7), 1035-1041.

Novick, J.S. (2000). Effects of a nutrition education program on the related knowledge and behaviors of family practice residents. Retrieved May 25, 2008 from <http://www.beyondveg.com/novick-j/nutrition-education/physicians-1.shtml>

Nutrient data laboratory home page. (2006). Retrieved May 25, 2008 from http://www.ars.usda.gov/main/site_main.htm?modecode=12354500

Obesity Education Initiative (n.d.). Retrieved May 25, 2008 from <http://www.nhlbi.nih.gov/about/oei/index.htm>

Obesity in Florida. Report of the Governor's Task Force on the Obesity Epidemic. (2004). Retrieved May 25, 2008 from <http://www.doh.state.fl.us/Family/GTFOE/report.pdf>

Obesity still a major problem. National Center for Health Statistics Fact Sheet. (2006). Retrieved May 25, 2008 from http://www.cdc.gov/nchs/pressroom/06facts/obesity03_04.htm

Oliver, G. & Wardle, J. (1999). Perceived effects of stress on food choices. *Physiology & Behavior*, 66(3), 511-515.

Oliver, G., Wardle, J. & Gibson, E. L. (2000). Stress and food choice: a laboratory study. *Psychosomatic Medicine*, 62(6), 853-865.

Painter, J.E., Wansink, B. & Hieggelke, J.B. (2002). How visibility and convenience influence candy consumption. *Appetite*, 38(3), 237-238.

Papakonstantinou, E., Hargrove, J.L., Huang, C., Crawley, C.C. & Canolty, N.L. (2002). Assessment of perceptions of nutrition knowledge and disease using a group interactive system: The perception analyzer. *Journal of the American Dietetic Association*, 102, 1663-1668.

Parmenter, K., Waller, J. & Wardle, J. (2000). Demographic variation in nutrition knowledge in England. *Health Education Research*, 15(2), 163-174.

Parmenter, K. & Wardle, J. (1999). Development of a general nutrition knowledge questionnaire for adults. *European Journal of Clinical Nutrition*, 53, 298-308.

Parraga, I. (1999). Determinants of food consumption (editorial). *Journal of the American Dietetic Association*, 90(5), 6616-663.

Pasco-Hernando Community College Institutional Fact Book 2005. Volume 19. Retrieved May 25, 2008 from <http://phcc.edu/iro/>

Pelto, G.H., Pelto, P.J. & Messer, E. (1989). Preference relations in *Research Methods in Nutritional Anthropology*. Retrieved May 25, 2008 from <http://www.unu.edu/unupress/unupbooks/80632e/80632E0p.htm#Preference%20relations>

Phillips, C. (1999). Complex systems model of dietary choice with implications for improving diets and promoting vegetarianism. *American Journal of Clinical Nutrition*, 70(S), 608S-614S.

Pollard, T. Steptoe, A. & Wardle, J. (1998). Motives underlying healthy eating: Using the food choice questionnaire to explain variation in dietary intake. *Journal of Biological Science*, 30, 165-179.

Pollard, T., Kirk, S. & Cade, J. (2002). Factors affecting food choice in relations to fruit and vegetable intake: a review. *Nutrition Research Reviews*, 15, 373-387.

Poppell Anderson, T., Stanberry, A.M., Blackwell, A.P., & Davidson, C.W. (2001). The effectiveness of nutrition instruction on student nutrition knowledge and food choices. *Journal of Family and Consumer Sciences Education*, 19(1), 31-37.

Potts, H.W. & Wardle, L. (1998). The list heuristic for studying personality correlates of food choice behaviour: a review and results from two samples. *Appetite*, 30(1), 79-92.

Povey, R., Conner, M., Sparks, P., James, R. & Shepherd, R. (2000). Application of the Theory of planned behaviour to two dietary behaviours: Roles of perceived control and self-efficacy, *British Journal of Health Psychology*, 5(2), 121-139.

Povey, R., Conner, M., Sparks, P., James, R. & Shepherd, R. (1999). A critical examination of the application of the Transtheoretical model's stages of change to dietary behaviors. *Health Education Research*, 14(5), 641-651.

Povey, R., Conner, M., Sparks, P., James, R. & Shepherd, R. (1998). Interpretations of healthy and unhealthy eating, and implications for dietary change, *Health Education Research*, 13(2), 171-183.

Prentice, A. (2004). Storing up problems: the medical case for a slimmer nation (Editorial). *Clinical Medicine*, 4(2), 99-101.

Prince, J.R. (2004). Why all the fuss about portion size? Designing the new American plate. *Nutrition Today*, 39(2), 59-64.

Ruel, M.T. (2003). Operationalizing dietary diversity: A review of measurement issues and research problems. *Journal of Nutrition*, 133, 3911S-3926S.

Roering, K.J., Boush, D.M. & Shipp, S.H. (1986). Factors that shape eating patterns: A consumer behavior perspective. *What is America Eating? Proceedings of a Symposium*. Retrieved May 25, 2008 from http://books.nap.edu/openbook.php?record_id=617&page=72

Roininen, K. (2001). Evaluation of food choice behavior: Development and validation of health and taste attitude scales. Retrieved May 25, 2008 from <http://ethesis.helsinki.fi/julkaisut/maa/elint/vk/roininen/evaluati.pdf>

Rolls, B. (2003). The supersizing of America. Portion size and the obesity epidemic. *Nutrition Today*, 38(2), 42-53.

Rozin, P. (2000). Human food intake and choice: Biological, psychological and cultural perspectives. *Food selection: From genes to culture*, Retrieved May 25, 2008 from http://www.danoneinstitute.org/publications/book/pdf/food_selection_01_rozin.pdf

Rozin, P., Bauer, R. & Catanese, D. (2003). Food and life pleasure and worry, among American college students: gender differences and regional similarities, *Journal of Personality & Social Psychology*, 85(1), 132-141.

Scheibehenne, B., Miesler, L., & Todd, P.M. (2006, November). *Go with the best and ignore the rest: Trade-offs and cue utilization in food choice*. Paper presented at the meeting of the 22nd Annual International Meeting of the Brunswik Society, Houston, Texas.

Scheibehenne, B., Miesler, L., & Todd, P.M. (2007). *Fast and frugal food choices: Uncovering individual decision heuristics*. Unpublished manuscript.

Schneeman, B.O. (2003). Evolution of dietary guidelines. *Journal of the American Dietetic Association*, 103(12S), 5S-9S.

Schlundt, D.G., Hargreaves, M.K. & Buchowski, M. (2003). The eating behavior patterns questionnaire predicts dietary fat intake in African American women. *Journal of the American Dietetic Association*, 3, 338-345.

Schwartz, J. & Byrd-Bredbenner, C. (2006). Portion distortion: typical portion sizes selected by young adults. *Journal of the American Dietetic Association*, 106(9), 1412-1418.

Sentyrz, S.M. & Bushman, B.J. (1998). Mirror, mirror on the wall, who's the thinnest one of all? Effects of self-awareness on consumption of full-fat, reduced-fat and no-fat products. *Journal of Applied Psychology*, 83(6), 944-949.

Seymour, J.D. Yaroch, A.L., Serdula, M., Blanck, H.M. & Khan, L.K. (2004). Impact of nutrition environmental interventions on point-of-purchase behavior in adults: a review. *Preventative Medicine*, 39(S), S108-S136.

Shepherd, R. (2005). Influences on food choice and dietary behavior. *Forum on Nutrition*, 57, 36-43.

Shepherd, R. & Shepherd, R. (2002). Resistance to changes in diet. *Proceedings of the Nutrition Society*, 61(2), 267-272.

Shive, S.E. & Morris, M.N. (2006). Evaluation of the energize your life! Social marketing campaign pilot study to increase fruit intake among community college students. *Journal of American College Health*, 55(1), 33-39.

Smith, L., Gilhooly, K. & Walker, A. (2003). Factors influencing prescribing decisions in the treatment of depression: A social judgment theory approach. *Applied Cognitive Psychology*, 17, 51-63.

Smith, S.C., Taylor, J.G. & Stephen, A.M. (2000). Use of food labels and beliefs about diet-disease relationships among university students. *Public Health Nutrition*, 3(2), 175-182.

Snijders, T. & R. Bosker. (1999). *Multilevel Analysis: An introduction to basic and advanced multilevel modeling*. New York: Sage Publications.

Sparks, P., Conner, M., James, R., Shepherd, R. & Povey, R. (2001). Ambivalence about health-related behaviours: An exploration in the domain of food choice, *Healthy Psychology*, 6(1), 53-68.

Sparks, P., Shepherd, R., Wierings, N. & Zimmermanns, N. (1995). Perceived behavioural control, unrealistic optimism and dietary change: An exploratory study, *Appetite*, 24(3), 243-255.

SPSS (2002). Statistical Package for Social Sciences (Version 11.5).

Stafleu, A., de Graaf, C. & van Staveren, W.A. (1991). A review of selected studies assessing social-psychological determinants of fat and cholesterol intake. *Food Quality and Preferences*, 3(2), 183-200.

Stephoe, A., Pollard, T. & Wardle, J. (1995). Development of a measure of the motives underlying the selection of food: the food choice questionnaire. *Appetite*, 25,267-284.

Stratton, P. & Bromley, K. (1999). Families: accounts of the causal processes in food choice, *Appetite*, 33(1), 89-108.

Stunkard, A. & Kaplan.D. (1977). Eating in public places: a review of reports of the direct observation of eating behavior. *International Journal of Obesity*, 1(1), 89-101.

Surgeon's General Call to Action to prevent and decrease overweight and obesity (2001). Retrieved May 25, 2008 from <http://www.surgeongeneral.gov/topics/obesity/>

Surgeon's General's 2004 Report: The health consequences of smoking. (2004). Retrieved May 25, 2008 from http://www.cdc.gov/tobacco/sgr/sgr_2004/sgranimation/flash/index.html

Taren, D.L., Thomson, C.A., Koff, N.A., Gordon, P.R., Marian, M.J., Bassford, T.L., Fulginiti, J.V. & Ritenbaugh, C.K. (2001). Effect of an integrated nutrition curriculum on medical education, student

clinical performance, and student perception of medical-nutrition training. *American Journal of Clinical Nutrition*, 73(6), 1107-1112.

Thiele, S., Mensink, G. & Beitz, R. (2004). Determinants of diet quality. *Public Health Nutrition*, 7(1), 29-37.

Thompson, B.L., Nelson, D.E., Caldwell, B. & Harris, J.R. (1986). Assessment of health risk behaviors. A tool to inform consumers, providers, healthy care organizations, and purchasers. *American Journal of Preventative Medicine*, 16(1), 48-59.

Topper, B.J. & Ullrich, N.V. (2002). Taste, smell and the genetics of food preferences. *Topics in Clinical Nutrition*, 17(4), 1-14.

Trends & statistics. (2006). Retrieved May 25, 2008 from <http://www.caloriecontrol.org/trndstat.html>

Tseng, M. (2004). Social circumstances and dietary intake. *Public Health Nutrition*, 7(6), 965-696.

Tucker, L.R. (1964). A suggested alternative formulation in the development of Hursch, Hammond, & Hursch, & by Hammond, Hursch, & Todd. *Psychological Review*, 71, 528-530.

Tuttle, C.R., Derrick. B., & Tagtow, A. (2003). A new vision for health promotion and nutrition education. *American Journal of Health Promotion*, 18(2), 186-191.

Unklesbay N., Sneed, J. & Toma. R. (1998). College students' attitudes, practices, and knowledge of food safety. *Journal of Food Protection*, 61(9), 1175-1180.

Van den Heuvel, T., van Trijp, H., Gremmen, B., Jan Renes, R. & van Woerkum, C. (2006). Why preferences change: beliefs become more salient through provided (genomics) information, *Appetite*, 47(3), 343-351.

Vinson, D.C. (2002). The challenge of helping patients change (Commentary). *The Journal of Family Practice*, 51(9), 759.

Wansink, B. (2006). *Mindless Eating*. New York: Bantam Books.

Wansink, B. (2004). Food illusions. Why we eat more than we think. *Nutrition Action Health Letter*, Retrieved May 25, 2008 from http://www.thefreelibrary.com/_/print/PrintArticle.aspx?id=114325245

Wansink, B. (2004). Environmental factors that increase the food intake and consumption volume of unknowing consumers. *Annual Review of Nutrition*, 24, 445-479.

Wansink, B. (1996). Can package size accelerate usage volume? *Journal of Marketing*, 60, 1-14.

Wansink, B. & Chandon, P. (2006). Meal size, not body size, explains errors in estimating the calorie content of meals. *Annals of Internal Medicine*, 145(5), 326-332.

Wansink, N. Cheney, M. M. & Chan, N. (2003). Exploring comfort food preferences across age and gender. *Physiology & Behavior*, 79, 739-747.

Wansink, B. & Huckabee, M. (2005). De-marketing obesity. *California Management Review*, 47(4), 6-18.

Wansink, B. & Kim, J. (2005). Bad popcorn in big buckets: Portion size can influence intake as much as taste. *Journal of Nutrition Education and Behavior*, 37(5), 242-245.

Wansink, N. & Park, S. (2000). At the movies: How external cues and perceived taste impact consumption volume. *Food Quality and Preference*, 12(1), 69-74.

Wansink, B., Painter, J.E. & North, J. (2004). Bottomless bowls: Why visual cues of portion size may influence intake. *Obesity Research*, 13(1), 93-100.

Wansink, B., van Ittersum, K. & Painter, J.E. (2006). Ice cream illusions bowls, spoons, and self-served portion sizes. *American Journal of Preventative Medicine*, 31(3), 240-243.

Wansink, B., Westgren, R.E. & Cheney, M.M. (2005). Hierarchy of nutritional knowledge that relates to the consumption of a functional food. *Nutrition*, 21(2), 264-268.

Wardle, J., Haase, A., Steptoe, A., Nillapun, M., Jonwutiwes, K. & Bellisle, F. (2004). Gender differences in food choice: The contribution

of health beliefs and dieting. *Annals of Behavioral Medicine*, 27(2), 107-116.

Wardle, J., Parmenter, K. & Waller, J. (2000). Nutrition knowledge and food intake. *Appetite*, 34, 269-275.

Wardle, J. & Steptoe, A. (2003). Socioeconomic differences in attitudes and beliefs about healthy lifestyles. *Journal of Epidemiology & Community Health*, 57(6), 440-443.

Weber, A.J., King, S.C., & Meiselman, H.L. (2004). Effects of social interaction, physical environment and food choice freedom on consumption in a meal-testing environment. *Appetite*, 42(1), 115-118.

Weight- control Information Network. (n.d.) Retrieved May 25, 2008 from <http://win.niddk.nih.gov/index.htm>

Weinstein, S., Shide, D. & Rolls, B. (1997). Changes in food intake in response to stress in men and women: Psychological factors. *Appetite*, 28, 7-18.

Welsh, S. (1994). Atwater to the present: evolution of nutrition education. *Journal of Nutrition*, 124(9S), 1799S-1807S.

Westenhoefer, J. (2005). Age and gender dependent profile of food choice. *Forum on Nutrition*, 57, 44-51.

Whitney, E. & Rolfes, S.R. (2005). *Understanding Nutrition* 10th edition. California: Thomson Learning, Inc.

Wigton, R.S. (1996). Social judgment theory and medical judgement. *Thinking & Reasoning*, 2(3), 175-190.

Wilkes, A. P. (2002). Snacks get the credit: Not surprisingly, college students snack mostly to satisfy hunger. *Snack Food & Wholesale Bakery*. Retrieved February 8th, 2008 from <http://www.allbusiness.com/retail-trade/food-beverage-stores-speciality-food/123272-1.html>

Williams-Piehota, P., Navarro Silvera, S.A., Mowad, L. & Salovey, P. (2006). Need for cognition and message complexity in motivating fruit and vegetable intake among callers to the cancer information service. *Health Communication*, 19(1), 75-84.

Winter Falk, L., Sobal, J., Bisogni, C.A., Connors, M. & Devine, C.M. (2001). Managing healthy eating: Definition, classifications and strategies. *Health Education & Behavior*, 28(4), 425-439.

Wirsam, B., Hahn, A., Uthus, E.O. & Leitzmann, C. (1997). Fuzzy sets and fuzzy decision making in nutrition. *European Journal of Clinical Nutrition*, 51(5), 286-296.

Woolcott, D. (2000). Impact of information and psychosocial factors on nutrition behavior change. Retrieved May 25, 2008 from http://www.danoneinstitute.org/publications/book/pdf/food_selection_07_woolcott.pdf

Yeomans, M.R. & Symes, T. (1999). Individual differences in the use of pleasantness and palability ratings. *Appetite*, 32, 383-394.

Young, L.R. & Nestle. M. (2002). The contribution of expanding portion sizes to the US obesity epidemic. *American Journal of Public Health*, 92(2), 246-249.

Zellner, D., Lozano, D., Gonzalez, A., Pita, J., Morales, J., Pecora, D. et al. (2006). Food selection changes under stress. *Physiology & Behavior*, 87, 789-793.

Appendices

Appendix A: Matrix Content Areas Table

Aims	Content	Measurement	Scale	Scoring
1	Cue utilization (Motives)	Regression weights	Paired Comparison task, FCQ _m	9 subscales maximum and/or composite score
2	Appropriateness	Calculated index Single score*	% calories, calories from fat, sodium, cholesterol & carbohydrate content**	Z score transformation – rank ordering number of food related to specific identified content measurements***
3	Cue utilization (motives)	Regression weights	Paired comparison scale	Rank sum scoring – preference
	Appropriateness	Calculated index *	**	***
	Knowledge	Single score Calculated score	FNQ	5 component parts – maximum score 30 – portion size, fat, sodium, sugar, protein & fiber
	Food related motives	Calculated score	FCQ	9 sub scales maximum and/or composite score
	Information processing style	Calculated score	NFC	18 questions summed with reversed scoring on 9 questions

Appendix B: Nutritional Aspects Articles

Nutritional Aspects Articles

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
ADA Position (2002)	K	Emphasize communication of healthy total diet based on the overall pattern and not the individual food choice using moderation, appropriate portion size and physical activity expenditure to maintain weight.
Adamson & Mathers (2004)	C	Review of studies noted that effective interventions to improve dietary choice include family, social support in small group settings that reflect the environmental culture of the participants.
Aikman & Crites, Jr. (2005)	C	Time effect experience had more influence than general experiences with foods given the context of hunger in college students.
Anderson (1994)	K	Need for innovative collaborative methods to improve the quality of nutrition education by recognizing the complexity of factors that affect dietary choice.
Barratt (2001)	K	Survey noted that health professionals show little differences in diet related knowledge, beliefs and actions and therefore need additional training in nutritional areas in order to provide therapeutic assistance to their clients.

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Bellisle (1999)	C	Examination of the impact and influence of exercise on food choices as a motivating factor that might provide a basis for understanding rather than traditional methods of looking at food choices and diet composition.
Brunstrom (2004)	K	Examination of the concept of "awareness" that might impact the dietary learning patterns identified in humans of flavor-flavor, flavor-post-ingestive and learned satiety as a way to understand dietary control.
Camire & Dougherty (2005)	K	On line survey noted that food industry and nutrition faculty is not necessarily aware or understands health claims on food labels.
Cantin & Dube (1999)	C	Examination of college students' food choices using varimax factor analysis noted that affective levels had a greater influence on liking and cognitive levels had a greater impact on food consumption.
Cason & Wenrich (2002)	C	Examination of college students using quantitative and qualitative methods noted that peer influence had a greater effect than gender on food choice; also that class standing had an effect on fast food consumption and that the availability of foods served on campus were viewed as

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Cordery (2006)	K	<p>potential barriers to healthy food choices.</p> <p>Examination of the nutritional knowledge of healthcare professionals treating clients with eating disorders noted that a multidisciplinary approach should be incorporated utilizing trained dietitians, as simple experience does not qualify as empirical nutrition knowledge in clinical practice areas.</p>
Cotugna & Vickery (1994)	K	<p>Small convenience sample of college students noted that awareness of the food pyramid does not necessarily translate to meeting suggested dietary recommendations but can be used as a starting point for decision-making behaviors in the area of dietary choice.</p>
Cousineau, Goldstein & Franko (2004)	K	<p>Qualitative research using concept mapping noted that the use of internet based activities could play a role in providing relevant nutritional concerns that would help to minimize barriers towards achieving successful dietary outcomes.</p>
Crites, Jr. & Aikman (2005)	K	<p>Examination of college students noted a positive interaction between nutrition knowledge and health evaluation but that knowledge alone might not play a significant role across the individual's life cycle.</p>

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Crossley & Khan (2001)	C	Convenience, price, mood and familiarity were rated higher by laypersons whereas professionals rated natural content and ethical concerns as being higher in terms of relative influence on dietary choice.
Davy, Benes & Driskell (2006)	C	Gender differences noted in college students in terms of dieting patterns, eating habits and nutritional beliefs as evidenced by reporting of food consumption of carbohydrates and fat, anthropometric measurements and selection of food behaviors.
Diliberti, Bordi, Conklin, Roe & Rolls (2004)	C	Increased portion size served in restaurant style setting led to an increase in food consumption with the price being held constant suggesting that the individuals are eating what is served to them without regard to caloric intake which may contribute to obesity.
Dinkins (2000)	C	Perception of eating healthy foods was found to be complicated using a modified version of the Healthy Eating Index (HEI) in a market research survey.
Dixon, Cronin & Krebs-Smith (2001)	C	Recognition of pyramid food guidelines is evident in the U.S. adult population but does not necessarily translate into food choice selection. Improvements of dietary

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Drewnoswki & Darmon (2005)	C	<p>patterns in adults were associated with increased education and finances.</p> <p>Examination of adults in France using multivariate regression adjusting for age and gender and looking at energy density and diet costs noted that the economic cost of foods may be a critical factor in promoting dietary change.</p>
Drewnoswki & Hann (1999)	C	<p>Food preferences and frequency of food consumption provide a strong predictive value of dietary patterns in young women.</p>
Dube & Cantin (2000)	C	<p>Findings noted that the consumption of milk was mediated by affect and cognition based variables in a convenience sample of adults who acknowledged an existing preference for the food.</p>
Eertmans, Baeyens & Van den Bergh (2001)	C	<p>Review of articles examining the impact of internal (personal) and external (social and environmental) factors affecting food choices with attention to the primary determinant of food liking or preference suggesting that health promotion efforts be aimed at understanding the complexity of variables attributed to dietary choice in order to be successful.</p>

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Foote, Murphy, Wilkens, Basiotis & Carlson (2004)	C	Findings noted that increasing dietary variety led to increased nutrient adequacy for adults participating in the Continuing Survey of Food Intakes for Individuals (1994-1996).
French (2003)	C	Findings noted that reductions in food prices led to a significant increase in consumption of lower fat foods in vending machines and fresh fruit and vegetables in a cafeteria setting indicating that food pricing plays a pivotal role in food choice consumption.
Furst, Connors, Bisogni, Sobal & Winter Falk (1996)	C	Qualitative research with 29 adults identified a conceptual model for food choice focusing on individual life experiences influenced by social and environmental contexts leading to the development of an individual value system that mediated food choice decisions (sensory and behavioral).
Gedrich (2003)	C	Determinants of nutritional behavior are influenced by the development of methods to resolve individual conflicts and the ability of the individual to realize gains rather than losses associated with dietary modification behaviors.

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Georgiou, Betts, Hoerr, Keim, Peters et al. (1997)	C	Differences exist in young adults' dietary behavior dependent on whether or not they attend college or have graduated from college. Those who attended some college made healthier food choices and were less likely to be overweight than those were non-students.
Gibson (2006)	C	Review of studies noted that emotion and mood patterns might trigger food selection decisions as well as affect the physiological release of chemical mediators.
Glanz, Basil, Maibach, Goldberg & Snyder (1998)	C	Cluster analysis findings noted that taste was identified as the most important factor in choice, followed by consumption, cost, nutrition, convenience and weight control. Membership in identified clusters (7 groups) showed relative differences in all factors with nutrition and weight control being the most predictive with respect to making food choices.
Greene & Rossi (1998)	C	Findings noted a main effect and a time by feedback interaction effect existed for a single feedback report with respect to decreases in fat consumption in an experimental controlled study using the stages of change theory.

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Grogan, Bell & Conner (1997)	C	Gender differences identified in terms of eating sweet snacks illustrated that social pressure affected females significantly greater than males in terms of intention to eat.
Guenther, Jensen, Batres-Marques & Chen (2005)	C	Findings focused on type of meat consumption with income measurements having predictive value. Higher income households ate more chicken whereas lower income households ate more processed pork meat products. Consumption of specific meat patterns also showed differences with respect to fat consumption, healthiness of diet, place of residence and level of education.
Henry, Reimer, Smith & Reicks (2006)	C	Findings noted that interventions aimed at acknowledging clients (low income African American mothers) specific stages of change may prove to be more beneficial in realizing nutritional benefits (improving fruit and vegetable consumption).
Horgen & Brownell (2002)	C	Findings noted that decreases in price alone were correlated with increased consumption of healthy food choices as compared with combination approaches of decreased pricing and health messages and/or health messages alone.

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Hurling & Shepherd (2003)	C	Findings noted the importance of food liking as a significant factor in food choice was unaffected by viewing the food in the raw vs. the cooked form.
Innis, Bahlo & Kardinaal (1999)	K	Review of the potential impact that physicians and healthcare workers can have on the development of food products and that focus should remain the importance of scientific validity, cost and safety as the mainstay for making consumer food recommendations.
Kant (2004)	C	Review of studies noting consumption of fruits, vegetables, whole grains and poultry correlated with increased micronutrient consumption; knowledge, income and age influence healthier food choices and the presence of cardiac disease correlates with poor dietary choices and increased mortality.
Kraak & Pelletier (1998)	C	Impact of promotional campaigns aimed at children and adolescents leading to an increase in unhealthy behaviors as manifested by diets that have a higher proportion of sugar and fat. Research also confirms that increased hours of watching television are associated with an increased likelihood of obesity with ethnic differences noted in African American and Hispanic groups as being more likely to watch

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Kristal, Glanz, Tilley & Li (2000)	C	<p>television and be overweight.</p> <p>Intervention study findings of the Next Step Trial noted the complexity of factors in helping to mediate dietary change thus acknowledging that knowledge and beliefs in conjunction with enabling social support are needed to affect dietary changes.</p>
Kristal, Hedderson, Patterson & Neuhauser (2001)	C	<p>Findings noted that individuals who were at the maintenance level of change and whose belief of a relationship between dietary intake and cancer showed the greatest change in dietary patterns.</p>
Letarte, Dube & Troche (1997)	C	<p>Food likes and dislikes were influenced by affective factors than cognitive factors. Taste and sensory factors had a greater impact on disliking a food item than on liking a food item. Convenience and food preparation contributed most to liking foods and symbolic effects of food has the most influence on disliking foods.</p>
Levi, Chan & Pence (2006)	C	<p>Findings noted that female college students placed a greater importance on food decisions than their male counterparts.</p>
Levitsky & Youn (2004)	C	<p>The food environment influenced college students in that when they were served increasing portion sizes in the same environment, their</p>

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Lewis, Sims & Shannon (1989)	C	<p>consumption pattern increased irrespective of their previous portion size experience.</p> <p>Findings note that differences exist between middle-aged adults and college students in terms of how they make dietary choices related to soda drinking and beverage selection. Nutrition knowledge was associated with attitude formation in adults with respect to soda drinking whereas nutrition knowledge was associated with sensory factors (taste and enjoyment) for college students with respect to beverage selection.</p>
Lin, Lee & Yen (2004)	C	<p>Findings note that individuals who are concerned with nutrition are more actively involved with reading food labels for they perceive value and importance to the information and have the requisite knowledge to understand the food label information whereas in order to have individuals read food labels who have unhealthy dietary patterns will require more interactive and creative methodologies.</p>
Lindmark, Stegmayr, Nilsson, Lindhal & Johansson (2005)	C	<p>Swedish study noted males and females who were older, had higher levels of education and increased BMI reported healthier food choices.</p>

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Lozano, Crites, Jr. & Aikman (1999)	C	Findings noted that individuals who were hungry had more positive food attitudes even if attitude ambivalence was present and that the timing of when foods are typically eaten has a greater affect on individuals who are hungry than those who are not hungry.
McKevith, Stanner & Buttriss (2005)	C	Review of primary care interventions research studies note that behavioral counseling and specific nutrition messages with follow up are more effective strategies then traditional methods provided by primary care practitioners.
McKie, Wood & Gregory (1993)	C	Qualitative research noting that women living in England perceive a distinct relationship between food and health but that this may not translate into adequate dietary patterns.
Makowske & Feiman (2005)	K	Analysis of 1 st year medical student's nutrition knowledge showing the importance of nutrition as a basis for discussing the therapeutic treatment of diseases such as cardiac, diabetes and obesity; its inclusion as a critical element of the medical curriculum and the practical importance of adequately training healthcare providers in the area of nutrition counseling in order to realize better client outcomes.

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Malinauskas, Raedeke, Aeby, Smith & Dallas (2006)	C	Female college students, regardless of their weight status (normal, overweight or obese), are more likely to use dieting practices as part of their normal eating patterns, understand that physical activity can be used to lose weight although only a small percentage of the respondents engaged in the type and amount of physical activity that could lead to weight loss and utilize nutrition behaviors such as eating less or using artificial sweeteners, skipping breakfast and/or smoking as methods to lose weight.
Marietta, Welshimer & Anderson (1999)	K	Findings note that college students are both aware of and use food labels during their food selection experience with greater use of food labels associated with a positive attitude regarding labels and being of female gender.
Matvienko, Lewis & Schafer (2001)	K	Findings note that female college students who take a freshman level nutrition course will be less likely to have an increase in weight during the first 1 ½ year of college than those students who did not take the class as evidenced by BMI measurements.
Mattes (1997)	C	Review of the physiological triggers associated with cephalic phase responses with respect to food absorption that are

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Meiselman, Johnson, Reeve & Crouch (2000)	C	<p>initiated by the sensory food experience (taste, smell and texture) as being important in understanding dietary choices and expression.</p> <p>Findings note that individuals have different perceptions of the same food when served in varied environments (training restaurant, student cafeteria and food science class) emphasizing that the environmental context (food location) plays a role in food acceptance.</p>
Mela (2001)	C	<p>Specific findings maybe related to overweight and obese clients being affected more by emotion and situational cues rather than merely increased liking of food itself thereby leading to a cyclical experience of weight gain.</p>
Mela (1999)	C	<p>Complexity of understanding food choices cannot merely be measured by the biochemical composition and food frequency variables but rather must be interpreted using the contextual framework of learning, culture, economics and environment.</p>
Mitchell (1990)	K	<p>Comparison of nutrition knowledge and changes in dietary behavior between nutrition students taking a basic nutrition course compared with students who did not take the course suggest that</p>

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Murcott (1995)	C	<p>nutrition students perceived a value to the information gathered and reported changes in their dietary practices. Pre and post testing methods were used to ascertain differences in behavior and responses were similar during the pre-testing phase for both groups of students. Findings suggest that methods used in a basic nutrition class may be helpful with increasing knowledge in the other college students.</p> <p>Findings note that the use of alternative models that allow for the development of social variables as a springboard for discussion rather than merely a statistical endpoint may prove more beneficial for explaining the complex area of dietary choice.</p>
Novick (2000)	K	<p>Intervention program was effective at increasing knowledge, interaction and frequency of nutrition communications between medical residents and their clients during an educational program with registered dieticians serving as mentors.</p>
Oliver & Wardle (1999)	C	<p>Students who were under stress were more likely to increase their food snacking pattern and decrease their intake of food meal patterns irrespective of their dieting pattern or gender.</p>

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Oliver, Wardle & Gibson (2000)	C	Findings report increased consumption patterns of sweet fatty foods for individuals who are identified as stressed and/or emotional eaters in a laboratory setting as compared to unstressed eaters who participated in a controlled stress study environment. Confirmation of the stress experience was reflected in changes in vital signs (blood pressure and heart rate), mood and hunger using sequential timed measurements during the stress experience simulation.
Painter, Wansink & Hieggelke (2002)	C	Findings reveal that convenience has a greater impact on candy consumption than visibility and that individuals who have candy that is more readily accessible underestimated the amount of candy they consumed as compared to those individuals where the candy was less accessible tended to overestimate the amount of candy they had consumed.
Papakonstantinou, Hargrove, Huang, Crawley & Canolty (2002)	K	Findings note that by using a Perception Analyzer (learning enhancement computer method) can increase understanding of the information provided on food labels leading to a better understanding of nutrition and healthy dietary practices.

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Parmenter, Waller & Wardle (2000)	K	Findings reported in England note significant deficiencies in nutrition knowledge and the relationship between diet and disease in the adult population. Gender differences were reported with women having more knowledge than men in this area along with a decrease in nutrition knowledge seen with lower social class status and educational level suggesting critical interventions are necessary to improve diet quality.
Parraga (1990)	C	Editorial comment noting the complexities of the interrelationships that exist between the determinants of food consumption.
Phillips (1999)	C	Use of a computer-generated model that incorporates psychological and cultural variables may have a greater likelihood of continued success than more traditional programs to explain vegetarianism dietary choice.
Pollard, Kirk & Cade (2002)	C	Literature review emphasizing the complex issues of factors related to food choice that can lead to ineffective health promotion and nutrition programs for different groups even though there is consensus of opinion that fruit and vegetable consumption has protective effects with respect to slowing disease

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Poppell Anderson, Stanberry, Blackwell & Davidson (2001)	K	<p>progression. Attention must be directed at addressing group differences in terms of dietary choice characteristics in order to have better health outcomes in the area of diet and nutrition.</p> <p>Findings report a significant difference in high school students' food knowledge when they have received nutrition instruction compared to their cohorts who do not receive the information but that while knowledge was improved there was no discernible difference reported in their food choice selections indicating that knowledge is but one aspect of the critical information needed to affect dietary change.</p>
Roininen (2001)	C	<p>Development and validation of the Health and Taste Attitude Scales (HTAS) note the relative predictive importance of health concerns and hedonic (taste, craving, reward and pleasure) parameters have on the area of dietary choice.</p>
Schlundt, Hargreaves & Buchowski (2003)	C	<p>Qualitative focus group design to develop a measurement tool for African American women showing subscale predictive value for micronutrient and macronutrient consumption.</p>

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Schwartz & Byrd-Bredbenner (2006)	C	Findings report that young adults have perceived differences in actual portion sizes leading to portion distortion for selected foods which may be contributing to weight gain and unhealthy eating practices.
Sentyrz & Bushman (1998)	C	Two study groups (college students and supermarket consumers) using a mirror as a situational method to determine if awareness affected food consumption for products that differed in fat content. The use of the mirror for each group only revealed a decrease in consumption of the high fat food item suggesting that perhaps awareness of one's environmental situation may influence one's food choice.
Seymour, Yaroch, Serdula, Blanck & Khan (2004)	C	Review of nutrition intervention programs for adults indicate that changes in food behaviors were most evident when there were limited resources or options and that consistent methods with an emphasis on assessment and access may help to improve dietary outcomes.
Shepherd (2005)	C	Discussion of the motivation to change as being a significant factor on the relative impact of dietary choice for any individual.

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Shepherd & Shepherd (2002)	C	Discussion of complexity, ambivalence and optimistic bias as being determinants that affect changes in dietary patterns and food selection.
Shive & Morris (2006)	K	Social marketing campaign aimed at community college students to improve food knowledge, attitudes and consumption of fruits noted increases in knowledge and attitude but consumption of fruits was affected by limited financial resources and personal food preferences.
Smith, Taylor & Stephen (2000)	K	Findings note that gender differences exist in Canadian college students in their use of food labels with females reading food labels more than males and that when comparing both male and female label users vs. non-label users, those who used labels attributed more value and importance to the label in terms of it providing accurate information than those who did not use labels.
Stunkard & Kaplan (1977)	C	Review of studies observing eating behaviors in public places suggest that differences exist between obese and non-obese individuals in the area of food choice (more vs. less consumption) and rate of eating (more vs. less timing) which may have an impact on environmental behavior modification.

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Unklesbay, Sneed & Toma (1998)	K	Findings note that college students majoring in nutrition and health had higher attitude scores and increased awareness of food safety than individuals who were not nutrition and health majors. Measurements related to food practices showed no differences.
Thiele, Mensink & Beitz (2004)	C	German study that identifies high quality diets are positively associated with demographic variables (education, age, energy intake, food diversity and physical activity) whereas low quality diets are associated with increased consumption of poor food choices (increased fats, sugars, alcohol and sodium).
Tseng (2004)	C	Discussion of the impact of social, environmental and religious behaviors that can have a significant on dietary food choice.
Wansink (2004)	C	Discussion of the impact of environmental factors (packaging, size of plate, lighting, ambiance and variety) that lead to increased food consumption to which the consumer might not even be aware of leading to increased caloric intake.
Wansink (1996)	C	Findings note that increased package sizes lead to increased use of the product than package sizes of smaller measurement.

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Wansink & Chandon (2006)	C	Study findings note that adults (overweight and normal weight) with respect to fast food consumption underestimated the amount of calories consumed in larger meals as compared to smaller meal sizes where their estimation is more accurate even when controlling for body weight differences.
Wansink & Kim (2005)	C	Findings note that increasing the amount of popcorn distributed to movie patrons leads to increased amount of food consumption regardless of hunger influence.
Wansink, Painter & North (2004)	C	Findings note that individuals ate more of a food item that had a refillable volume without being able to detect that they had increased their overall consumption compared to individuals who had only a one-time volume of the food item.
Wansink, van Ittersum & Painter (2006)	C	Findings note that individuals served themselves more of a food item if they were given a larger bowl or plate without realizing that they had increased their food consumption pattern.
Wansink, Westgren & Cheney (2005)	C	Findings note that increased knowledge of a functional food product led to increased consumption but was not correlated with increased liking for the food product.

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Wardle, Haase, Steptoe, Nillapun, Jonwutiwes & Bellisle (2004)	C	International Health Behavior Survey (IHBS) findings noted gender differences as women were more likely to have used "dieting" as part of their lifestyle and were more likely to believe in a health related nutritional benefit as compared to their male counterparts.
Wardle, Parmenter & Waller (2000)	K	Higher nutrition knowledge scores in adults correlate with a higher intake of healthy food types (fruits and vegetables) and lower intake of fats.
Wardle & Steptoe (2003)	C	Findings note that differences in socioeconomic status are associated with different practices in health and lifestyle behaviors that may be mediated by individual life experiences.
Weber, King & Meiselman (2004)	C	Findings note that differences in the presentation of food accompaniments and environment have an impact on increasing consumption of food products.
Weinstein, Shide & Rolls (1997)	C	Females who ate more had higher disinhibition scores whereas males did not exhibit any increase in eating due to stress response.
Westenhoefer (2005)	C	Discussion of gender differences and life cycle attributes that influence one's food choice. Females show a greater interest in healthy food

Authors	Nutritional Aspects C = choice K = Knowledge	Important Findings
Woolcott (2000)	C	<p>consumption, weight control and health beliefs where as males have a limited nutrition knowledge base. Variations across the life cycle reflect the integration of physiological responses and socio-economic events that impact one's dietary choices regardless of gender.</p> <p>Stage of change level was a predictor that indicated that females could sustain more effective changes in the area of dietary choice.</p>
Yeomans & Symes (1999)	C	<p>Findings note that understanding and interpretation of the word "palability" provided an inconsistent measure with regard to dietary choice and as such did not convey reliable measures of the specified variable.</p>
Zellner, Loaiza, Gonzalez, Pita, Morales, Pecora & Wolf (1987)	C	<p>Two experiments looking at the effects of stress and gender on dietary choice report: (1) stress induces a significant change in eating behaviors and (2) females who report higher food consumption are also more likely to exhibit dieting behaviors as part of their history and eat foods that they might otherwise avoid with respect to healthy/unhealthy factors during the stress state.</p>

Appendix C: Dietary Choice Characteristics

Dietary Choice Characteristics

Article	CO	TI	AF	AT	PP	TA	CU
Adamson & Mathers (2004) H			+		+		+
Aikman & Crites, Jr. (2005) H	+	+		+			
Bellisle (1999) H	+	+			+		+
Cantin & Dube (1998) C					+		
Cason & Wenrich (2002) C	+	+					+
Crossley & Khan (2001)	+	+	+	+	+	+	+
Davy, Benes & Driskell (2006) C					+		+
Diliberti, Bordi, Conklin, Roe & Rolls (2004) H				+	+		+portion
Dinkins (2000)					+		
Dixon, Cronin & Krebs-Smith (2001) H					+		+
Drewnoswki & Darmon (2005) H	+	+	+		+		+
Drewnoswki & Hann (1999) CH					+	+	
Dube & Cantin (2000)					+	+	
Eertmans, Baeyens & Van	+	+	+	+	+	+	+

Article	CO	TI	AF	AT	PP	TA	CU
denBergh (2001)							
Foote, Murphy, Wilkins, Basiotis & Carlson (2004) H					+		+gender
French (2003) H	+		+			+	
Furst, Connors, Bisogni, Sobal & Winter Falk (1996)	+	+	+	+	+	+	+
Gedrich (2003)	+	+	+	+	+	+	+
Georgiou, Betts, Hoerr, Keim, Peters et al. (1997) CH					+		+
Gibson (2006) H	+	+	+	+	+	+	+
Glanz, Basil, Maibach, Goldberg & Snyder (1998) H	+				+	+	
Greene & Rossi (1998) H					+		+
Grogan, Bell & Conner (1997)					+	+	+gender
Guenther, Jensen, Batres- Marques & Chen (2005) H			+				+
Henry, Reimer Smith & Reicks (2006)							+
Horgen & Brownell (2002) H			+				

Article	CO	TI	AF	AT	PP	TA	CU
Hurling & Shepherd (2003) H				+	+	+	
Kant (2004) H			+				+age. Education
Kraak & Pelletier (1998)	+	+	+	+	+	+	+
Kristal, Glanz, Tilley & Li (2000)				+	+		+
Kristal, Hedderson, Patterson & Neuhauser (2001) H							+
Letarte, Dube & Troche (1997)	+	+	+	+	+	+	+
Levi, Chan & Pence (2006) C					+		+gender, male
Levitsky & Youn (2004) C	+	+	+	+	+	+	+
Lewis, Sims & Shannon (1989) C					+	+	+
Lin, Lee & Yen (2004) H				+	+		+
Lindmark, Stegmayr, Nilsson, Lindhal & Johansson (2005)							+gender
Lozano, Crites, Jr. & Aikman (1999)		+			+		+hunger
Malinauskas, Raedeke, Aeby, Smith & Dallas (2006) C	+	+	+	+	+	+	+
Mattes (1997)					+	+	

Article	CO	TI	AF	AT	PP	TA	CU
McKevith, Stanner & Buttriss (2005)					+		
McKie, Wood & Gregory (1993)					+		+
Meiselman, Johnson, Reeve & Crouch (2000)				+	+	+	+
Mela (2001)	+	+	+	+	+	+	+
Mela (1999)	+	+	+	+	+	+	+
Murcott (1995)				+	+		+
Oliver & Wardle (1999) H				+	+		+stress
Oliver, Wardle & Gibson (2000) H				+	+		+stress
Painter, Wansink & Hieffelman (2002)	+	+		+	+	+	
Parraga (1990)				+	+		+
Phillips (1999)	+	+	+	+	+	+	+
Pollard, Kirk & Cade (2002)	+	+	+	+	+	+	+
Roininen (2001)	+	+	+	+	+	+	+
Schundt, Hargreaves & Buchowski (2003)					+	+	+
Schwartz & Byrd- Bredbenner (2006)	+	+			+	+	+portion size
Sentyra & Bushman (1998) C				+	+		+mirror

Article	CO	TI	AF	AT	PP	TA	CU
Seymour, Yaroch, Serdula, Blanck & Khan (2004)				+	+		+
Shepherd (2005)	+	+	+	+	+	+	+
Shepherd & Shepherd (2002)	+	+	+	+	+	+	+
Stunkard & Kaplan (1977)		+			+		+obese
Thiele, Mensink & Beitz (2004)			+		+	+	+
Tseng (2004) H							+
Wansink (2004) H	+	+	+	+	+	+	+
Wansink (1996) H	+	+		+	+	+	
Wansink & Chandon (2006) H	+				+	+	
Wansink & Kim (2005) H	+			+	+	+	
Wansink, Painter & North (2004) H	+			+	+	+	
Wansink, van Ittersum & Painter (2006) H	+			+	+	+	
Wansink, Westgren & Cheney (2005)					+		
Wardle, Haase, Steptoe, Nillapun, Jonwutiwes & Bellisle (2004)					+		+gender
Wardle & Steptoe (2003)			+	+	+		+

Article	CO	TI	AF	AT	PP	TA	CU
Weber, King & Meiselman (2004)	+			+	+		
Weinstein, Shide & Rolls (1997)					+		+gender, stress
Westenhofer (2005)			+	+		+	+gender
Woolcott (2000)	+	+	+	+	+	+	+gender
Yeomans & Symes (1999)					+	+	
Zellner, Loazia, Gonzalez, Pita, Morales, Pecora & Wolf (1987) C				+			+gender, stress

C = College, H = Health

CO = Convenience, TI = Timing, AF = Affordability, AT = Atmosphere, PP = Personal Preference, TA = Tastiness and CU = Cultural

Appendix D: Student Participation Letter

Dear Pasco-Hernando Community College (PHCC) student:

In addition to my being a full time faculty member at PHCC, I am presently a Doctoral candidate at the University of South Florida, College of Nursing working on a research study that is focusing on how individuals (like you) make dietary choices.

College students are not only gaining wisdom but also weight according to the Center for Disease Control. A recent CDC study found that most college students aren't just gaining the Freshman 15, but are gaining a great deal of weight and aren't losing it. Why? Food Choices. Take a moment and think back to breakfast? What do you eat for breakfast? Did you eat breakfast? How healthy was your lunch?

There are no right or wrong answers to the questions that you are being asked. What is important is finding out how and why you make your food selections. While your participation in filling out this survey is completely voluntary, I would greatly appreciate your thoughts as each completed survey can help us to have a better understanding of how dietary choices are made. Your name will be entered into a lottery where you will be eligible to win a \$10.00 gift certificate to a local eatery.

You and your fellow students have a unique perspective; you can help us, in a way no one else can, to identify those areas in terms of food choices and services where we are doing well – and those where we need to improve.

After the survey is completed, the results will be compiled and analyzed both for the overall group as well as sub groups. Individual responses may be reported but students will remain anonymous during all phases of data collection. The results will be used to help evaluate influences on dietary choices and assist in the design of programs that can be used to promote positive health outcomes. You can see, then, why your participation is so important. Your opinions will influence what we do and will benefit students in the future.

Please, take a few moments to fill out the survey. Your responses are confidential, so please feel free to be absolutely candid.

Many thanks for your assistance.

Sincerely,

Daryle Wane MS, APRN, BC

Associate Professor of Nursing PHCC

Doctoral Candidate at University of South Florida, College of Nursing

Appendix E: Survey Part Submissions

Sample Sizes for Survey Parts

Part	Name	Sample Size (n)
1	FCQ	391
2	FNQ	364
3	NFC	346
4A	FCQ _m 1	339
4A2	FCQ _m 2	334
4A3	FCQ _m 3	322
4A4	FCQ _m 4	312
4A5	FCQ _m 5	298
4A6	FCQ _m 6	290
4A7	FCQ _m 7	282
4A8	FCQ _m 8	277
4A9	FCQ _m 9	277
4A10	FCQ _m 10	283
4B	Paired Comparison	278
5	Demographic	281

FCQ_m1=Nature Valley Trail Mix Fruit & Nut Bar, FCQ_m2=Granny Smith Apple, FCQ_m3=Dole Peeled Mini Carrots, FCQ_m4=Betty Crocker Fruit Roll-Ups Blastin'Berry Hot Colors, FCQ_m5=Orville Redenbacher's Smart Pop Butter Mini Bags, FCQ_m6=Starbucks Coffee Frappuccino, FCQ_m7=Nabisco's Oreo Sandwich Cookies Mini Bite Size Snak Sak, FCQ_m8=Frito-Lay Lay's Potato Chips, Classic flavored, small bag, FCQ_m9=Chocolate Glazed Cake Donut (Dunkin' Donuts), FCQ_m10=McDonald's vanilla reduced fat ice cream cone.

Appendix F: Nutrition Survey

*The survey will appear in a condensed modified format as it was uploaded into a learning management system and had extensive graphic imaging files.

Part I

Factors that influence your choice of food

Several different factors influence our choice of food. For every person, there will be a different set of factors that is important. In the next set of questions, we are interested in finding out what factors influence *your choice of food*. Listed below are a series of factors that may be relevant to your choice of foods. Read each item carefully and decide how important the item is to you. Select the circle that best reflects your feelings. Remember, there are no right or wrong answers – we are interested in *what is important to you*.

Please make sure that you have answered every item.

1. It is important to me that the food I eat on a typical day: is easy to prepare
 Not important A little important Moderately important Very important
2. It is important to me that the food I eat on a typical day: contains no additives
 Not important A little important Moderately important Very important
3. It is important to me that the food I eat on a typical day: is low in calories
 Not important A little important Moderately important Very important
4. It is important to me that the food I eat on a typical day: tastes good
 Not important A little important Moderately important Very important
5. It is important to me that the food I eat on a typical day: contains natural ingredients
 Not important A little important Moderately important Very important

6. It is important to me that the food I eat on a typical day: is not expensive
 Not important A little important Moderately important Very important
7. It is important to me that the food I eat on a typical day: is low in fat
 Not important A little important Moderately important Very important
8. It is important to me that the food I eat on a typical day: is familiar to me
 Not important A little important Moderately important Very important
9. It is important to me that the food I eat on a typical day: is high in fiber and roughage
 Not important A little important Moderately important Very important
10. It is important to me that the food I eat on a typical day: is nutritious
 Not important A little important Moderately important Very important
11. It is important to me that the food I eat on a typical day: is easily available in shops and supermarkets
 Not important A little important Moderately important Very important
12. It is important to me that the food I eat on a typical day: is good value for the money
 Not important A little important Moderately important Very important
13. It is important to me that the food I eat on a typical day: cheers me up
 Not important A little important Moderately important Very important
14. It is important to me that the food I eat on a typical day: smells nice
 Not important A little important Moderately important Very important
15. It is important to me that the food I eat on a typical day: can be cooked very simply
 Not important A little important Moderately important Very important
16. It is important to me that the food I eat on a typical day: helps me cope with stress
 Not important A little important Moderately important Very important
17. It is important to me that the food I eat on a typical day: helps me control my weight
 Not important A little important Moderately important Very important

18. It is important to me that the food I eat on a typical day: has a pleasant texture
 Not important A little important Moderately important Very important
19. It is important to me that the food I eat on a typical day: is packaged in an environmentally friendly way
 Not important A little important Moderately important Very important
20. It is important to me that the food I eat on a typical day: comes from countries I approve of politically
 Not important A little important Moderately important Very important
21. It is important to me that the food I eat on a typical day: is like the food I ate when I was a child
 Not important A little important Moderately important Very important
22. It is important to me that the food I eat on a typical day: contains lots of vitamins and minerals
 Not important A little important Moderately important Very important
23. It is important to me that the food I eat on a typical day: contains no artificial ingredients
 Not important A little important Moderately important Very important
24. It is important to me that the food I eat on a typical day: keeps me awake and alert
 Not important A little important Moderately important Very important
25. It is important to me that the food I eat on a typical day: looks nice
 Not important A little important Moderately important Very important
26. It is important to me that the food I eat on a typical day: helps me relax
 Not important A little important Moderately important Very important
27. It is important to me that the food I eat on a typical day: is high in protein
 Not important A little important Moderately important Very important
28. It is important to me that the food I eat on a typical day: takes no time to prepare
 Not important A little important Moderately important Very important

29. It is important to me that the food I eat on a typical day: keeps me healthy
 Not important A little important Moderately important Very important
30. It is important to me that the food I eat on a typical day: is good for my skin/teeth/hair/nails etc
 Not important A little important Moderately important Very important
31. It is important to me that the food I eat on a typical day: makes me feel good
 Not important A little important Moderately important Very important
32. It is important to me that the food I eat on a typical day: has the country of origin clearly marked
 Not important A little important Moderately important Very important
33. It is important to me that the food I eat on a typical day: is what I usually eat
 Not important A little important Moderately important Very important
34. It is important to me that the food I eat on a typical day: helps me to cope with life
 Not important A little important Moderately important Very important
35. It is important to me that the food I eat on a typical day: can be bought in shops close to where I live or work
 Not important A little important Moderately important Very important
36. It is important to me that the food I eat on a typical day: is cheap
 Not important A little important Moderately important Very important
37. Please indicate which characteristic influences you the most when making a food choice
 convenience timing affordability atmosphere/ambiance
 personal preference tastiness cultural influence
38. Please indicate which characteristic influences you the least when making a food choice
 convenience timing affordability atmosphere/ambiance
 personal preference tastiness cultural influence

Part II

For each of the following questions, you will see a grouping of 4 food items and you will be asked to make a choice. Each group of questions will involve looking at a specific food dimension – portion size, fat content, salt content, sugar content, protein content and fiber content.

1. Food Dimension – Portion size

Which option represents a standard portion size?

- 64-ounce beverage
- 8-ounce candy bar
- 3 ounces meat
- 8 ounces mashed potatoes

2. Food Dimension – Portion size

Which option represents a standard portion size?

- 1-cup ice cream
- 3 pats of butter
- 2 ounces of fat free salad dressing
- 12 oyster crackers

3. Food Dimension – Portion size

Which option represents a smaller portion size?

- 2 ounces fresh apricots
- 4 ounces apple juice
- 6 ounces plain fat-free yogurt
- 1 ½ medium plain cake doughnut

4. Food Dimension – Portion size

Which option represents a larger portion size?

- 1-tablespoon ketchup
- 2 teaspoons grape jelly
- 8 ounces French fries
- 1 ½ medium size dill pickle

5. Food Dimension – Portion size

Which option represents the largest portion size?

- 4 ounces grapefruit juice
- 8 ounces prune juice
- 8 ounces whole milk
- 8 ounces 2% milk

6. Food Dimension – Fat content

Which option has the highest fat content?

- Whole milk
- Cottage cheese
- Chocolate pudding, canned
- Polyunsaturated margarine

7. Food Dimension – Fat content

Which option has the lowest fat content?

- Enriched white bread
- Sugared Dunkin Donut
- Trail Mix
- Egg salad

8. Food Dimension – Fat content

Which option is the highest in saturated fat?

- Mars almond bar
- Milky Way candy bar
- Milk chocolate coated peanuts
- Jellybeans

9. Food Dimension – Fat content

Which option is the highest in Trans fat?

- Fast food french fries
- Pound cake
- Stick margarine
- Butter

10. Food Dimension – Fat content

Which option would be considered an example of a “hidden fat”?

- Bacon
- Butter
- Cheese
- French salad dressing

11. Food Dimension – Salt content

Which option has the highest salt content?

- Beef sirloin
- Seasoned breadcrumbs
- Light beer
- Kit Kat wafer bar

12. Food Dimension – Salt content

Which option has the lowest salt content?

- Lobster
- Angel food cake store bought
- Low fat fruit flavored yogurt
- Cream cheese

13. Food Dimension – Salt content

Which option has the highest salt content?

- White meat roasted turkey
- Leg of lamb
- Pork tenderloin
- Flank steak

14. Food Dimension – Salt content

Which option (1 tablespoon measure) has the highest salt content?

- Yellow mustard
- Mayonnaise
- Jam
- Ketchup

15. Food Dimension – Salt content

Which option has no salt in it (“salt free”)?

- Fresh cranberries
- Grapefruit
- Strawberries
- Blueberries

16. Food Dimension – Sugar content

Which option has the highest sugar content?

- Strawberry Sundae
- Dried sunflower seeds
- Canned sweet potatoes
- Toasted buttered English muffin

17. Food Dimension – Sugar content

Which option has the lowest sugar content?

- White meat roasted turkey
- Leg of lamb
- Pork tenderloin
- Flank steak

18. Food Dimension – Sugar content

Which option would you not include in your diet if you wanted to decrease your sugar content?

- Skim milk ricotta cheese
- Strawberry low fat yogurt
- Fresh Banana
- Fresh Strawberries

19. Food Dimension – Sugar content

Which option has the highest sugar content?

- Honey Nut Cheerios
- Shredded Frosted Wheat
- Kellogg's Corn Flakes
- Kix

20. Food Dimension – Sugar content

Which option has no sugar in it ("sugar free")?

- 1% low fat milk
- Unsweetened apple sauce
- Cooked cabbage
- Air popped plain popcorn

21. Food Dimension – Protein content

Which option has the highest protein content?

- Baked flounder
- White rice
- Kidney beans
- Cheddar Cheese

22. Food Dimension – Protein content

Which option has the lowest protein content?

- Oscar Mayer beef bologna
- Low-fat plain yogurt
- Soy milk
- Cooked shrimp

23. Food Dimension – Protein content

Which option has the highest protein content?

- Arbys Regular Roast Beef
- Kentucky Fried Chicken Wing
- Burger King Whopper
- McDonald's 4 piece chicken nuggets

24. Food Dimension – Protein content

Which option is the best source of protein?

- Egg salad on white bread
- Chicken salad on white bread
- Peanut Butter & Jelly sandwich on white bread
- Fried Rice

25. Food Dimension – Protein content

Which option has no protein in it?

- Soy sauce
- 2 teaspoons grape jelly
- Haagen Daz lemon sorbet
- Chocolate hot fudge syrup

26. Food Dimension – Fiber content

Which option has the highest fiber content?

- Dry roasted salted almonds
- Dried figs
- Frozen hash brown potatoes
- Whole-wheat bagel

27. Food Dimension – Fiber content

Which option has the lowest fiber content?

- Alpha Bits
- Corn Bran
- Post Raisin Bran
- Wheaties

28. Food Dimension – Fiber content

Which option is the best source of soluble fiber?

- Apple
- Cornflakes
- Kidney beans
- Banana

29. Food Dimension – Fiber content

Which option is the best source of insoluble fiber?

- Tomato
- Corn
- White bread
- Green peas

30. Food Dimension – Fiber content

Which option has no fiber in it?

- Ultra Slim Fast French Vanilla
- Whole chocolate milk
- Banana
- Roast Chicken

Part III

Instruction: For each of the statements, please indicate whether or not the statement is characteristic of you or of what you believe. For example, if the statement is extremely uncharacteristic of you or what you believe about yourself (not at all like you) please select "1". If the statement is extremely characteristic of you or what you believe about yourself (very much like you) then please select number "5". You should use the following scale as your rate each of the statements below.

1	2	3	4	5
Extremely uncharacteristic of me	Somewhat uncharacteristic of me	Uncertain	Somewhat characteristic of me	Extremely characteristic of me

1. I prefer complex to simple problems.

1 2 3 4 5

2. I like to have the responsibility of handling a situation that requires a lot of thinking.

1 2 3 4 5

3. Thinking is not my idea of fun.

1 2 3 4 5

4. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.

1 2 3 4 5

5. I try to anticipate and avoid situations where there is a likely chance I will have to think in depth about something.

1 2 3 4 5

6. I find satisfaction in deliberating hard and for long hours.

1 2 3 4 5

7. I only think as hard as I have to.

1 2 3 4 5

8. I prefer not to think about small daily projects to long term ones.

1 2 3 4 5

9. I like tasks that require little thought once I've learned them.

1 2 3 4 5

10. The idea of relying on thought to make my way to the top appeals to me.

1 2 3 4 5

11. I really enjoy a task that involves coming up with new solutions to problems.

1 2 3 4 5

12. Learning new ways to think doesn't excite me very much.

1 2 3 4 5

13. I prefer my life to be filled with puzzles I must solve.

1 2 3 4 5

14. The notion of thinking abstractly is appealing to me.

1 2 3 4 5

15. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.

1 2 3 4 5

16. I feel rather relief rather than satisfaction after completing a task that requires a lot of mental effort.

1 2 3 4 5

17. It's enough for me that something gets the job done; I don't care how or why it works.

1 2 3 4 5

18. I usually end up deliberating about issues even why do not affect me personally.

1 2 3 4 5

Part IV (A1 – A10)

Each of the 10 food items has a separate question page.

In the next set of questions, we are interested in finding out what factors influence *your choice of a specific food*. Listed below are a series of factors that may be relevant to your choice for this food. Select the circle that best reflects your feelings. Remember, there are no right or wrong answers – we are interested in *what is important to you*.

Please make sure that you have answered every item.



For questions 1-36 refer to this image. Granny Smith Apple

1. It is important to me that the food I eat on a typical day: can be prepared at the food location in a short amount of time
 Not important A little important Moderately important Very important
2. It is important to me that the food I eat on a typical day: contains no additives
 Not important A little important Moderately important Very important
3. It is important to me that the food I eat on a typical day: is low in calories
 Not important A little important Moderately important Very important
4. It is important to me that the food I eat on a typical day: tastes good
 Not important A little important Moderately important Very important
5. It is important to me that the food I eat on a typical day: contains natural ingredients
 Not important A little important Moderately important Very important
6. It is important to me that the food I eat on a typical day: is not expensive
 Not important A little important Moderately important Very important
7. It is important to me that the food I eat on a typical day: is low in fat
 Not important A little important Moderately important Very important

8. It is important to me that the food I eat on a typical day: is familiar to me

Not important A little important Moderately important Very important

9. It is important to me that the food I eat on a typical day: is high in fiber and roughage

Not important A little important Moderately important Very important

10. It is important to me that the food I eat on a typical day: is nutritious

Not important A little important Moderately important Very important

11. It is important to me that the food I eat on a typical day: is considered an "on the go" food

Not important A little important Moderately important Very important

12. It is important to me that the food I eat on a typical day: is good value for the money

Not important A little important Moderately important Very important

13. It is important to me that the food I eat on a typical day: cheers me up

Not important A little important Moderately important Very important

14. It is important to me that the food I eat on a typical day: smells nice

Not important A little important Moderately important Very important

15. It is important to me that the food I eat on a typical day: can be eaten quickly

Not important A little important Moderately important Very important

16. It is important to me that the food I eat on a typical day: helps me cope with stress

Not important A little important Moderately important Very important

17. It is important to me that the food I eat on a typical day: helps me control my weight

Not important A little important Moderately important Very important

18. It is important to me that the food I eat on a typical day: has a pleasant texture

Not important A little important Moderately important Very important

19. It is important to me that the food I eat on a typical day: is packaged in an environmentally friendly way
 Not important A little important Moderately important Very important
20. It is important to me that the food I eat on a typical day: comes from countries I approve of politically
 Not important A little important Moderately important Very important
21. It is important to me that the food I eat on a typical day: is like the food I ate when I was a child
 Not important A little important Moderately important Very important
22. It is important to me that the food I eat on a typical day: contains lots of vitamins and minerals
 Not important A little important Moderately important Very important
23. It is important to me that the food I eat on a typical day: contains no artificial ingredients
 Not important A little important Moderately important Very important
24. It is important to me that the food I eat on a typical day: keeps me awake and alert
 Not important A little important Moderately important Very important
25. It is important to me that the food I eat on a typical day: looks nice
 Not important A little important Moderately important Very important
26. It is important to me that the food I eat on a typical day: helps me relax
 Not important A little important Moderately important Very important
27. It is important to me that the food I eat on a typical day: is high in protein
 Not important A little important Moderately important Very important
28. It is important to me that the food I eat on a typical day: can be consumed easily
 Not important A little important Moderately important Very important
29. It is important to me that the food I eat on a typical day: keeps me healthy
 Not important A little important Moderately important Very important
30. It is important to me that the food I eat on a typical day: is good for my skin/teeth/hair/nails etc
 Not important A little important Moderately important Very important

31. It is important to me that the food I eat on a typical day: makes me feel good

Not important A little important Moderately important Very important

32. It is important to me that the food I eat on a typical day: has the country of origin clearly marked

Not important A little important Moderately important Very important

33. It is important to me that the food I eat on a typical day: is what I usually eat

Not important A little important Moderately important Very important

34. It is important to me that the food I eat on a typical day: helps me to cope with life

Not important A little important Moderately important Very important

35. It is important to me that the food I eat on a typical day: can easily be carried to class

Not important A little important Moderately important Very important

36. It is important to me that the food I eat on a typical day: is cheap

Not important A little important Moderately important Very important

Part IV B

For each of the pictured food item pairs, please indicate which snack you would prefer to eat?

Which snack would you prefer?

1.



For each of the 45 pairs, a visual graphic pair was constructed similar to the above graphic image. Below is a listing of the 45 food pairs.

Random Pair Listing

1. Nature Valley Trail mix fruit & nut bar (TM)
2. Granny Smith Apple (AP)
3. Dole peeled mini carrots (CR)
4. Betty Crocker Fruit Roll-ups Blastin' Berry Hot Colors (FR)
5. Orville Redenbacher's Smart Pop Butter Mini Bags (PC)
6. Starbucks Coffee Frappuccino (SB)
7. Nabisco Oreo Sandwich Cookies Mini Bite Size Snak Sak (CK)
8. Frito-Lay Lay's Potato Chips, Classic flavored, small bag (CH)
9. Chocolate Glazed Cake Donut -Dunkin'Donuts (DN)
10. McDonald's vanilla reduced fat ice cream cone (IC)

1. TM and AP
2. CR and FR
3. PC and SB
4. CK and CH
5. DN and IC
6. SB and AP
7. FR and CK
8. CH and IC
9. TM and DN
10. SB and CR
11. IC and AP
12. CR and CH
13. PC and FR
14. CR and AP
15. CR and CK
16. CK and IC
17. DN and FR
18. SB and TM

19. PC and CH
20. PC and CK
21. CR and IC
22. CK and AP
23. DN and CR
24. SB and DN
25. TM and FR
26. FR and CH
27. CH and AP
28. PC and TM
29. TM and CK
30. SB and CK
31. DN and CH
32. FR and IC
33. PC and AP
34. SB and FR
35. DN and CK
36. FR and AP
37. TM and CR
38. PC and DN
39. SB and CH
40. TM and CH
41. PC and CR
42. SB and IC
43. PC and IC
44. TM and IC
45. DN and AP

Part V (Demographics)

The following series of questions are concerned with your dietary behavioral history.

1. Your age: fill in the blank
2. Gender (select one):
Male, female
3. Race/ethnicity (select one)
Caucasian, African America, Hispanic, Asian/Pacific Islander, Other (please specify)
4. If you have selected OTHER to the question above, please indicate your response in the box provided below. If you have not selected OTHER, then please enter the letter X in the box.
5. Were you born in the United States? (select one)
Yes, no
6. Please provide the following physical assessment information. Note your height in feet and inches in the box below. For example, if you are 5 feet, 11 inches you would note 5 and 11.
7. Please provide the following physical assessment information. Note your weight in pounds in the box below.

8. How would you describe your current activity level on a day-to-day basis?

- Low – inactive, sitting during most of the day
- Moderate – participates in activities that take moderate physical effort and make you breathe harder than normal
- Vigorous – participates in activities that take hard physical effort and make you breathe much harder than normal

9. Have you ever been diagnosed with any of the following health problems? If so, please select from the following list as to the nature of your diagnosed health problem. Select all that apply.

Diabetes, hypertension, heart disease, respiratory disease, vascular disease, diseases of the blood or lymphatic system, gastrointestinal disease, allergies, diseases of the skin, other (please specify), none

10. If you have selected OTHER to question 9, please indicate your response in the box provided below. If you have not selected OTHER, then please enter the letter X in the box.

11. If you answered YES or OTHER to question 9, please select from the following list that identifies the type of diet pattern(s) you were on? Select all that apply. If you selected NONE to that question, then please select NONE.

Self-imposed diet, physician advised diet, supervised diet program – e.g. Weight Watchers, Other (Please specify), none

12. If you have selected OTHER to question 11, please indicate your response in the box provided below. If you have not selected OTHER, then please enter the letter X in the box.

13. Are you currently taking any of the following medications? Select all that apply. If you are not currently taking medications, then please select none.

Prescribed medication(s), over the counter medication(s), supplements, none

14. Have you ever received nutritional counseling as part of your medical course of treatment?

Yes, no

15. If you have answered YES to the above question, please identify from the following list what sources provided you with nutritional counseling. Select all that apply. If you did not answer YES to the above question, please select none.

Counseling from my primary care physician during an office visit, counseling from my primary care physician in the hospital, counseling from my nurse practitioner during an office visit, counseling from a dietician in the hospital, other (Please specify), none

16. If you have selected OTHER to the question above, please indicate your response in the box provided below. If you have not selected OTHER, then please enter the letter X in the box.

Please answer these questions that are asked for background and descriptive purposes.

17. Do you have a food allergy?

Yes, no

18. If you answered YES to the above question, please identify the food type or product that you are allergic to. If you did not answer YES, then please select none.

Nuts, lactose intolerance, strawberries, tomatoes, seafood, eggs, chocolate, wheat, wheat (gluten), other (please specify), none

19. If you have selected OTHER to the question above, please indicate your response in the box provided below. If you have selected OTHER, then please enter the letter X in the box.

20. Have you ever been on a diet?

Yes, no

21. How often do you restrict your food intake in an effort to control your weight?

Never, sometimes, often, always

The following questions concern your occupational status and nutritional knowledge.

22. Work status (select one)

Full time, part time, do not work

23. What is your occupation?

24. Student status (select one)

Full time, part time

25. What is your major field of study?

26. Please indicate from the choices offered below, how you have obtained your Nutrition Knowledge background. Select all that apply.

Formal nutrition course in High School, integrated nutrition information during High School, formal nutrition course in college undergraduate, formal nutrition course in college graduate, no formal or informal nutrition classes during schooling, other (please specify)

27. If you have selected OTHER to the question above, please indicate your response in the box provided below. If you have not selected OTHER, then please enter the letter X in the box.

28. From the choices below, please identify how you learn about new Nutrition information. Select the top THREE sources.

Healthcare provider, medical journal, nutrition journal, newspaper, magazines, TV headlines, TV advertising. Family & friends, other (please specify)

29. If you have selected OTHER to the question above, please indicate your response in the box provided below. If you have not selected OTHER, then please enter the letter X in the box.

About the Author

Daryle Hermelin Wane received a Bachelor of Arts in Food and Nutrition from Brooklyn College, New York in 1976 and a Bachelor of Science degree in Nursing from State University of New York (SUNY) Downstate Medical Center, College of Nursing in 1980. In 1991, she earned a Master of Nursing degree from the University of South Florida, Tampa, Florida. She has worked as a staff nurse and charge nurse in both medical surgical and obstetrical clinical areas. She has also worked as an Obstetrical Nurse Manager and as a Prenatal Clinic nurse. She is also a board certified Family Nurse Practitioner and is currently a tenured faculty member at Pasco-Hernando Community College, Florida where she teaches both nursing and nutrition courses. She completed her Ph.D. in 2008 with an emphasis on nutrition, health decision behaviors and advanced statistics.